ETHNOBOTANICAL STUDY OF TRADITIONAL MEDICINAL PLANTS OF TOLE WOREDA, SOUTH WEST SHOA ZONE OF OROMIA REGION, ETHIOPIA

M.Sc. THESIS

KENENI GOBU

MAY, 2018

HARAMAYA UNIVERSITY, HARAMAYA

Ethnobotanical Study of Traditional Medicinal Plants of Tole Woreda, South West Shoa Zone of Oromia Region, Ethiopia

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

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

Keneni Gobu

May 2018
Haramaya University, Haramaya

HARAMAYA UNIVERSITY

POSTGRADUATE PROGRAM DIRECTORATE

I hereby certify that I have read and evaluated this Thesis entitled by 'Ethnobotanical study of traditional medicinal plants in Tole Woreda south west shoa zone of Oromia, Ethiopia' prepared under my guidance by Keneni Gobu. I recommend that it be submitted as a fulfilling the thesis requirements.

Meseret Chimdessa (PhD)	_____	_____
Major Advisor	Signature	Date
Manikandan Muthuswamy (PhD)	_____	_____
Co- Advisor	Signature	Date

As member of the Board of Examiners of the M.Sc. Thesis Open Defense examination, I certify that I have read and evaluated the Thesis prepared by Keneni Gobu and examined the candidate. I recommend that the thesis be accepted as fulfilling the thesis requirements for the degree of Master of Science in field of Botany.

_____	_____	_____
Chairperson	Signature	Date
_____	_____	_____
Internal examiner	Signature	Date
_____	_____	_____
External examiner	Signature	Date

ACRONYMS AND ABBREVIATIONS

CSA	Central Statistical Agency
FL	Fidelity Level
IBC	Institute of Biodiversity Conservation
ICF	Informant Consensus Factor
IK	Indigenous knowledge
Masl	Meters above sea level
WHO	World Health Organization

DEDICATION

This thesis is dedicated to my beloved mother **Ayantu Wami Balcha** and my brother **Chala Gobu Gurmessa** who bring me up to this level, nursing me with affection and their giving love for my work and successes in my life.

STATEMENT OF THE AUTHOR

By my signature below, I declare that this thesis is my own work and all sources of materials consulted for this work have been duly acknowledged. I have followed all ethical principles of the research in data collection, analysis, the preparation and completion of this thesis. All scholarly matters that are included in the thesis have been given recognition through citation. I affirm that I have cited and referenced all sources used in this document.

This thesis has been submitted in partial fulfillment of the requirement for degree of master science in biology from the Post graduate Program Directorate at Haramaya University. The thesis is deposited in the university library to be made available to borrowers under rules of the library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma or certificate.

Brief quotations from this document are allowable without special permission provided that an accurate acknowledgment of the source is made Request for permission for extended quotation from or reproduction of the manuscript in whole or in part may be granted by Postgraduate Program Directorate when the proposed use of material is in the interest of scholarship. In other instances, however, permission must be obtained from the author.

Name: Keneni Gobu

Signature_____

Place: Haramaya University, Haramaya

Date of Submission: _____

Department _____

BIOGRAPHICAL SKETCH

The author, Keneni Gobu, was born from her father Gobu Gurmessa and from her mother Ayantu Wami in January 20, 1996 in Kursiti arada leka kebele, Tole Woreda, South west Shewa Zone, Oromia Regional State, Ethiopia. She attended her elementary school at Arangama School from 2002 to 2009 then she attended her secondary and preparatory school from 2010 to 2013 at Bantu Secondary and Preparatory school. After completion of her Preparatory at Bantu school in 2013, she joined Dire Dawa University in 2014. She graduated, in June 2016 with B.Sc. degree in Biology. After graduating with first degree she joined the School of Graduate Studies at Haramaya University as a candidate for Master of Science in Botany.

ACKNOWLEDGEMENTS

First of all my most profound gratitude and thanks go to my major Advisor Dr: Meseret Chimdessa for his valuable comments and professional guidance for the completion of this thesis work. My sincere gratitude also goes to my Co-advisor Dr. Manikandan Muthuswamy for his helpful comments, suggestion and support during the course of the thesis research.

I am greatly indebted to the local people of Tole Woreda who generously shared their wisdom and experiences on traditional medicinal plants. Special thanks go to Haramaya University Herbarium for species identification. My deepest appreciation goes to all my brothers, sisters, and partners for their constant encouragement on my work.

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS iv

DEDICATION v

STATEMENT OF THE AUTHOR vi

BIOGRAPHICAL SKETCH vii

ACKNOWLEDGEMENTS viii

LIST OF TABLES xi

LIST OF FIGURES xii

LIST OF APPENDIX xiii

ABSTRACT xiv

1. INTRODUCTION 1

2. LITERATURE REVIEW 3

2.1. Historical Development of Ethnobotanical Study 3

2.2. Indigenous Knowledge 5

2.3. Traditional Medicinal plants in Ethiopia 6

2.4. Threats to medicinal plants 8

2.5. Conservation of traditional medicinal plants 9

3. MATERIALS AND METHODS 11

3.1. Description of the Study Area 11

3.1.1. Location 11

3.1.2. Vegetation and Major Cultivated Crops 12

3.1.3. Climate condition 12

3.1.4. Population 12

3.2. Reconnaissance Survey and Selection of Study Sites 12

3.3. Ethnobotanical Data Collection **13**

3.4. Data Analysis **13**

Preference ranking **13**

Direct Matrix Ranking **14**

Informant Consensus Factor **14**

The Fidelity Level **14**

4. RESULTS AND DISCUSSION **16**

4.1. Diversity and distribution of medicinal plants in the Study Area **16**

4. 2. Part of Plants Used for Medicine, their preparations **18**

4.3. Preference Ranking and Direct Matrix Ranking **19**

4.4. Informant Consensus Factor and Fidelity Level **21**

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS **24**

5.1. Summary and Conclusions **24**

5.2. Recommendation **25**

6. REFERENCES **26**

7. APPENDIXES **34**

LIST OF TABLES

Table	Page
1. Plant part used for medicines in the study area	18
2. Preference ranking of medicinal plants used for treating common cold	20
3. Direct matrix ranking of medicinal plants used for multipurpose	21
4. ICF values of ailments treated using the medicinal plants of the study area.	22
5. Fidelity level of some medicinal plants	23

LIST OF FIGURES

Figure	page
1. Map of study area	11
2. Habits of medicinal plants used to treat ailments in the study area	17
3. Habitat distribution of medicinal plants used to treat ailments in the study area	17
4. Route of application of the remedies	19

LIST OF APPENDIX

Appendix	Page
1. List of medicinal plants used for humans and livestocks	34
2. Human disease treated by traditional medicinal plants in the study area	43
3. Animal disease treated by traditional medicinal plants in the study area	44
4. Animal and human disease treated by traditional medicinal plants in the study area	44
5. Plant families with their respective genera and species number	45
6. List of informants that give information on ethnobotanical study in the study Area.	47

ETHNOBOTANICAL STUDY OF TRADITIONAL MEDICINAL PLANTS OF TOLE WOREDA, SOUTH WEST SHOA ZONE OF OROMIA REGION, ETHIOPIA

ABSTRACT

In Ethiopia, about 70% of human and 90% of livestock population depend on traditional medicine, which mostly are from plant origin. The purpose of this study was to collect, identify and document traditional medicinal plants that are related with indigenous knowledge of the study area. Ethnobotanical data were collected from 100 respondents in three study sites through semi-structured interviews, group discussion, and guided field walks with key informants for field observations. Key informants were selected by purposive sampling from the study kebeles based on the information gathered from the local people while other ordinary respondents were randomly selected. Informant consensus factor (ICF) and fidelity level were calculated to assess the agreement of informants on the medicinal value of plants. Furthermore preference ranking and direct matrix were computed. In this study, 68 species belonging to 64 genera and 39 families were documented. Of these plants 51(75%) were mentioned for use in the treatment of human ailment, 14(20.5%) for livestock and 3(4.41%) of them for use in the treatment of both human and livestock ailments. Family Poaceae was represented by the highest number (5) of species. Herbs were the dominant life form and accounted for 31(46%) of the plant species. Leaves were the most cited plant parts for remedy preparation. Diseases categories such as Urino-genital problems (Urine retention, Placental retention and gonorrhea) (0.94); Evil spirit, Fibril illness, headache (0.87); had higher ICF values, suggesting high occurrence of these diseases in the study area and agreement of people on their remedies. Preference ranking show that Allium sativum was the most preferred plant in treating common cold. Direct matrix ranking showed Acacia sieberiana was the most utilized species by the community. Providing awareness for traditional healer, encouraging their knowledge on traditional medicinal plants and creating awareness on sustainable use of declining plant resources help in the sustainable use of these plant resources.

Key words: Ethnobotany, Indigenous knowledge, Informant consensus factor, Key informants, Tole

1. INTRODUCTION

From the beginning of humanity, indigenous people have developed their own local specific knowledge on plant use, management and conservation (Cotton, 1996). Indigenous people around the world have unique knowledge of plant resources on which they depend for food, medicine and other uses (Samar *et al.,* 2015). The local specific knowledge of a particular community develops as a result of human interaction with their environment, and shaped by its unique culture and religion. This interaction between the environment (plants) and people of a particular community is studied by ethnobotany. Ethnobotanical studies are useful in documenting, analyzing and communicating knowledge and interaction between biodiversity and human society, how diversity in nature is used and influenced by human activities (Balick and Cox, 1996). Among others, ethnobotany deals with plants use for medicine, food, shelter, etc. Medicinal plants have been globally used for millennia by indigenous people to get relief from illness (Hawkins, 2008).

It was estimated that 25000 to 75000 species of higher plants have been used in traditional medicine worldwide (Farnsworth, 1985) and globally about 64% of the total world population remains dependent on traditional medicine for their healthcare needs. Plants have been vital source of both preventive and curative traditional medicine for man and livestock (Dery *et al.,* 1991). Medicinal plants still play considerable role in health care system of the world. Africa is a continent greatly endowed with medicinal plants, which indigenous people are familiar with and have used over time. As highlighted by Sofowora (1982) Africa has as much as three hundred thousand medicinal plants and more than 80% of the people in Africa depend on traditional medicine for their health care needs (WHO, 2003).

Ethiopia is characterized by a wide range of ecological, edaphic, and climatic conditions that accounts for the wide diversity of its biological resources both in terms of flora and fauna (Jansen, 1981). About 10-12% of the Ethiopian flora is estimated to be endemic, many of which are of medicinal value (Endalew, 2007). It is well known that traditional medicines are widely used especially in the low income rural parts of the country. In Ethiopia, about 70% of human and 90% of livestock population depend on traditional medicine (Endalew, 2007).

The demand for medicinal plants is increasing in both developing and developed countries and the bulk of their material trade is still from wild harvested plants. In developing countries, traditional medicine of plant origin is gaining popularity as it is inexpensive compared to the modern health services (Pareek and Trivedi, 2011). The excessive use of plants for medicinal plants, however, possesses great pressure on plant resources and associated indigenous knowledge. This requires documentation of the medicinal plants and their associated indigenous knowledge before it is too late for their sustainable use. With this regard, many researchers (Kebu *et al.,* 2004; Endalew, 2007; Etana, 2007; Mulugeta, 2014; Eskedar, 2011; Mekonnen, 2013) have conducted in different parts of Ethiopia. However, ethnobotanical studies conducted on medicinal plants in Ethiopia so far are not included with many localities with their own ethnic communities having unique language, culture and vegetation types are uninvestigated. One of such places is Tole Woreda in South West Shoa of the Oromia regional state, Ethiopia. This study was made to conduct ethnobotanical studies on medicinal plants of Tole with the following objectives.

General objectives

- To undertake ethnobotanical study on medicinal plants in Tole Woreda, Ethiopia

Specific objectives

- To gather, record, and document indigenous knowledge of people on medicinal plants of Tole Woreda;
- To collect and identify and document medicinal plant species used to treat human and animal ailments in the study area; and
- To identify plant parts used for medicinal purposes, their methods of preparation, route of application and utilization in the study area.

2. LITERATURE REVIEW

2.1. Historical Development of Ethnobotanical Study

John Hershberger proposed the term ethnobotany for the first time in 1895 (Balick and Cox, 1996). However this term has been given different interpretations and definitions depending on the interest of workers involved in the study (Cotton, 1996). Currently ethnobotany has become a more diversified and multidisciplinary subject that requires experts in various fields of academic study such as Botany, Anthropology, Agriculture, Linguistics, Archeology and Economics (Martin, 1995; Alexiades, 1996; Balick and Cox 1996). Ethnobotany is also a rapidly growing science, attracting people with widely varying academic back grounds and interests (Mac, 2009) and now days ethnobotany has tended to become more analytical, quantitative cross-disciplinary and multi institutional (Hamilton *et al*., 2003).

Ethnobotany encompasses all studies that concern the mutual relationships between plants and traditional people (Cotton, 1996). In general the focus of ethnobotany is on how plants have been or are used, managed and perceived in human societies and includes plants used for food, medicine, rituals, social life and others. Ethnobotanical investigation documents the knowledge on cultural interaction of people with plants. It also tries to find out how local people have traditionally used plants for various purposes and how they incorporated plants in to their cultural tradition and religions (Balick and Cox, 1996). Therefore, traditional local communities worldwide have a great deal of knowledge about native plants on which they intimately depend.

During the last decade, the use of traditional medicine (TM) has expanded globally and has gained popularity. It has not only continued to be used for primary health care of the poor in developing countries, but has been used in countries where conventional medicine is predominant in the national health care system (Ayehu *et al*., 1993). During the century, a considerable attention has focused not only on how plants are used, but also on how they are perceived & managed and the reciprocal relationships between human societies and the plants on which they depend (Mersha, 2011). In the development of the field of ethnobotany, a gradual change from a narrow scope to a broader one is evident.

The term ethnobotany was found a rather difficult one to define during the times and a number of scholars attempted (Alcorn, 1984; Cotton, 1996). Following this, Harshberger and Robbins in 1925 redefined ethnobotany as the study of how plants are perceived and understood by the tribal people. In addition, Ford (1978) stated it as 'study of direct interaction between human beings and plants'. Furthermore, Martin (1995) conceptualized ethnobotany as the study of how local people classify, manage and use plants available in their surroundings; whereas Balik and Cox (1996) defined it as a branch of Ethnobiology and ethnosciences that deals with the reciprocal relationship between plants, people and the way they live.

Explorers, missionaries and immigrants have contributed a lot to the basis of ethnobotany. e.g., Christopher Columbus favored the exchange of plants from the Old World to the New World. Associated with exchange of the plant species there is an associated exchange of plant use and management knowledge from the traditional people of the two extremes. In the 16th century, increased interaction of people of the world led to exchange of plants and other products originally discovered through observations and use by indigenous people (Ford, 1978; Cotton, 1996).

It is difficult to tell exactly when the term ethnobotany became part of modern science. However, it can be traced back to the time when humans started making conscious interaction with plants and animals. Ethnobotanical work seems to have started with Christopher Columbus in 1492, at a time when he brought tobacco, maize, spices and other useful plants to Europe from Cuba (Cotton, 1996) and when other immigrants from the new world documented food, medicine and other useful plants of the Aztec, Maya and Inca Peoples (Martin, 1995). Research concerned with ethnobotany involves recording the knowledge on the cultural interaction of people with plants, finding out how local people have traditionally used plants for various purposes, and how they incorporate plants into their cultural tradition and religion (Balick and Cox, 1996).

To get more detailed and reliable information, ethnobotanical investigation needs to involve scholars from various streams such as plant taxonomy, plant ecology, anthropology, linguistic, economic botany, pharmacology and the like (Martin, 1995).

2.2. Indigenous Knowledge

Indigenous knowledge refers to the accumulation of knowledge, rule, standards, skills, and mental sets, which are possessed by local people in a particular area (Balcha, 2014). The immediate and intimate dependency of local people on natural resources resulted in the accumulation of indigenous knowledge that helped to adapt to and survive in the environments in which they live. It is local knowledge that is unique to a given culture or society and the base for agriculture, health care, food preparation, education, environmental conservation and a host of other activities. The complex knowledge beliefs and practices generally known as indigenous knowledge develops and changes with time and space. Hence, such knowledge includes time tested practice that developed in the process of interaction of humans with their environment (Alcom, 1984). Therefore, Indigenous knowledge is a body of knowledge built up by a group of people through generations of living in close contact with nature and it is cumulative and dynamic.

Traditional people around the world knowledge possess unique knowledge of plant resources on which they depend for food, medicine and general utility including tremendous botanical expertise (Martin, 1995). Over centuries, indigenous people of different localities have developed their own specific knowledge on plant resource use, management and conservation (Cotton, 1996). Systematic application of indigenous knowledge is important for sustainable use of resources and sustainable development (Thomas, 1995). The local people have a long history of traditional plant usage for medicinal purposes. It was believed to be the result of many generations long year's experiences, careful observations and trial and error experiments that early humans acquired the knowledge on the utilization of plants for disease prevention and curative purposes (Sofowora, 1982; Martin, 1995). So, the knowledge and application of traditional medicine is one of the widely used indigenous knowledge systems. This implies that humans are dependent on other organisms for their life. This close interaction and dependency of humans on plants is studied under the field of ethnobotany. Such knowledge, known as ethnomedicinal knowledge involves traditional diagnosis, collection of raw materials, preparation of remedies and its prescription to the patients. The documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important drugs of modern day (Balick and Cox, 1996). Indigenous knowledge on remedies in

many countries including Ethiopia passes from one generation to the other generation verbally with great secrecy. Such secrete makes indigenous knowledge or ethnomedicinal knowledge vulnerable to distortion and in most cases, some of the lore is lost at each point of transfer; hence, there is a need for systematic documentation of such useful knowledge through ethnobotanical research. According to Getachew Berhan and Shiferaw Dessie (2002) the knowledge of medicinal plants is commonly passed from generation to generation. In this process valuable information can be lost whenever a medicinal plant is lost or when a traditional medical practitioner dies without passing his/her indigenous knowledge to others (Yibrah, 2014).

2.3. Traditional Medicinal plants in Ethiopia

The various climatic and topographic conditions of the country contributed to a rich biological diversity. Ethiopia is believed to be home for about 6,000 species of higher plants with approximately 10% endemism (Ensermu *et al.,* 2006). In Ethiopia, plants have been used as a source of traditional medicine from antiquity to solve different health problems and human sufferings (Kebede *et al.,* 2006). The country possesses a wide range of potentially useful medicinal plants, more extensive indeed than available in many other parts of the world.

They remain the main resource for a large majority (80%) of the people in Ethiopia to treat their illnesses and maintain their health (Asfaw *et al*., 1999). However, this is not only because of poverty where people cannot afford to buy expensive modern drugs, but traditional systems are also more culturally acceptable and meet the psychological needs in a way modern medicine does not. In Ethiopia, even though the traditional medical practitioners are the best sources of information about the knowledge of the medicinal plants, it was found very difficult to obtain their traditional medicinal information as they are consider their indigenous knowledge as a professional secret, and only to be passed orally to their older son at their oldest age (Jansen, 1981). On the other hand, the local indigenous knowledge on medicinal plants is being lost at a faster rate with the increase of modern education, which has made the younger generation to under estimate its traditional values.

In addition the increase in population growth rate would result in the intensification of agriculture in marginal areas which would lead to deforestation with decrease in number or loss of medicinal plants in the wild (Phankhurst, 2001). In Ethiopia, there is a large magnitude of use and interest in medicinal plants due to socio cultural acceptability, accessibility, affordability, and biomedical benefits of the traditional medicinal plants (Haimanot, 2010). In other words, in all regions of the country, traditional medicine has high acceptability since it is an integral part of the local culture and hence, people often rely on their efficient and less costly alternative health care (Mwambazi, 1996; WHO, 2000; Konno, 2004). It is also noted that since medicinal plants are often within easy reach compared to modern drugs that are dispensed in remotely located health institutions, so most people in Ethiopia rely on the medicinal plants for treating their livestock and themselves (WHO, 2000; Dawit, 2001; Konno, 2004).

Medicinal plants have also economic importance besides their critical role in the health care provision of much of the world population (Medihn *et al*., 2001). These plants are commonly traded in various forms in different countries (Lange, 1998), currently large number of medicinal plants have been found their way as raw materials of modern bio-pharmaceutical industries (Rai *et al*., 2000). Ethiopia is endowed with a number of economically useful medicinal plants. But Ethiopia is not known in developing the law for importing and exporting medicinal plants legally.

Modern medical services are in accessible to the vast majority of the population due to their costs made herbal medicines more acceptable. Due to incomplete coverage of modern medical system shortage or pharmaceuticals and unaffordable prices of modern drugs, the majority of Ethiopian still depends on traditional medicine. The antiquity of the traditional use of medicinal plants in Ethiopia could never be disregarded (Pankhurst, 2001; Mirutse, 1999). Due to acceptability, accessibility and biomedical benefits there is a large magnitude of use and interest of medicinal plants in Ethiopia (Dawit, 2001).

2.4. Threats to medicinal plants

Ethiopia's traditional medicine as elsewhere in Africa is facing problems of continuity and sustainability (Ensermu *et al*., 1992). The primary causes of this problem are loss of taxa of medicinal plants, loss of habitats of medicinal plants and loss of indigenous knowledge. Some studies have shown that most of the medicinal plants utilized by Ethiopian people are harvested from wild habitats (Mirutse, 1999; Tesfaye and Zemede, 1999) and hence this aggravates the rate of loss of taxa with related indigenous knowledge and loss of widely occurring medicinal plant species.

The current loss of medicinal plants and the associated indigenous knowledge in Ethiopia is due to natural and anthropogenic factors (Giday, 2010b); (Ermias *et al*., 2008). Some medicinal plant species of Ethiopia are reported to have been threatened because of over harvesting for marketing as medicine. Among many medicinal plants in Ethiopia, about 26 species are endemic and they are becoming increasingly rare and at the verge of extinction (Tesfaye and Sebsebe, 2009).

According to Abebe (2001), the diversity of plants in Ethiopia is on the process of being eroded mainly due to human induced pressures. The same paper states that habitat destruction and deforestation for commercial timber, encroachment by agriculture and other land uses have resulted in the loss of some thousand hectares of forest that harbor useful medicinal plants, annually over the past several decades. With the present ecological and socio-economical changes, the medicinal plants together with ethnobotanical knowledge, may disappear and thus may be lost from humanity forever (Tesfaye, 2003).

Rapid increase in population, the need for fuel, urbanization, timber production, over harvesting, destructive harvesting, invasive species, commercialization, honey cut, degradation, agricultural expansion and habitat destruction are human caused threats to medicinal plants (Engedasew *et al*., 2015). 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 (Zemede, 2001). Likewise, natural causes include recurrent drought, bush fire, disease and pest out breaks (Ensermu *et al*., 1992).

Beside to these known factors which threat medicinal plant species, other condition like the types of the medicinal plant and the part used also affect the medicinal plant. Moreover, uprooting and unsustainable utilization are the major threats to medicinal plants in Ethiopia (Haile, 2007). Besides to other factor, the younger generation under estimate the traditional system of healing (Sofowora, 1982) and this is bad fortune for the advancement and the conservation of medicinal plants and associated knowledge.

2.5. Conservation of traditional medicinal plants

There is a worldwide decline in natural vegetation, including medicinal plants, due to human activities, and more than half the habitable area of the planet has already been disturbed. Over utilization of natural resources and pollution of the soil, water and the atmosphere have all reduced biodiversity (Debela, 2001). Conservation is defined as the sustainable use of biological resources. The concept of sustainability is now seen as the guiding principle for economic and social development, particularly with reference biological resources. According to Zemede (2001), medicinal plants are considered to be at conservation risk due to over use and destructive harvesting of parts. Medicinal plants can be conserved by encouraging their growth in special places, as they have been traditionally (Zemede, 2001). This is possible in places of worship sacred grooves, farm margins, river banks, road sides, live fences of gardens and fields.

According to Zemede (2001), medicinal plants can be conserved using appropriate conservational methods in gene banks and botanical gardens. These types of conservation of medicinal plants can also be possible in home gardens, as the home garden is strategic and ideal farming system for the conservation, production medicinal plants. Study of Jin *et al*., (1999) showed that documentation of indigenous knowledge through ethnobotanical studies is important for the conservation of biological and cultural diversities as well as sustainable utilization of resources. Due to these facts the need of conservation of the biological diversity and its indigenous knowledge has been emphasized in contemporary studies of ethnobotany and genetic diversity (Rossato *et al*., 1999; Padula *et al*., 2013; Fernandez *et al*., 2013). However, this conservation cannot be successful without indigenous people and application of their ethnobotanical knowledge.

Ethiopia has polices and strategies that support the development and utilization of plant resources in a sustainable manner. The policies are reflected under various sectors including environmental protection, development of the natural resources and diversification of the domestic and export commodities (Endashaw, 2007).

The country also has developed policy and a guide line for intellectual property rights protection of traditional medicine. The policy encourages and promotes the appropriate use and protections of traditional medicine knowledge in Ethiopia taking into account the need of the traditional medicinal knowledge holders and the communities who benefit from the use of the knowledge.

Medicinal plants fit in the development activities that support public efforts in meeting livelihood requirements. According to Debela (2007), in order to benefit continuously from the natural resource base, people must conserve the biodiversity within their surroundings and the related indigenous knowledge regarding medicinal plants. Indigenous knowledge can be a fundamental starting point in any conservation strategy (Bodeker, 2005) as there are often traditional management practices or rituals that promote sustainable resource use. Effective conservation of biodiversity can only be achieved through the sustained efforts of all, but most importantly rural communities, who rely directly on local biodiversity for their livelihoods (Debela, 2007).

3. MATERIALS AND METHODS

3.1. Description of the Study Area

3.1.1. Location

The study was conducted in Tole Woreda, South West Shoa zone of Oromia Region, Ethiopia. Tole is one of the woreda's in the Oromia Region of Ethiopia. It is part of the South west Shoa Zone, it is bordered on the southwest by Kokir, on the west by Becho, on the northwest by Elu, on the northeast by the Awash which separates it from Alem Gena, and on the east and south by Kersana malima. The major town in Tole is Bantu Liben which is 83km away from Addis Ababa. Bantu is the only town found in the Woreda. Distance of the town from zonal capital, Weliso, is 80kms. Tole is located at 8^{o} 37' 12"N and 38^{o} 21' 44"E latitude and longitude, respectively. The Woreda is located on altitude between 2100-3080 m.a.s.l. (Tole Woreda Agricultural Office, 2015). Its total land mass coverage is about 41019 hectares and subdivided into 25 kebele of which one is the urban kebele and the rest are rural (Tole Woreda Agricultural Office, 2015).

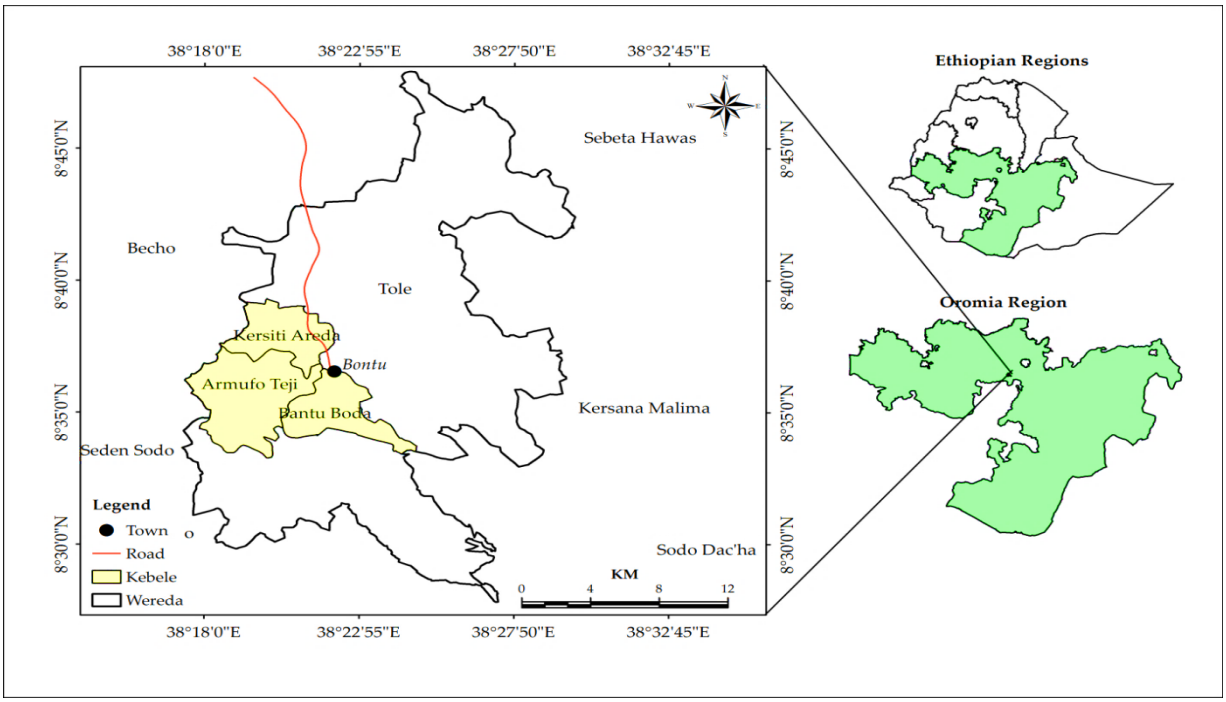

Figure 1. Map of Tole Woreda

3.1.2. Vegetation and Major Cultivated Crops

The vegetation of the study area consists of various trees, shrubs and herbaceous species. Some of the common plant species include Barhirzaf (*Eucalyptus* species), Wadeessa (*Cordia africana*), Laaftoo (*Acacia sieberiana),* Garbii (*Feidherbia albida*), Agamsaa (*Carissa edulis*), Mi'eessa (*Euclea schimperi*), Ebicha (*Vernonia amygdalina*) and *Juniperus procera*. Teff (*Eragrostis teff*), Wheat (*Triticum species*), Chickpeas (*Cicer arietinum*), Barely (*Hordeum vulgare*), Bean (*Vicia faba* L.), pea (*Pisum sativum* L.), Grass pea (*Lathyrues sativus*) are among the commonly cultivated crops in the study area (Tole Woreda Agricultural Office, 2015).

3.1.3. Climate condition

According to Agricultural development office of Tole Woreda, Tole Woreda has only *dega* climate and *Woina dega* types. These agro-ecological zones account for 20 and 80% of the area, respectively (Ashenafi, 2013). The average temperature of the area varies from 18^{o}c to 20^{o}c and has an annual rainfall ranging from 1600mm to 2000mm area (Tole Woreda Agricultural Office, 2015). In the Woreda, vertisols (black basaltic soils), Nitosols (Red basaltic soils) and Combisol (shallow and sandy soils with coarse texture) type of soils are mainly identified. However the Woreda is mainly situated on sandy soils with coarse texture surrounded by vertisol type of soils.

3.1.4. Population

The Woreda has a total population of 62895 of whom 31798(50.55%) are men and 31097(49.44%) are women; 2895 or 4.6% are urban and 60000 or 95.6% of its population are rural dwellers. The majority (90.48%) of the inhabitants practice Ethiopian Orthodox Christianity while 2.37% of the populations are Muslims (CSA, 2007).

3.2. Reconnaissance Survey and Selection of Study Sites

Reconnaissance survey was conducted from August 12, 2017 to August 20, 2017, to select three potential kebele which included *Kursiti arada leka, Bantu boda* and *Armufo Taji* for

ethnobotanical data collections. These kebeles were selected based on the availability of traditional medicinal practioners and traditional medicine use history.

3.3. Ethnobotanical Data Collection

One hundred respondents (aged ≥20) of which 75(59 male and 16 female) of them were non practioners and 25 (18 male and 7 female) key informants were participated in this study. Key informants were selected by purposive sampling from the study kebeles based on the information gathered from the local people while non practioners were randomly selected. Ethnobotanical data were collected between August, 2017 and September, 2017 on trips made to the three sites. Data collection methods were through semi-structured interviews, group discussions, and guided field walks with key informants for field observations. All respondents were individually interviewed to mention about the local names of the plants they use to treat diseases, diseases treated, parts of plants used, and methods of preparation of remedies, route of application of the remedies and factors that threaten medicinal plants. During the study period, each informant was asked two to three times (triangulation) in order to get the reliability of the information. The responses that were contradicted with each other were rejected. Then after, group discussions were made with key informants and later field trip was made with them for onsite observation of the plants and collection of voucher specimens. The collected voucher specimens were pressed and identified in Haramaya University and deposited in the same university's herbarium.

3.4. Data Analysis

A descriptive statistical method and other indices were used to analyze ethnobotanical data.

Preference ranking

To compare the most effective medicinal plants used by the community to treat common cold preference ranking was conducted following Martin (1995) and Cotton (1996) for most important medicinal plants used in treating common cold. For this, ten informants were selected to identify the best preferred medicinal plant species for treatment of the common cold. Each informant was provided with the mentioned medicinal plants reported to cure the

illness with leaves of medicinal plant used being paper tagged then was asked to assign the highest value (7) for the most preferred species against the illness and the lowest value (1) for the least preferred plant and in accordance of their order for the remaining one. The value of each species was summed up and the rank for each species was determined based on the total score.

Direct Matrix Ranking

Direct matrix ranking exercise was done following Martin (1995) and Cotton (1996) in order to compare multipurpose use of a given species and to relate this to the extent of its utilization versus its dominance. Based on information gathered from informants, multipurpose tree species were selected out of the total medicinal plants and use diversities of these plants were listed for selected key informant to assign use value to each species. Each key informant was then asked to assign use values (5=best, 4=very good, 3=good, 2=less used, 1= least used). Accordingly, each key informant use values assignment were summed up and ranked.

Informant Consensus Factor

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

$$\mathbf{ICF} = \frac{n_{ur} - n_t}{n_{ur} - 1}$$

The Fidelity Level

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

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

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

4. RESULTS AND DISCUSSION

4.1. Diversity and distribution of medicinal plants in the Study Area

A total of 68 species of medicinal plants used to treat 40 diseases were collected and documented from the study area. These plants belong to 64 genera and 39 families. Of these plants, 51 species (75%) are used to treat human diseases, 14 species (19.11%) are used to treat animal disease and 3 species (5.88%) are used to treat both human and animal diseases (Appendix 1). Traditionally, the local people give more emphasis to their health. As a matter of evidence, they have a proverb where the local people compare their health with cattle**.** In Oromo tradition, cattle are much liked and are source of their livelihood, and the proverb says in local language or Afan Oromo that *"**Fayyaan ofii loon moora tokko caala***", which roughly translates as ***'health worths much more than dozens of cattle'*.** However, as there was no modern medication during early time in rural areas, traditionally people used to depend on plants of their locality to treat their ailments. Dependency of the locals on plants for the treatment of ailments is again evidenced by another proverb, which in Afan Oromo reads as **"*Gizawaa fi Agamsi yoo jiraate barri kee duraa maaf dhukkubsataa mucaan kee si jala"*** This roughly translates as **''your child will never be sick if you have plants such as *Withania somnifera* and *Carissa edulis* around you.** This fact tells us that people of the study area depend on traditional medicine of plant origin besides modern medication, and still consider plants as main source of health care system. According to Fassil Kibebew (2001), about 75-90 % of the rural population in the world (excluding western countries) relies on traditional medicines as their only healthcare system.

In term of species composition family Poaceae consists of 5 species followed by Lamiaceae, Solanaceae, Fabaceae, Asteraceae each with 4 species; Rutaceae, Euphorbiaceae each with 3 species; Flacourtiaceae, Cucurbitaceae Brassicaceae, Borginaceae, Amaryllidiaceae, Acanthaceae, Rubiaceae, Rosaceae and Scrophulariaceae each with 2 species. The remaining 23 families consists one species (Appendix 1). Out of the total 68 collected medicinal plants, majority of them are herbs while shrubs, trees and climbers follow in number in a descending order (Figure 2) comparatively high number of herbs and shrubs has also been reported

previously for medicinal purpose by Debela Hunde, (2001); Mekonnen Abebe (2013) and Jarsso Belay (2016).

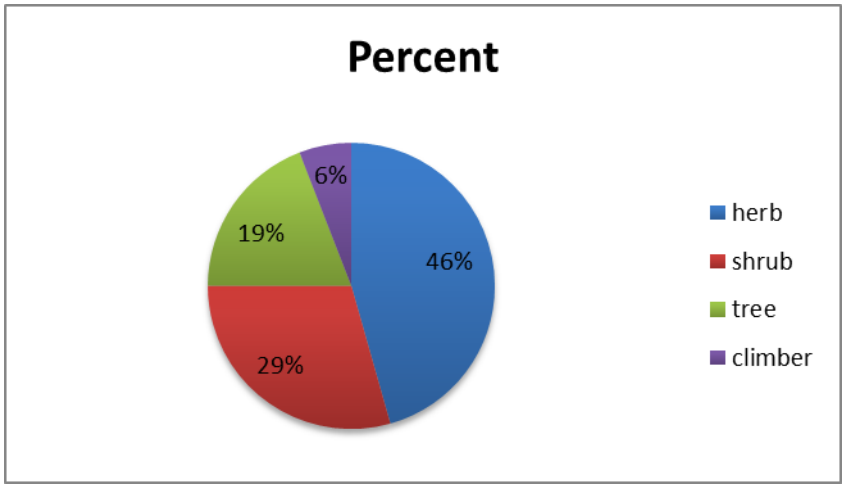

Figure 2. Habits of medicinal plants used to treat ailments in the study area

Most of these medicinal plants were collected from wild (forest, road side and river side) while the rest are also found from managed areas such as home gardens, live fence and agricultural fields (Fig. 3).

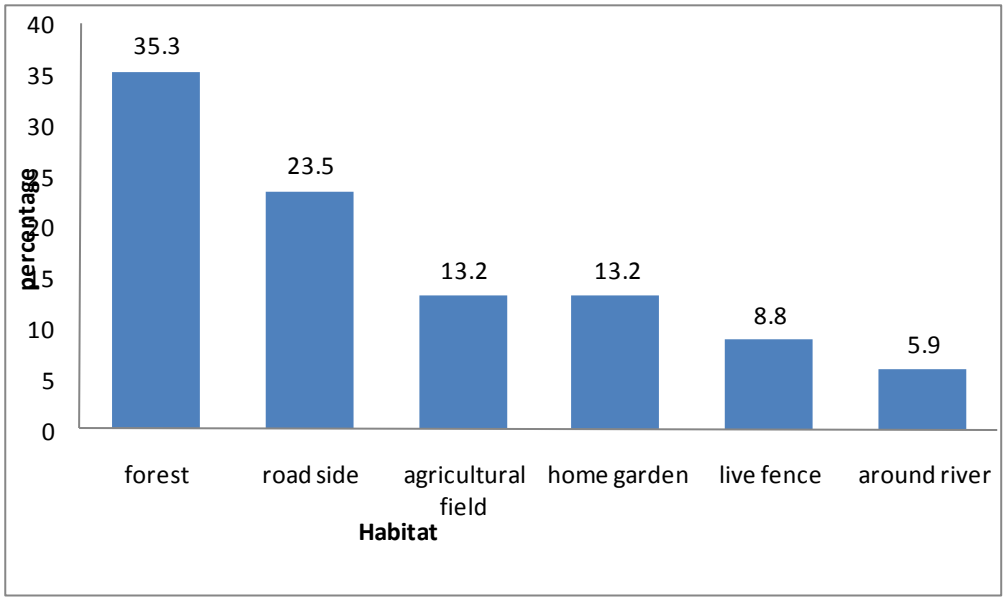

Figure 3. Habitat distribution of medicinal plants used to treat ailments in the study area

4. 2. Part of Plants Used for Medicine, their preparations

In this study, different parts of the plants were stated to be used for medicines. Leaves and roots were the most commonly reported plant parts in the preparation of remedies accounting for 41.2% and 19.1% of the total medicinal plants, respectively (Table 1). Sets of works that were carried out previously elsewhere in Ethiopia also revealed that leaves followed by roots were the common plant parts used to treat various health problems (Bayafers, 2000; Eskedar, 2011; Mekonnen, 2013; Abebe, 2017; Yeshambel, 2017).

Table 1. Plant part used for medicines in the study area

Plant parts used for medicine	Frequency	Percent
Leaves	28	41.2
Root	13	19.1
Seed	10	14.7
Stem	4	5.9
Fruit	4	5.9
Latex	2	2.9
Sap	2	2.9
Bark	2	2.9
Bulb	2	2.9
Resin	1	1.5

Remedies are prepared and administered in different ways. In most cases plant parts are reported to be crushed/powdered for use in raw being concocted using parts from different plants or different parts of the same plant, or decocted. To the remedies, some additives such as butter, salt, sugar, coffee and honey are also mixed so as to enforce their curative power. The remedies are then administered through different routes depending on the site and type of the illness. Mainly the preparations are taken orally (by drinking, chewing and eating) followed by dermal, nasal, through the eye, etc. (Fig. 4).

Such traditional way of remedy preparations and administrations have been reported by different researchers (Kebu *et al.* 2004; Endalew, 2007; Etana, 2007; Mulugeta, 2014; Abebe, 2017) who carried out similar study in different parts of the country.

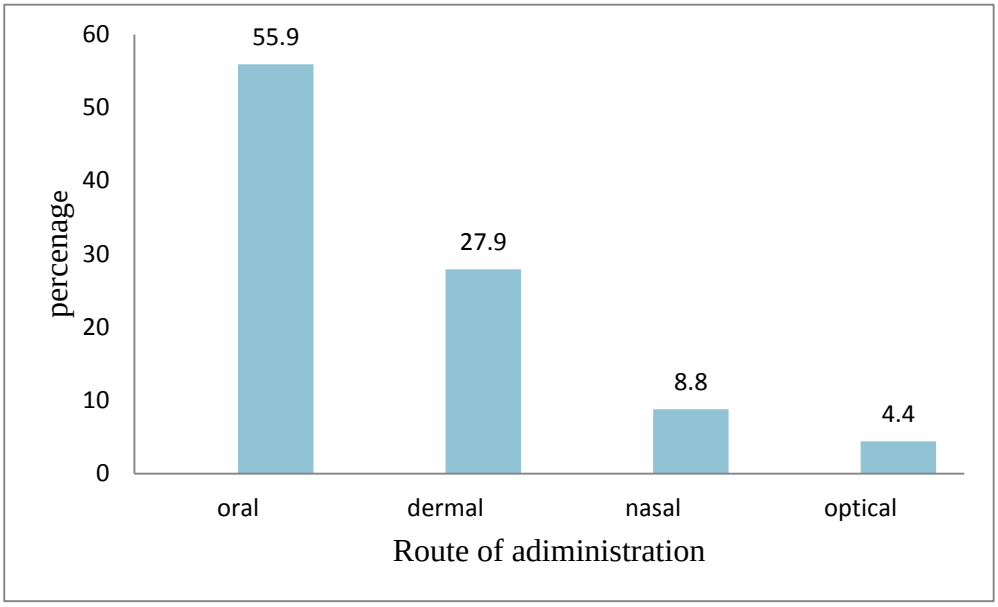

Figure 4. Route of application of the remedies

4.3. Preference Ranking and Direct Matrix Ranking

Sometimes, different species are prescribed for the same health problem. When asked to choose one over the other, local people show preference to the one that they perceive as the most efficacious. In the study area common cold is reported to be treated using 7 plant species and preference ranking was then conducted after selecting 10 key informants. Key informants were asked to give the highest value (7) for the most preferred plant and least (1) for less preferred plant. The value given for each species was then summed up and rank for each species was determined based on the total score. Accordingly, *Allium sativum* was found to be the most preferred plant in treating common cold followed by *Guizotia abyssinica* and *Ocimum lamiifolium.* The least preferred plant was *Cyperus rotundus* (Table 2).

Table 2. Preference ranking of medicinal plants used for treating common cold

	Medicinal plants						
Informant 1-10	*Allium sativum*	*Citrus aurentifolia*	*Cyperus rotundus*	*Guizotia abyssinica*	*Nicotiana tabacum*	*Ocimum lamiifolium*	*Ruta chalepensis*
I_1	7	3	4	6	4	5	3
I_2	5	3	5	5	2	7	6
I_3	7	2	5	6	3	3	5
I_4	6	5	2	3	5	2	4
I_5	6	3	3	6	4	7	3
I_6	7	4	1	5	2	2	6
I_7	6	4	3	5	1	4	2
I_8	5	2	2	7	3	5	5
I_9	4	5	4	3	6	4	1
I_{10}	7	5	2	5	5	6	2
Total	60	36	31	51	35	45	37
Rank	1^{st}	5^{th}	7^{th}	2^{nd}	6^{th}	3^{rd}	4^{th}

Direct matrix ranking was done for five plants reported to have six other main uses apart from medicinal value. Selected 10 key informants gave values (maximum 5 and minimum 1) for each species. Corresponding to each use value, Values given to each species were then summed up and ranked based on the score. Result showed that *Acacia sieberiana*, *Cordia africana* and *Eucalyptus globulus* ranked 1st to 3rd (Table 3) in terms of being used for various purposes. This implies that these plant species may be under great pressure unless proper conservation measures are given.

Table 3. Direct matrix ranking of medicinal plants used for multipurpose

	Medicinal plants				
Use value of medicinal plants	*Acacia sieberiana*	*Cordia africana*	*Croton macrostachyus*	*Eucalyptus globulus*	*Olea europeae*
Construction	4	2	3	5	1
Utensils	4	4	3	1	2
Fire wood	5	2	1	4	3
Charcoal	5	3	2	1	5
Live fence	2	3	4	5	1
Ceremonial value (sacred tree)	5	4	3	1	2
Total	25	18	16	17	14
Rank	1st	2nd	4rth	3rd	5th

4.4. Informant Consensus Factor and Fidelity Level

The diseases of the study area have grouped into 8 different categories based on the site of occurrence of the disease, condition of the disease as well as treatment resemblance of the disease to the local people. The informant consensus factors have been calculated for each category (Table 4). Urino-genital problems (Urine retention, Placental retention and gonorrhea) had high ICF value followed by Evil spirit, Fibril illness, headache; Dermal problem **(**Wound, wart, skin rash, dandruff, insect allergy, spider poison, swelling); Digestive system problem (Stomach ache, gastritis, constipation, diarrhea, stabbing pain, Intestinal parasite, tonsilitis, Tooth ache); Rabies; Respiratory system problem (common cold, cough); Eye disease; Malaria had the lowest (0.56) this is may be due to the rare occurrence of the disease in the study area. Disease categories having high ICF value (e.g., > 0.79) may be the ones that commonly occur in the study area so that more number of people communicates on their remedy. According to Tilahun Teklehaymanot and Mirutse Giday (2007), medicinal plants that are presumed to be effective in treating a certain disease have higher ICF values.

A high ICF value (value close to 1)indicates that the informants rely most on the same taxa to manage specific disease conditions, while a low value (close to 0) indicates that the informants disagree on the taxa to be used in the treatment of a given ailments.

Table 4. ICF values of ailments treated using the medicinal plants of the study area.

Disease categories	No of plant Plant used Treat ailment (nt)	No of use Reports (nur)	ICF value
Eye disease	9	30	0.72
Digestive system problem (Stomach ache, gastritis, constipation, diarrhea, stabbing pain, Intestinal parasite, tonsilitis, Tooth ache)	12	55	0.79
Respiratory system problem (common cold, cough)	12	45	0.75
Dermal problem (Wound, wart, skin rash, dandruff, insect allergy, spider poison, swelling)	10	54	0.83
Evil spirit, Fibril illness, head ache	7	50	0.87
Urino-genital problems (Urine retention, placenta retention, gonorrhea)	3	37	0.94
Rabies	14	60	0.77
Malaria	8	17	0.56

Fidelity level (FL) values were calculated for some commonly used medicinal plants against some commonly reported ailments in order to know the importance of the medicinal plants for a particular disease treatment. According to Tilahun Teklehaymanot and Mirutse Giday (2007), medicinal plants that are widely used by the local people to treat one or very few ailments have higher FL values than those that are randomly picked for any ailment. Result of this study showed that *Allium sativum*, which had the highest (95%) FL was cited by informants for the treatment of common cold. Hence it can be considered as the most effective treatment material for common cold (Table 5).

Table 5. Fidelity level of some medicinal plants

Scientific name of medicinal plants	Disease treated	Np	N	FL	FL%
Allium sativum	Common cold	22	23	0.95	95
Lepidium sativum	Evil eye	19	21	0.90	90
Citrus aurentifolia	Diarrhea	20	23	0.86	86
Schinus molle	Birds flu	16	20	0.8	80
Ficus palmate	Wart	14	18	0.77	77
Ruta chalepensis	Stabbing pain	12	16	0.75	75
Nicotiana tabacum	Common cold	17	23	0.73	73

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary and Conclusions

Ethnomedicinal plants used by the people of Tole Woreda, south west shoa zone of Oromia region, Ethiopia were documented using ethnobotanical techniques. Totally 100 respondents (aged ≥20) of which 75(59 male and 16 female) were non practioners and 25 (18 male and 7 female) traditional practioners were participated in this study. The techniques for data collection included semi-structured interview, group discussion and guided field walk to collect plant species. In the study area totally 68 medicinal plants of medicinal value were recorded. Of these, 51 species were noted to treat human ailments while 14 and 3 species are used to treat livestock and both livestock and human ailments, respectively. Family Poaceae was represented by the highest number of species. Herbs constitute the main source of traditional remedies followed by shrubs and tree species. Leaves were also found to be the most frequently used plant parts followed by roots for preparation of the remedies. Most medicinal plants are harvested from forest followed by road side. Remedies are prepared through crushing/powdering for use in raw being concocted using parts from different plants or different parts of the same plant. Additives such as butter, salt, sugar, coffee and honey are also mixed so as to enforce their curative power. Preference ranking show that *Allium sativum* was the most preferred plant in treating common cold. Direct matrix ranking showed Acacia sieberiana was the most utilized species by the community. Diseases categories such as Urino-genital problems (Urine retention, Placental retention and gonorrhea) have high informant consensus factor. In conclusion, this study showed that people of Tole Woreda depend on traditional medicine that needs attention for the conservation of these species.

5.2. Recommendation

- Providing awareness on safe way of plant harvesting is of paramount importance for sustainable use of plants, particularly those plants whose roots are used for medicinal value.
- Medicinal plants that have multiple uses should be given due attention including their plantation in the area in order to conserve them.
- People's culture and spiritual belief like ceremonial value must be strengthened and encouraged, not to undermine it for the conservation of medicinal plants.

6. REFERENCES

Abebe Ayele. 2017. Ethnobotanical study of medicinal plants used by the people of Tarmaber district, North Shewa zone, M.Sc. Thesis. Haramaya University.

Abebe Demisse. 2001. Biodiversity conservation of medicinal plants; problems and prospects. **In;** conservation and sustainable use of medicinal plants in Ethiopia. Proceeding of the National work shop on Biodiversity and sustainable use of medicinal plants in Ethiopia, 28 April-01 *may 1998 pp 56-64,* (*Medhin Zewdu and Abebe Demisse, eds). IBCR, Addis Ababa*.

Ayehu Ahadu, Abebe Demisse. 1993. Medicinal plants and enigmatic health practices of Northern Ethiopia Addis Ababa, Ethiopia.

Abudulhamid Bedri, Sebsib Belay, Workineh Nigatu and Addisu Asmare. 2004. Survey Results: Socio economic study of medicinal plants. Addis Ababa University, Addis Ababa.

Alexiades, M. 1996. Collecting ethnobotanical data. An introduction to basic concepts and techniques. In**:** *Selected Guideline for ethno botanical research.* Pp. 58-94.

Alcorn, B, J, 1984. Huastec Mayan ethnobotany, university of Texas press, Austin, USA. *Alternatives for Livestock Development*. Proceedings of an international conference held in Pune.

Ashenafi Girma, 2013. Urban Growth and Development in Ethiopia in Case of Bantu Town South West Shewa zone of Oromia Region, Ethiopia.

Balcha Abera. 2014. Medicinal plants used in traditional medicine by Oromo People, Ghimbi District, Southwest Ethiopia. *Journal of Ethinobiology and Ethnomedicine,* 10(40).

Balick MJ, Cox P.1996. Plant, People and Culture: The Science of Ethnobotany. Scientific American Library, New York. p.220.

Bayafers Tamene. 2000. A Floristic Analysis and Ethnobotanical Study of the Semi- Wet Land of Cheffa Area, South Welo, Ethiopia, M.Sc.Thesis, Addis Ababa University.PP.139.

Bodeker, G. 2005. Medicinal plant biodiversity and local healthcare sustainable use and livelihood development. 17th Common wealth Forestry Conference. Coast (Brazil). Economic Botany 53: 387 - 395.

Cotton, C.M. 1996. *Ethnobotany: Principles and Applications*. John Wiley and Sons, New York, 412pp.

CSA (Centeral Statistical Agency). 2007. Population and Housing Census for Ethiopia, Statistical Report Results at Country Level. Central Statistical Authority, Addis Ababa.

Dawit Abebe and Ahadu Ayehu. 1993. Medicinal plants and Enigmatic Health Practices of *Northern Ethiopia, Berhanina Selam printing Enterprise*, Addis Ababa. 341.

Dawit Abebe. 2001. The Role of Medicinal Plants in Health Care Coverage in Ethiopia, the Possible Benefit of Integration. Institute of Biodiversity Conservation and Research, Addis Ababa, 6-21.

Dawit Abebe. 1986. Traditional medicine in Ethiopia. The Attempts being made to *promote it for effective and better Utilization. SINET: Ethiopian Journal of science,* 9:61-69.

Debela Hunde. 2001. Use and Management of Traditional Medicinal Plants by Indigenous People of Boosat Woreda, Wolenchiti Area: *Ethiopian Journal Biological Science.* 3:113-132.

Dery BB, Otsyina R, Ngatigwa C. 1991. Indigenous knowledge of medicinal trees and setting priorities for their domestication in Shinyanga Region, Tanzania. International Center for Research in Agro Forestry, Nairobi, Kenya, pp. 87.

Duke, J. A. 1992. Tropical botanical extractives. In: sustainable harvest and marketing of Rain forest products, Covelo, California, USA. Pp.53-62.

Endalew Amenu. 2007. Use and management of medicinal plants by indigenous people of Ejaji area (Chelya Woreda) west Shoa. M.Sc.Thesis, Addis Ababa University, Ethiopia.

Engedasew Andarge, Abraham Shonga, Mathewos Agize and Asfaw Tora. 2015. Utilization and conservation of medicinal plants and their associated Indigenous Knowledge (IK) in Dawuro Zone : *An ethnobotanical approach, 4*(3), 330–337.

Ensermu Kelbessa, Sebsebe Demissew, Zerihun Woldu and Edwards, S. 1992.Threatened Endemic Plants of Ethiopia. **In: (***Edwards, S. and Zemede Asfaw eds*.). *Plants used in African traditional medicine as practiced in Ethiopia and Uganda*.

Ermias Lulekal, Ensermu Kelbessa and Tamrat Bekele. 2008. An Ethnobotanical Study of Medicinal Plants in Mana Angetu District, South Eastern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*. 4:1-10.

Eskedar Abebe. 2011. Ethnobotanical study on medicinal plants used by local communities in Debark Woreda, North Gondar Zone, Amhara Regional State, Ethiopia.

Etana Tolasa 2007. Use and Conservation of Traditional Medicinal Plants by Indigenous People in Gimbi Wereda, Western Wellega. M.Sc. Thesis. Addis Ababa, Ethiopia.

Farnsworth, N.R., Akerel, O. and Bingel, A.S. 1985. Medicinal plants in therapy. *Bulletin of the World health organization .63(6):81-965.*

Fassil Kibebew 2001. The status and availability of oral written knowledge on traditional health care in Ethiopia. In conservation and sustainable use of medical plants in Ethiopia proceeding of the national work shop on biodiversity and sustainable use of medicinal plants in Ethiopia, 28 aprial-01 may 1998 ,PP.168-175.

Fernandez EC, Rajchl A, Lachman J, Čížková H, Kvasnicka F, Kotikova Z, Milella L, Voldřich M. 2013. Impact of yacon landraces cultivated in the Czech Republic and their ploidy on the short- and long-chain fructooligosaccharides content in tuberous roots. *Food Science Technology 54: 80 – 86.*

Friis I, Demissew Sebsebe and van Breugel P. 2011. Atlas of the potential vegetation of Ethiopia. Addis Ababa University.

Getachew Berhan and Shiferaw Dessie. 2002. Medicinal plants in Bonga Forest and their uses. **In:** *Biodiversity Newsletter.*Vol.No2.PP.9–10.

Gidey Yirga. 2010b. Use of traditional medicinal plants by indigenous people in Mekele town, capital city of Tigray regional state of Ethiopia, *Journal of Medicinal Plants Research.* 4:25-50.

Gidey Yirga. 2010a. Assessment of indigenous knowledge of medicinal plants in Central Zone of Tigray, Northern Ethiopia. *African Journal Plant Science.* 4(1): 6-11.

Haile Yineger. 2005. A study of Ethnobotany of medicinal plants and floristic composition of the dry afromontane Frorest at Bale mountains National park. M.Sc. Thesis, Addis Ababa, Ethiopia.

Haile Yineger and Delnesaw Yehuwalaw. 2007. Traditional Medicinal Plant Knowledge and Use by Local Healers in Sekoru District, Jimma Zone, Southwestern Ethiopia. *Journal of Ethnobiology and Ethnomedicine.* 3:24.

Haimanot Reta. 2010. An ethnobotanical study of useful plants of the farming site in Gozamen Wereda, East Gojjam Zone of Amhara Region, Ethiopia unpublished thesis. Addis Abeba University.

Hamilton, A.C., Shengji, P., Kessy, J., Khan, A. A., Lagoss-Witte, S. and Shinwari, Z.K. 2003. The Purpose and Teaching of Applied Ethnobotany. *People and plants working paper*. United Kingdom, 71pp.

Hawkins, B. 2008. Plants for life: Medicinal plant conservation and botanic gardens. Botanical Gardens Conservation International, Richmond, United Kingdom.

Hunde Debela. 2007. Human influence and threat to biodiversity and sustainable living. Ethiopian Journal of Education and Science 1: 85–94.

IBC (Institute of Biodiversity Conservation). 2005. National Biodiversity Strategy and Action plan. Addis Ababa Ethiopia. pp, 115.

Jarsso Belay. 2016. Ethnobotanical study of traditional medicinal plants by indigenous people of Jigjiga Woreda, Somali Region state, Ethiopia.

Jansen, P.C.M. 1981. Spices, Condiments and Medicinal plants in Ethiopia: Their Taxonomic and agricultural significance. Centre for agricultural publishing and documentation. *Wageningen, the Netherlands.*

Jin C, Yin-Chun S, Gui-Qin C, Wen-Dun W. 1999. Ethnobotanical studies on wild edible fruits in southern Yunnan: Folk names, nutritional value and uses. *Economic Botany 53: 12 - 14.*

Kebede Deribe, Alemayehu Amberbir, Binyam Getachew, Yunis Mussema. 2006. A Historical Overview of Traditional Medicine Practices and Policy in Ethiopia. *Journal of Health development,* 20:127-134.

Kebu Balemie, Ensermu Kelbesa and Zemede Asfaw. 2004. Indigenous medicinal plant utilization, management and threats in Fentale area, Eastern Shewa, Ethiopia. *Ethiopian Journal of Biological Sciences* 3: 37 – 58.

Kelbessa Urga, Asefa Ayale and Guta Merga. 2004. Traditional Medicine in Ethiopia Proceedings of a national workshop held in Addis Ababa, Ethiopia, 30 June-2 July 2003. Addis Ababa, Ethiopia.

Konno, B. 2004. Integration of traditional medicine with modern medicine Addis Ababa. Pp.3-9.

Lange, D., 1998. Trade figures for botanical drugs worldwide. Med. Plant Conservation 3: 16-17.

MacDonald, I. 2009. Current trends in Ethnobotany. *Tropical Journal pharmacology Research*. 8(4)**:**295-297.

Martin GJ. 1995. Ethnobotany: A Method Manual. Chapman and Hall, London.

Medhin Zewdu, Tsige Gebremariam and Kalebe Asres. 2001. Global perspectives of medicinal Plants. **In:** *Conservation and sustainable use of Medicinal plants in Ethiopia. Proceeding of the National Workshop on Biodiversity conservation and sustainable use of medicinal plants in Ethiopia, 28 April-01 May1998*, pp, 198-203.

Mekonnen Abebe. 2013. Ethnobotanical Study of Traditional Medicinal Plants of Gololcha District, Bale Zone. M.Sc. Thesis. Haramaya University.

Mersha Ashagre. 2011. Ethnobotanical Study of Medicinal Plants in Guji Agro-pastorilists, Blue Hora District of Borana Zone, Oromia Region, Ethiopia. MSC Thesis unpublished Addis Abeba University.

Mirutse Giday. 1999. An ethnobotanical study of medicinal plants used by the Zay people in Ethiopia. M.Sc. Thesis. Uppsala, Sweden.

Mirutse Giday, Zemede Asfaw and Zerihun Woldu. 2010. Ethnomedicinal study of Medicinal plants used by Sheko ethnic group of Ethiopia. *Journal of Ethnopharmacology* 132: 75–85.

Muthuswamy, R and Solomon Mequanente. 2009. Ethnomedicinal Survay of Folk Drugs used in Bahirdar Zuria district, Northwestn Ethiopia. *Indian Journal of traditional Knowledge*, 8:281-284.

Mulugeta Kuma. 2014. Use and management of medicinal plants by indigenous people of Jima Rare District in Oromia Region, Ethiopia. MSc Thesis. Haramaya University.

Mwambazi, W.C. 1996. World health organization partnership in the development and utilization of herbal remedies in Ethiopia. **In**: development of herbal remedy in Ethiopia proceedings of work shop on *Development of herbal remedies in Ethiopia, PP.26-27.* Addis Ababa.

Padula MC, Lepore L, Milella L, Ovesna J, Malafronte N, Martelli G, De Tommasi N. 2013. Cultivar based selection and genetic analysis of strawberry fruits with high levels of health promoting compounds. *Food Chemistry 140: 639 – 646.*

Pankhurst, R. 2001. The status and availability of oral and written knowledge on traditional health care **In:** Conservation and Sustainable Use of Medicinal Plants in Ethiopia Proceeding of The National Workshop on Biodiversity Conservation and Sustainable Use of Medicinal Plants in Ethiopia, 28 April-01.

Pareek, A and Trivedi PC. 2011. Ethnobotanical Studies on Medicinal Plants of Kaladera Region of Jaipur district. *Indian Journal of Promoting Compounds Food Chemistry,* 140: 639 - 646.

Rodrigo, S. 2005. Knowledge and use of medicinal plants by local specialist in an region of Atlantic Forest in the state of Pernambuco (Northeastern Brazil). *Journal of Ethnobiology Ethnomedicine,* 1:9.

Rossato SC, Leitao Filho HD, Begossi A. 1999. Ethnobotany of Caicaras of the Atlantic forest Coast (Brazil). Econ Bot 53: 387 - 395.

Samar, R., Shrivastava, P. N., & Jain, M. 2015. Ethnobotanical Study of Traditional Medicinal Plants Used By Tribe of Guna District, Madhya Pradesh ,India, *4*(7), 466–471.

Sebsebe Demissew, Ermias Lulekal. 2001. Conservation and Sustainable Use of Medicinal Plants in Ethiopia Proceeding of The National Workshop on Biodiversity Conservation and Sustainable Use of Medicinal Plants in Ethiopia, 28 April-01 May 1998, pp.29-33.

Seyoum Getaneh. 2009. Ethnobotanical studies of medicinal plants in Debre Libanos Woreda, North Shewa Zone of Oromia Region, Ethiopia. M.Sc. Thesis, Addis Ababa.

Sofowara, A. 1982. *Medicinal Plants and Traditional Medicine in Africa*. John Wiley and Sons. New York.

Tesema Tanto, Mirutse Giday, Negesu Aklilu, Teshome Hunduma. 2003. Medicinal plant Biodiversity, National biodiversity Strategy and Action plan Project (UN published). Institute of Biodiversity conservation and research Addis Ababa.

Tesfaye Awas and Sebsebe Demissew. 2009. Ethnobotanical study of medicinal plants in kafficho People, South western Ethiopia. Proceedings of the 16th international conference of Ethiopia Studies. Addis Ababa, Ethiopia.

Tesfaye Awas and Zemede Asfaw. 1999. Report on Ethnobotanical Study Nations, of Nationalities and People in Gambella and Benishangul Gumuz Reginal State Progres Report to Research and Publication Office, Addis Ababa University, Addis Ababa.

Tilahun Teklehaymanot and Mirutse Giday. 2007. Ethnobotanical study of medicinal plants used by people in Zegie Peninsula, Northwestern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 3(12).

Thomas, H. 1995. Indigenous knowledge, Emancipation and alienation. *Journal of knowledge Transfer and utilization, 8(1): 63-73.*

Tole Woreda Agricultural Office. 2015. Annual Report, Addis Ababa, Ethiopia.

Vivero JL, Ensermu Kelbessa and Sebsebe Demissew. 2006. Conservation and bio-geography of endemic flowering taxa. **In**: Taxonomy and ecology of African plants, their conservation and sustainable use. Addis Ababa, Ethiopia, pp. 761-778.

WHO (World Health Organization). 2000. Development of National policy on traditional medicinal report of the work shop *on development of national policy on traditional medicine. Beijing, China.*

WHO(World health organization) 2003. *African Traditional Medicine: Our Culture, Our future*. African Health Monitor. A Magazine of World health organization Regional Office for Africa, **4(1)**.

Yeshambel Berhanu. 2017. Use and management of Medicinal Plants by the people of Jabitehnan Woreda, West Gojjam Amhara, Regional State.

Yibrah Tekle. 2014. An ethno-veterinary botanical survey of medicinal plants in Kochore District of Gedeo Zone, SNNPRS, Ethiopia. *Journal of Scientific and Innovative Research*, 3(4): 433-445.

Zemede Asfaw. 2001. Conservation and Sustainable Use of Medicinal plants in Ethiopia. Proceeding of the National workshop on Biodiversity Conservation and Sustainable use of medicinal plants in Ethiopia, 28 April- 01 May 1998, pp. 76-91.

7. APPENDIXES

Appendix 1. **:** List of medicinal plants used for human (#), livestock (*), and both human and animal (#*) diseases scientific name, family, local name, habit, parts used, disease treated, mode of preparation, route of administration and additives.

Scientific Name	Local name	Family Name	Part of use	Disease they treat	Mode of Preparation	Route	Additive	Habit	Habitat
Acacia sieberiana Hochst.ex Benth. (KG 39)	Laaftoo	Fabaceae	Resin	Wound[#]	Dry it then crush finely and mix with butter paint in the sun	Dermal	Butter	Tree	Forest
Adhatoda schimperiana (KG 36)	Emuuga a	Acanthac eae	Leave	Gonorrhea[#]	Crushing the leave in fresh	Oral	Honey	Shrub	Forest
Ajuga integrifolia Ham. Bunch (KG 37)	Harman gussi	Lamiacea e	Leave	Stomach ache[#]	Fresh leave was squeeze with H_2O and take one cup of coffee	Oral	-	Herb	Road side
Allium cepa L. (KG 57)	Shunkur taa	Amarylli daceae	Bulb	Stabbing pain[#]	The bulb is cut firmly and mix with salts	Oral	-	Herb	Home garden
Allium sativum L. *(*KG 56)				Common cold Malaria[#]	Cutting finely with *Capsicum annuum* into small pieces	Oral			

			Hair remove[#]		Crushing with salt wash by soap and tied it by cloth change it by 3 day	Dermal	Salt		
Aloe bertemariae (KG 42*)*	Dobbii	Aloaceae	Sap	Wound*	The stem cut into two and the inner liquid is painted	Dermal	-	shrub	Forest
Anethum foeniculum L. (KG 7)	Silaalee	Apiaceae	Leave	Problem of excretion of urine*	The leave is crushed and dissolve in H_2O	Oral	-	Shrub	Around water
*Arbulocerpus sphaerostigma (*KG 8)	Biliqqee	Rubiaceae	Leave	Stomach ache[#]	Squeezed with H_2o take 1cup of coffee	Oral	-	Herb	Road side
Arundo donax (KG 4)	Shamboqqoo	Poaceae	Stem	Broken bone[#*]	The stem is cut Measured with broken body and tied by it	Dermal	-	Tree	Forest
Asystasia schimperi T.Anders (KG 5)	Xaayibadarii	Acanthaceae	Leave	Stomach ache[#]	Cooked and separate H_2O from it mix with butter take cup of tea	Oral	Butter	Shrub	Home garden
Brassica carinata. Braun (KG 35)	Sinaficaa	Brassicaceae	Seed	Stomach ache*	Seed crushed with salt given 1bottle	Oral	Salt	Herb	Agricultural field
Capparis tomentosa Lam. (KG 47)	Arangamaa gurraacha	Capparidaceae	Root	Fibril illness[#]	Boil with H_2O and wash by that water	Dermal		Shrub	Forest

Carissa edulis L. (KG 10)	Agamsaa	Apocynaceae	Root	Evil eye[#]	Burning/smoking	Nasal		Shrub	Forest
Cirsium vulgare (savi) Tenore (KG 63)	Sokorruu	Asteraceae	Root	Anthrax*	The root was crushed in the mortal and dissolve with salt give 1 bottle to animals	Oral		Shrub	Road side
Citrus aurentifolia (KG 2)	Loomii	Rutaceae	Fruit	Diarrhea[#]	Squeeze fruit until water removed and take 1cup of tea for 3 days continuly	Oral	Sugar	Tree	Home garden
				Common cold[#]	Juice will be drunk with tea				
Clausena anisata .Benth (KG 45)	Ulmaa	Rutaceae	Leave	Tooth ache[#]	Boil with salt and wash by that water	Oral	Salt	Shrub	Forest
Clematis simensis Fresen (KG 25)	Hidda fiitii	Ranunculaceae	Leave	Wound[#*]	Dried and crushed apply on it	Dermal		Climber	Forest
Cordia africana Lam.(KG 33)	Wadeessa	Boraginaceae	leave	Skin rash[#]	Drying and grinding	Dermal	Butter	Tree	Forest
Cynoglossum lanceolatum Forou (KG 62)	Qorichaa Michii	Boraginaceae	leave	Fibril illness[#]	The leaf squeezed and keep for 1hr until the color changed to red	Dermal		Herb	Road side
Cyperus rotundus L (KG 64)	Qunnii	Cyperaceae	Root	Common cold[#]	Boiled with sugar drink for 3 days at at morning	Oral	Sugar	Herb	Around river
Cyphostemma cyphopetalum (KG 31)	Lafaa butaa	Vitaceae	Root	Stomach blotting*	Crushed with salt give 1bottle to animals	Oral	Salt	Climber	Forest

Croton macrostachyus Del. (KG 44)	Bakkanisaa	Euphorbiaceae	Bark	Placenta retenation[#]	Grinding and boil in H_2O take1cup of coffee	Oral	Butter	Tree	Forest
Cucumis dipsaceus(KG17)	Hiddi hoolota	Cucurbitaceae	Root	Insect allergy[#]	Drying and Crushing its root	Dermal	Butter	Climber	Road side
Datura stramonium L. (KG 26)	Manjii	Solanaceae	Seed	Tooth ache[#]	Seed will be roasted and held on the teeth	Oral	-	Shrub	Road side
Dodonaea angustifolia (KG 38)	Ittachaa	Sapindaceae	leave	Diarrhea[#]	Boil with root of croton macrostachyus	Oral	-	Shrub	Forest
Dovyalis abyssinica (A.Rich). (KG 13)	Koshimaa	Flacourtiaceae	Fruit	Gastritis[#]	Fresh fruit is crushed with sugar	Oral	Sugar	Shrub	Live fence
Dovyalis spp (KG 50)	Maxxajjaa	Flacourtiaceae	Stem	Tooth ache[#]	Uses as a brush of teeth	Oral	-	Shrub	Forest
Eleusine jaegeri pilger (KG 19)	Coqorsaa	Poaceae	leave	Skin rash[#]	Chewed in the mouth and split on area	Dermal	Butter	Herb	Road side
Euclea schimperi (KG 34)	Mi'eessa	Ebenaceae	Leave	Intestinal parasite[#]	Boil with root *Dodonaea angustifolia* drink it	Oral	-	Shrub	Forest
Eucalyptus globulus Labill. (KG 14)	Bargamoo adii	Myrtaceae	Leave	Head ache[#]	Boil the leave and smoken its air	Nasal		Tree	Live fence
Euphorbia tirucalli (KG 53)	Adaamii	Euphorbiaceae	Latex	Wart[#*]	The stem is cut into two part applied on it	Dermal		Shrub	Live fence
Eragrostis teff	Xaafii diima	Poaceae	Seed	Goiter[#]	The seed is	Oral		Herb	Agricultur

*(*KG 55)					powdered and make porridge				al field
Feidherbia albida (KG 41)	Garbii	Fabaceae	Bark	Eye disease*	Chewing and split with saliva on eye	Optical		Tree	Around river
Ficus palmata (KG 27)	Luugoo	Moraceae	Latex	Wart#	Cut the stem and apply milk substance	Dermal		Shrub	Around river
			Leave	Wound#	Crushed and tied on by cloth				
Galium hametum hochst (KG 61)	Maxxannee	Rubiaceae	Root	Eye disease*	Chewing in the mouth and split on eye	Optical		Herb	Road side
Guizotia abyssinica Caso. (KG 23)	Nuugii	Asteraceae	Reed	Common cold#	Roasting, grinding and boil it	Oral		Herb	Agricultural field
*Guizotia schimperi (*KG 21)	Hadaa	Asteraceae	Leave	Bleeding#	Squeeze leaves tied on area	Dermal		Herb	Agricultural field
Hagenia abyssinica (Brace.) J. F. Gmel. (KG 1)	Heexoo	Rosaceae	Fruit	Tape worm#	grinding and dissolve with water	Oral		Tree	Forest
Hordeum vulgare L (KG 60)	Garbuu	Poaceae	Seed	Heart failure#	Roast, grind and dissolve with sugar drink at the morning	Oral	Sugar	Herb	Agricultural field

Ipomoea oenotherae (KG 6)	Hababaa	Convolvulaceae	Root	Eye disease*	Crushed and mix with butter and rub on	Optical	Butter	Herb	Road side
Juniperus procera Hochst. ex. Endl (KG 11)	Gattiraa	Cupressaceae	Leave	Fibril illness#	Boil and smoke its air through nouse	Nasal	-	Tree	Live fence
Lagenaria siceraria (Molina) standley (KG 43)	Buqqee	Cucurbitaceae	Fruit	Evil sprit#	The inner part is washed by H_2O and drink ½ cup of tea	Oral		Climber	Live fence
Lepidium sativum L. (KG 40)	Shiffaa	Brassicaceae	Seed	Evil eye#	Dry seed is powdered mix Allium sativum	-		Herb	Home garden
				Fibril illness#	the seed is powdered and drink with coffee	Oral	Coffee		
Lens culinaris medic cv.copticum (KG 65)	Misiraa	Fabaceae	Seed	Spider poison#	The seed is chewed in mouth and split on area	Dermal	-	Herb	Agricultural field
Lippia abyssinica (KG 48)	Kusaayee	Verbenaceae	Leave	Tenea corporosis#	Squeeze and rubbing	Dermal		Herb	Forest
Linum usitatissimum L. (KG 58)	Talbaa	Linaceae	Seed	Constiption *	The seed powderd dissolved with salt give 1bottle	Oral	Salt	Herb	Agricultural fields
Nicotiana tabacum L. (KG 54)	Tamboo	Solanaceae	Leave	Common cold#	Squeezing within water Leaf will be	Nasal Oral		Herb	Home garden

				Leeches*	pounded mixed with water and given				
Ocimum basilicum L. (KG 15)	Shokoksaa	Lamiaceae	Leave	Fibril illness#	Crush with Cynoglossum lanceolatum drink	Oral	Coffee	Herb	Road side
Ocimum lamiifolium Hochst. ex Benth. (KG 12)	Dammakasee	Lamiaceae	Leave	Common cold#	Fresh leave was crushed H_2O drink with coffee, take into nose	Oral and dermal	Coffee	Herb	Forest
*Olea europeae (*Wall. ex G. Don) Cif. (KG 59)	Ejersaa	Oleaceae	Stem	Tooth ache#	Uses as brush of teeth			Tree	Forest
Opuntia ficus-indica mill (KG 52)	Adaamii faranjii	Cactaceae	Sap	Dandruff#	The stem is crushed and tied on hair by cloth	Dermal	Butter	Shrub	Live fence
Pennisetum adoense steud. (KG 20)	Migiraa	Poaceae	Stem	Goiter #	Rope making and tied on the neck	Dermal	-	Herb	Road side
Plantago lanceolata L. (KG 24)	Qurisaa	Plantaginaceae	Leave	Bleeding#	Squeeze the leaves and tied by cloth on area	Dermal		Herb	Agricultural field
Phytolacca dodecandra L'Herit. (KG 67)	Handoodee	Phytolaceae	Leave	Rabies*	Crushed the leave given to dog	Oral	Butter	Shrub	Forest

Rhamnus prinoides L Herit. (KG 9)	Geshoo	Rhamnaceae	Leave	Tonsil[#]	Chewed and swallow the within saliva in mouth	Oral		Shrub	Home garden
Rhamphicarpa volkensii skan (KG 18)	Gororsaa	Scrophulariaceae	Root	Tonsil[#]	The root Chewed and swallow the water in mouth	Oral		Herb	Road side
Ricinus communis L. (KG 32)	Qobboo	Euphorbiaceae	Seed	Constiption *	Crush and dissolve in H_2O given to animal	Oral	Salt	Tree	Forest
Rosa abyssinica Lindley. (KG 16)	Goraa	Rosaceae	Root	Broken bone[#]	Boil with salt and wash	Dermal	Salt	Shrub	Forest
Rosmarinus officinalis L. (KG 30)	Xoosee	Lamiaceae	Root	Tonsil[#]	The root Chewed and the saliva swallowed	Oral		Herb	Home garden
Rumex nervosus vahl. (KG 66)	Dhangagoo	Polygonaceae	Root	Stomach ache[#]	The root Chewed well and the saliva swallowed	Oral	Sugar	Herb	Road sides
Ruta chalepensis L. (KG 3)	Cirakotaa	Rutaceae	Leave	Common cold[#]	Boil with sugar	Oral		Herb	Home garden
				Stabbing pain[#]	Boil with butter		Butter		
Salix subserrata (KG 46)	Alaltuu laga	Salicaceae	Leave	Rabies*	Crushed with leave *Phytolacca dodecandra*	Oral	-	Shrub	Around river

Schinus molle L. (KG 28)	Alaltuu	Anacardiaceae	Leave	Birds flu* Tonsil#	Crush leave apply in left ear and nose Chewed and Swallowed	Auricular and nasal Oral		Tree	Forest
Solanum indicum (KG 29)	Anqorcaa	Solanaceae	Leave	Nasal bleeding#	Squeezing within water	Nasal		Herb	Road side
Trigonella foenum-gaecum L. (KG 68)	Abishii	Fabaceae	Seed	Gastritis#	The seed is powdered dissolve with H_2O keep for 24hr mix with sugar	Oral	Sugar	Herb	Agricultural fields
Verbascum spp (KG 22)	Gurra harree	Scrophulariaceae	Leave	Leg swelling#	Boiling and wash by that water	Dermal	-	Herb	Road side
Vernonia amygdalina Del. (KG 49)	Ebichaa	Asteraceae	Leave	Stabbing pain*	The leave crushed with salt and dissolve 1bottle to Animals	Oral	Salt	Tree	Forest
Withania somnifera L**.** **(**KG 51 **)**	Hiddi warabeessa	Solanaceae	Root	Evil eye #	Burning with root of *Carisse edulis* and smoke it	Nasal		Shrub	Forest

Appendix 2. Human disease treated by traditional medicinal plants in the study area

Human disease	Local Name	Frequency	Percent
Gonorrhea	Cophxoo	1	2.5
Common cold	Utaaloo	6	15
Leg swelling	Miila dhiita'aa	1	2.5
Nasal bleeding	Fununsaa	1	2.5
Tonsilitis	Dhukkubaa qoonqoo	3	7.5
Dandruff	Forforii	1	2.5
Tenea corprosis	Robbii	1	2.5
Spider poison	Sararitii	1	2.5
Evil sprit	Seexanaa	1	2.5
Tape worm	Rammoo hookkoo	1	2.5
Heart failure	Dadhabinaa laphee	1	2.5
Bleeding	Dhiigni dhabbachuu diduu	2	5
Goiter	Morma dhiiteessa	2	5
Malaria	Busaa	1	2.5
Evil eye	Budaa	2	5
Head ache	Dhukkubaa mataa	2	5
Intestinal parasite	Rammoo garaa keessa	1	2.5
Gastritis	Gurraacha	2	5
Placenta retention	Obaatii bahuu diduu	1	2.5
Fibrile illness	Qaama caccabsaa	4	10
Skin rash	Shiffee	2	5
Tooth ache	Dhukkubaa ilkaanii	4	10
Cough	Ukaa	1	2.5
Insect allergy	Hadha'aa	1	2.5
Hair remove	Haaddoo	1	2.5
Stabbing pain	Waransaa	1	2.5

Appendix 3. Animal disease treated by traditional medicinal plants in the study area

Animal disease	Local Name	Frequency	Percent
Anthrax	Abba gorbaa	1	2.5
Birds flu	Dhukkuba sinbiraa	1	2.5
Rabies	Dhukkuba saree	2	5
Constipation	Gogaa garaa	2	5
Eye disease	Dhukkubaa ija	3	7.5
Stomach blotting	Garaa bokoksaa	2	5
Urine retention	Rakkoo fincaanii	1	2.5
Leeches	Dhulndhulaa	1	2.5

Appendix 4. Animal and human disease treated by traditional medicinal plants in the study area

Animal and human disease	Local Name	Frequency	Percent
Wound	Madaa	3	7.5
Stomach ache	Garaa cinninnaa	1	2.5
Stabbing pain	Dhukkuba tasaa	2	5
Broken bone	Cabaa lafee	2	5
Wart	Kormommuu	1	2.5
Diarrhea	Gad teessumaa	3	7.5

Appendix 5. Plant families with their respective genera and species number

No	Family of the plant	No of genera	No of species
1	Acanthaceae	2	2
2	Aloaceae	1	1
3	Amaryllidaceae	1	2
4	Anacardiaceae	1	1
5	Apiaceae	1	1
6	Apocynaceae	1	1
7	Asteraceae	3	4
8	Borginaceae	2	2
9	Brassicaceae	2	2
10	Cactaceae	1	1
11	Cappardiaceae	1	1
12	Convolvulaceae	1	1
13	Cucurbitaceae	2	2
14	Cupressaceae	1	1
15	Cyperaceae	1	1
16	Ebenaceae	1	1
17	Euphobiaceae	3	3
18	Fabaceae	4	4
19	Flacourtiaceae	1	2
20	Lamiaceae	3	4
21	Linaceae	1	1
22	Moraceae	1	1
23	Myrataceae	1	1
24	Oleaceae	1	1
25	Phytolaceae	1	1
26	Plantaginaceae	1	1
27	Poaceae	5	5

28	Polygonaceae	1	1
29	Ranunculaceae	1	1
30	Rhamnaceae	1	1
31	Rosaceae	2	2
32	Rubiaceae	2	2
33	Rutaceae	3	3
34	Salicaceae	1	1
35	Sapindaceae	1	1
36	Scrophulariaceae	2	2
37	Solanaceae	4	4
38	Verbenaceae	1	1
39	Vitaceae	1	1

Appendix 6. List of informants that give information on ethnobotanical study in the study Area.

No	Name	Sex	Age	Occupation	Marital status	Educational status	Kebele
1	Adugna Tullu*	M	64	Farmer	Married	G-4	K/A/L
2	Onata Fayisa*	M	60	Farmer	Married	Illiterate	K/A/L
3	Tadesse Taka*	M	36	Farmer	Married	G-8	B/B
4	Adugna Wakjira	M	54	Farmer	Married	G-8	K/A/L
5	Galana Hordofa	M	33	Farmer	Married	G-8	K/A/L
6	Birhanu Gurmessa*	M	63	Farmer	Married	G-4	A/T
7	Ayetu Enamo	F	53	House wife	Divorced	Illiterate	K/A/L
8	Angessa Fayisa	M	68	Farmer	Married	G-8	K/A/L
9	Tesfaye Angessa*	M	40	Farmer	Married	Illiterate	K/A/L
10	Galane Wami	F	55	House wife	Divorced	Illiterate	K/A/L
11	Gudisa Ejeta	M	39	Farmer	Married	Illiterate	K/A/L
12	Girma Ashami	M	48	Farmer	Married	G-4	K/A/L
13	Damma Aliya*	M	53	Farmer	Married	G-4	A/T
14	Kusha Reba	M	36	Farmer	Married	Illiterate	B/B
15	Beyene Adara	M	39	Farmer	Married	G-4	A/T
16	Getahun Adugna	M	30	Student	Single	G-10	B/B
17	Gemechu Bogala	M	28	Farmer	Married	G-4	A/T
18	Nagaye Gesu	F	38	House wife	Married	Illiterate	B/B
19	Gudisa Gurmessa*	M	50	Farmer	Married	Diploma	K/A/L
20	Gazu Wakjira	M	34	Farmer	Married	Illiterate	K/A/L
21	Dumesa Arada	M	55	Farmer	Married	Illiterate	B/B
22	Gelene Ashami	F	62	Housewife	Divorced	Illiterate	A/T
23	Gurara Hunde	M	70	Farmer	Married	Illiterate	A/T
24	Boresa Adugna	M	27	Student	Single	Diploma	B/B
25	Burushe Megersa*	M	34	Farmer	Married	G-4	K/A/L
26	Samu Beyene	M	73	Farmer	Married	Illiterate	A/T

27	Mormata Guluma	M	52	Farmer	Married	Illiterate	A/T
28	Damitu Begna*	F	42	House wife	Divorced	Illiterate	A/T
29	Reba Aliya	M	58	Farmer	Widower	Illiterate	K/A/L
30	Werkiye Hailu	F	25	Student	Single	G-10	A/T
31	Nuguse Ashami	M	27	Farmer	Married	G-8	A/T
32	Desta Bogala	F	54	House wife	Married	Illiterate	K/A/L
33	Hababu Wakjira	F	75	House wife	Divorced	Illiterate	A/T
34	Damesa Urgesa	M	80	Farmer	Married	Illiterate	A/T
35	Daba Enamo*	M	67	Farmer	Married	G-4	K/A/L
36	Bekelu Bedi	F	30	Teacher	Single	Diploma	A/T
37	Kenenisa Gudisa	M	24	Student	Single	G-10	A/T
38	Gerema wakjiro	M	66	Farmer	Married	Illiterate	K/A/L
39	Ararso Kelesa	M	57	Farmer	Married	Illiterate	A/T
40	Alamayo Gerema*	M	36	Farmer	Married	G-4	K/A/L
41	Diriba Megersa*	F	48	House wife	Married	Illiterate	A/T
42	Urgessa Dajene	M	26	Student	Single	G-8	A/T
43	Chaltu Tufa*	F	54	House wife	Married	G-4	B/B
44	Buzuna Tilahun	M	49	Farmer	Married	Illiterate	K/A/L
45	Tuji Bededa	M	80	Farmer	Married	Illiterate	B/B
46	Lomi Taka	F	43	House wife	Married	Illiterate	A/T
47	Buruse Urgessa*	F	35	House wife	Married	Illiterate	K/A/L
48	Ayeta Duga	M	78	Farmer	Married	Illiterate	B/B
49	Chala Yada	M	55	Farmer	Married	Illiterate	A/T
50	Tujuba Kalesa	M	73	Farmer	Married	Illiterate	A/T
51	Gadise Morke*	F	51	House wife	Divorced	Illiterate	A/T
52	Mokonin Tuji	M	74	Farmer	Married	Illiterate	K/A/L
53	Worku Tumsa	M	45	Farmer	Married	Illiterate	B/B
54	Werkitu Hailu	F	25	Student	Single	Degree	A/T
55	Hordofa Gurmessa	M	70	Farmer	Married	G-4	K/A/L
56	Baharu Ibsa*	M	28	Farmer	Married	G-4	A/T

57	Milkesa Mokonen	M	23	Student	Single	Degree	A/T
58	Galane Bededa*	F	50	House wife	Divorced	Illiterate	B/B
59	Korra Daba	M	42	Farmer	Married	G-4	K/A/L
60	Tesema Bikila	M	34	Farmer	Married	Illiterate	B/B
61	Melaku Adugna	M	26	Teacher	Single	Degree	A/T
62	Gemeda Lelisa	M	49	Farmer	Married	G-4	K/A/L
63	Dinka Fayisa*	M	76	Farmer	Married	Illiterate	A/T
64	Gemechu Tikesa	M	43	Farmer	Married	G-8	A/T
65	Chala Bededa	M	55	Farmer	Married	Illiterate	K/A/L
66	Negesa Demu	M	65	Farmer	Married	Illiterate	A/T
67	Bayesa Aliya	M	45	Farmer	Married	Illiterate	K/A/L
68	Marga Bikila	M	47	Farmer	Married	Illiterate	A/T
69	Kuma Kophisa*	M	55	Farmer	Married	Illiterate	A/T
70	Danbale Abera	F	25	House wife	Married	G-10	K/A/L
71	Gonfa Damasa	M	66	Farmer	Married	Illiterate	A/T
72	Edo Hordofa	M	36	Teacher	Married	Diploma	K/A/L
73	Huruma Tilahun	M	33	Merchant	Single	G-4	A/T
74	Kafala Edo*	M	40	Farmer	Married	G-4	A/T
75	Chala Barecha	M	55	Farmer	Single	Illiterate	A/T
76	Sisay Bogala	M	25	Student	Single	Degree	A/T
77	Galata Gudata*	M	27	Farmer	Single	Illiterate	B/B
78	Abera Angesa	M	28	Student	Single	Degree	A/T
79	Darare Dema	F	56	House wife	Married	Illiterate	B/B
80	Shaka Gutama	M	78	Farmer	Married	Illiterate	A/T
81	Birhanu Gerema	M	40	Farmer	Married	G-8	B/B
82	Yadesa Adugna*	M	30	Farmer	Married	G-10	K/A/L
83	Bayisa Birbo	M	38	Farmer	Married	Illiterate	B/B
84	Deresa Ashami	M	64	Merchant	Married	G-4	A/T
85	Negashu Worku	M	46	Farmer	Married	G-4	B/B
86	Dawit Gurara*	F	59	House wife	Divorced	Illiterate	B/B

87	Jomore Arada	F	62	House wife	Married	Illiterate	A/T
88	Jida Gudisa	M	54	Farmer	Married	Illiterate	A/T
89	Diriba Gurara	M	36	Teacher	Married	Degree	B/B
90	Adara Midhaksa	M	63	Farmer	Married	Illiterate	A/T
91	Worku Debele	M	29	Student	Single	Degree	B/B
92	Sukare Dajane	F	25	Student	Single	Degree	B/B
93	Ratta Tafara*	M	45	Farmer	Married	G-8	K/A/L
94	Kano Ibsa	F	39	House wife	Married	Illiterate	B/B
95	Lelisa Demesa	M	78	Farmer	Married	Illiterate	A/T
96	Onata Kophesa*	M	70	Farmer	Married	Illiterate	K/A/L
97	Boresa Guta	M	60	Farmer	Married	Illiterate	B/B
98	Gobana Hirko	M	56	Farmer	Married	G-4	B/B
99	Likelesh Yadesa*	F	34	Student	Single	G-10	B/B
100	Sefu Edo	M	62	Farmer	Married	Illiterate	A/T

Key to abbreviations: A/T (Armufo Taji), B/B (Bantu boda) and K/A/L (Kursiti arada leka).

Appendix 7. Questionnaires for respondents

The following questions are designed only to get sufficient information about the use and how you are practicing with medical plants.

I. General information

Name_____

Sex: Male __ Female____

Age: _____ Kebele: _____

Educational status: Elementary___High school__Diploma____Degree____ Illiterate_____

Marital status: single___ Married____ Divorced____

Job _____

II.Ethnobotanical Data

7. What are the most common diseases of human in your area?
8. What are the most common animal ailments in your area?
9. List plant species used to treat a given disease in your area
10. Part of the plant used to treat the ailments
11. Route of application _____
12. Disease they treat _____
13. Way of preparation _____
14. What are the major threats to medicinal plants? _____
15. How do you conserve medicinal plants? _____
16. Additives that are used with medicinal plants? _____
17. Habit of the plant_____
18. Habitat of the plant_____

Appendix 2: Group Discussion

What are the main health problems or disease?

What are plants parts used?

Which type is used as a treatment for many diseases?

Do you use plants to treat disease in your locality?

Name of the plant_____

Habitat of the plant_____

Parts of the plant used_____

Habit of plant_____

Preparation methods_____

Application method_____