ETHNOBOTANICAL STUDY OF TRADITIONAL MEDICINAL PLANTS IN ADAMI TULU JIDO KOMBOLCHA DISTRICT, OROMIA, ETHIOPIA

M.Sc. THESIS

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Haramaya University, Haramaya

ETHNOBOTANICAL STUDY OF TRADITIONAL MEDICINAL PLANTS IN ADAMI TULU JIDO KOMBOLCHA DISTRICT, OROMIA, ETHIOPIA.

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MASTER OF SCIENCE IN BOTANY

Mekonen Wolditsadik

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POSTGRADUATE PROGRAM DIRECTORATE

We here by certify that we have read and evaluated this Thesis titled '**Ethnobotanical Study of Traditional Medicinal Plants in Adami Tulu Jido Kombolcha District, Oromia, Ethiopia'** prepared under our guidance by **Mekonen Wolditsadik Beyi.** We recommend that it be submitted as fulfilling the Thesis requirement.

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DEDICATION

I dedicated this manuscript to my Father, Wolditsadik Beyi, who sacrificed a lot to bring me up to this level, nursing me with affection, and for his dedicated partnership in success of 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 compilation of this thesis. This thesis has been submitted in partial fulfillment of the requirement for degree of Master of Science in botany from the Postgraduate 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 the head of the School of Biological Sciences and Biotechnology or the director of 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.

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ACRONYMS/ABBREVIATIONS

ASLNP	Abijata Shalla Lakes National Park
ADTJK	Adami Tulu Jido Kombolcha District
CSA	Central Statistical Agency
FL	Fidelity Level
ICF	Informant Consensus Factor
IK	Indigenous Knowledge
MRV	Mid rift Valley
OARI	Oromia Agricultural Research Institute
WHO	World Health Organization

BIOGRAPHICAL SKETCH

The author, Mekonen Wolditsadik, was born to his father Wolditsadik Beyi and his mother Biritu Fayisa on November 3, 1991 in Haro Walkite Kebele, Metta Robi Woreda, West Shoa Zone, Oromia Regional State, Ethiopia. He attended his elementary, high school, preparatory education at Ketketo Primary School and Shino High School and Holota Preparatory School, respectively. After completion of his Secondary education at Holota preparatory School in 2009, he joined Wollega University and graduated with B.Sc degree in Applied Biology. Soon after his graduation, he was employed as a Junior I Researcher at Oromia Agricultural Research Institute, Adami Tulu Agricultural Research Center in 2014. In 2016 he joined the School of Graduate Studies at Haramaya University as a Candidate to pursue Master of Botany at the School of Biological Sciences and Biotechnology.

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Ethnobotanical Study of Traditional Medicinal Plants in Adami Tulu Jido Kombolcha District, Oromia, Ethiopia

ABSTRACT

Ethiopia has rich flora with different plant species having medical importance in health care system based on local indigenous knowledge. In this study, plants of traditional medicinal use and their associated indigenous knowledge in Adami Tulu Jido Kombolcha were investigated. A total of 100 informants (age≥25) were selected to collect information on medicinal plant use from three sampled kebeles. Of these, 20 key informants were selected purposively and 80 informants were selected randomly. Ethnobotanical data were gathered using semi-structured interviews, field observations and group discussions with local traditional medicine practitioners. Data were analyzed using descriptive statistics. More over Jaccard's similarity index, informant consensus factor, fidelity level, preference ranking and direct matrix ranking were computed following standard procedures. Ethnomedicinal use of 89 plant species distributed in 81 genera and 47 families was documented. Highest number of species (6) was under family Fabaceae, Asteraceae, Euphorbiaceae and Solanaceae. Habit wise, 38.2% were herbs followed by shrubs (32.5%) tree species (22.8%) and climbers (3.3%). Plants were used mostly in fresh for remedy preparation. The most widely used method of preparation were pounding (44.1%),crushing (26.4%) and cooking/boiling (19.5%), were the major remedy preparation methods reported. Route of administration mainly oral followed by dermal. Malaria and headache, intestinal parasite, diarrhea, amoebiasis, and stomach ache and common cold and cough had the highest ICF value $\geq$ 90. Indigenous people of the study area have their own ways of managing health problems of human and livestock as they are endowed with specific culture, tradition and ethical norms. Biochemical profiles of plant species used for diseases categories of high ICF should be investigated for screening of the active principles.

Key words: Ethnobotany, Indigenous knowledge, Informant Consensus Factor, Traditional medicine

1. INTRODUCTION

Ethnobotany is the study of how people of a particular culture and religion make use of indigenous plants. It accounts for the study of the relationship between people and plants for their use as medicines, food, shelter, clothing, fuel, fodder and other household purposes (Samar *et al.,* 2015). In Africa, up to 80% of the population uses traditional medicine to help meet their health care needs (Yayesh *et al.,* 2015). Traditional medicines of plant origin are less costly than modern medication (Mekonen, 1990; Tesema *et al*., 2003). The current account of medicinal plants use of Ethiopia shows that about 887 plant species are reported to be utilized in the traditional medicine (Ermias *et al*., 2013). Among these, about 26 species are endemic and they are becoming increasingly rare and rare at the verge of extinction.

From the beginning of humanity, indigenous people have developed their own local specific knowledge on plant use, management and conservation (Cotton, 1996). In most cases, this traditional knowledge on medicinal plants passes down from generation to generation verbally and prone to loss if not documented (Jansen, 1981). Moreover, due to ecological shifts and environmental perturbations, plant resources are dwindling at an alarming rate, suggesting the rapid loss of medicinal plants and their associated indigenous knowledge. Indigenous knowledge develops as a result of human interaction with their environment. Traditional medical system is, therefore, shaped by the ecological diversity of the country, socio-cultural back ground of the different ethnic groups as well as historical developments, which are related to migration. In Ethiopia, for example, previous studies showed the existence of traditional medical pluralism (Tesema *et al*., 2002). Documentation of ethnobotanical knowledge on medicinal plants is basic for conservation and community developments. Ethnobotanical studies are often significant in revealing locally important plant species especially for the discovery of new drugs (Wright, 2005). Despite the agro-ecological and cultural diversity of the country, the documentation of medicinal plants and associated indigenous knowledge appears incomplete (Vechiato, 1993; cited in Mesfin *et al*., 2005). Most of the reviewed literatures show that studies on medicinal plants of Ethiopia are so far concentrated in parts of the south and south-west (Dula, 2013; Yibrah, 2014; Kidane *et al*., 2014; Birhanu *et al*., 2015), central (Birhan *et al*., 2011; Ermias *et*

al., 2013), north, north-western and north-east (Gidey, 2010dbcd; Giday and Teklehaymanot, 2013; Yigezu *et al*., 2014), and western parts (Bussmann *et al*., 2011; Gidey and Samuel, 2012; Megersa *et al*., 2013) and eastern part (Jarrso, 2016; Anteneh and Sebsebe, 2012, Alemayehu and Zemede, 2015; Kebede and Ayalew,2016; Mekonen, 2013) of the country. However, there is no much study in western part of Ethiopia, and particularly no documented study is found from Adami Tulu Jido Kombolcha District of Oromia Region, Ethiopia. This suggesting that there is still a gap in our knowledge about ethnobotanical data on medicinal plants from various parts of Ethiopia, although we have rich and diverse ethnolingustic groups throughout the country (Engdasew *et al.,* 2015). According to Pankhurst (2001), detailed information on the medicinal plant could only be obtained when studies are taking place in the various areas of the country to include places where little or no botanical and ethnobotanical explorations have been made. Among rural Oromo communities of ATJK District as would be the case elsewhere, traditional medication is believed to be an important health care system, which mainly involves the use of locally available medicinal plants. However, such knowledge and practices, and plant resources may be threatened due to anthropogenic and other natural factors. Thus, concerted ethnobotanical research plays a vital role to draw information on plants and related indigenous knowledge for conservation and sustainable utilization. This study was, therefore, designed to conduct ethnobotanical study of medicinal plants of Adami Tulu Jido Kombolcha District with the following objectives.

General Objective

- To carryout ethnobotanical investigation on medicinal plants used by peoples of Adami Tulu Jido Kombolcha district to treat human and livestock ailments.

The specific objectives of the study were:

- To collect, identify and document traditional medicinal plants that are used by local people for the treatment of human and livestock ailments in the study area;
- To document plant parts used, methods of preparation and mode of administration of remedies;
- To assess the threats to medicinal plants and conservation efforts made by indigenous people of the study area

2. LITERATURE REVIEW

2.1. Origin and Development of Ethnobotanical Study

Since ancient times, plants have been vital sources of both preventive and curative traditional medicine preparations for human beings and livestock. Historical accounts of traditionally used medicinal plants depict that different medicinal plants were in use as early as 5000 to 4000 BC in China and 1600 BC by Syrians, Babylonians, Hebrews and Egyptians (Dery *et al.,* 1999). Considerable indigenous knowledge system, from the earliest times, is linked to the use of traditional medicine in different countries (Farnsworth, 1994). Evidence obtained from observations of animals shows that even chimpanzees use a number of plant species for their medicinal value (Huffman and Wrangham, 1994).

According to Cotton (1996), ethnobotany encompasses all studies that concern the mutual relationships between plants and traditional people. Among the relationships of humans with plants, indigenous knowledge on traditional medicine is one. Thus, people depend on plants not only for food, but also for preparation of remedies. 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, medicinal, rituals, social life and others.

The relationship between plants and human cultures is not limited to the use of plants for food, clothing and shelter but also includes their use for religious ceremonies, ornamentation and health care (Khan *et al*., 2007). Ethnobotanical research documents the knowledge on cultural interaction of people with plants, and figures 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). Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine and general utility including tremendous botanical expertise (Martin, 1995).

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).

The term Ethnobotany was for the first time mentioned orally by John Hershberger in 1895 during a public lecture (Balick, 1996; Cotton, 1996; Hamilton *et al.*, 2003). Ethnobotany has become a more diversified and multidisciplinary subject that requires expert in various fields of academic study such as Botany, Anthropology, Agriculture, linguistics, Archeology and Economics (Martin, 1995; Alexiades, 1996; Balick, 1996). Ethnobotany is also a rapidly growing science, attracting people with widely varying academic backgrounds and interests (MacDonald, 2009) and now a days ethnobotany has tended to become more analytical, quantitative, cross disciplinary, and multi-institutional (Hamilton *et al*., 2003).

Ethnobotany is to define local community plant resources needs, utilization and management. Therefore, the conservation of ethnobotanical knowledge as part of living cultural knowledge and practices between communities and the environment is essential for biodiversity conservation (Martin, 1995; Balick and Cox, 1996; Cotton, 1996). Moreover, the development of medicinal plants in primary health care not only will save the foreign exchange but also will aid in conserving our national heritage (Abiot *et al.*, 2006). Medicinal plants play a key role in the development and advancement of modern studies by serving as a starting point for the development of novelties in drug (Wright, 2005). According to Hamilton *et al*. (2003), application of ethnobotany can lead to a strengthening of cultural diversity conservation, greater sustainability in the exploitation of plant resources, and the development of new plant products.

2.2. Indigenous Knowledge

Indigenous knowledge (IK) is, broadly speaking, the knowledge used by local people to make a living in a particular environment (Warren, 1991). Terms used in the field of sustainable development to designate this concept include indigenous technical knowledge, traditional environmental knowledge, rural knowledge, local knowledge and farmer's or pastoralist's knowledge. Indigenous knowledge can be defined as "A body of knowledge built up by a group of people through generations of living in close contact with nature" (Johnson, 1992).

Indigenous knowledge is now considered to be cultural knowledge in its broadest sense, including all of the social, political, economic and spiritual aspects of a local way of life. Sustainable development researchers, however, have found the following categories of indigenous knowledge to be of particular interest: resource management knowledge and the tools, techniques, practices and rules related to pastoralism, agriculture, agroforestry, water management and the gathering of wild food; classification systems for plants, animals, soils, water and weather; empirical knowledge about flora, fauna and inanimate resources and their practical uses; and the worldview or way the local group perceives its relationship to the natural world (Emery, 1996).

Indigenous knowledge is important for an essential first step for development projects, allows better innovation and adaptation of technologies, adds to scientific knowledge, increases understanding between researchers and local people, increases the local capacity to experiment and innovate and empowers local people (Warburton and Martin, 1999). And also relevance to conservation and sustainable development because of locally appropriate, diversified production systems, respect for nature, flexible and social responsibility (Dewalt, 1994). According to Stephan and Justin (2003), indigenous knowledge is the local knowledge that is unique to a given culture or society and the base for agriculture, health care, food preparation, education, environmental conservation and a host of other activities.

It is a systematic body of knowledge built up by a group of people through generation of living in close contact with nature and it is cumulative and dynamic. The complex knowledge, beliefs and practices, generally known as indigenous knowledge develops and changes with time and space.

One important feature of indigenous knowledge system is its adaptive skills for local people acquired informally though interaction with the natural environments (Zemede and Tigist, 2007). Indigenous knowledge systems also refer to sets of concepts, beliefs and perceptions comprising the stock of knowledge as well as the process by which it is acquired, stored and transmitted. One of the widely used indigenous knowledge system in many countries is the knowledge and application of traditional medicine. Such knowledge known as ethnomedicinal knowledge

involves traditional diagnosis, collection of raw materials, preparation of remedies and its prescriptions to the patients (Farnsworth, 1994).

The immediate and intimate dependence of indigenous people on local resources resulted in the accumulation of indigenous knowledge, which helps the people to adapt to and survive in the environments in which they lived (Martin, 1995). Indigenous knowledge on remedies in many countries including Ethiopia passed from one generation to the other generation verbally with great secrecy (Jansen,1981).Such secrete and crude transfer makes indigenous knowledge or ethnomedicinal knowledge vulnerable to distortion and in most cases, some of the lore is lost at each point of transfer (Amare, 1976), hence there is a need for systematic documentation and record of such useful knowledge through ethnobotanical research, record and use of indigenous knowledge, raise awareness in the community about the value of indigenous knowledge, help communities record and document their local practices providing computers, video equipment, etc and make indigenous knowledge available to disseminate indigenous knowledge back to the community through newsletters, videos, books and other media.

2.3. Traditional Medicines

Traditional medicine has been defined by the World Health Organization (WHO, 2008) as the sum total of all knowledge and practices, whether explicable or not, used in the diagnosis, prevention and elimination of physical, mental or social imbalances and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing. This system of health care is also known as folk medicine, ethnomedicine, or indigenous medicine.

According to World Health Organization, more than 3.5 billion people in the developing world rely on medicinal plants as components of their healthcare (Balick and Cox, 1996). On the other hand, about 60-85% of the population in every country of the developing world has to rely on traditional medicine (Sofowora, 1982). The practice of traditional medicine is widespread in China, India, Japan, Pakistan, Sri Lanka and Thailand. In Africa, traditional medicine is a part of the people's culture despite the fact that this form of medicine is not as well organized as, for example, in India and China.

Traditional medicine practitioners include herbalists, bonesetters, village midwives or traditional birth attendants, traditional psychiatrists, herb sellers, and other specialists (Sofowora, 1996). Traditional medicinal plants play typical role in the lives of many people in terms of health support, financial income and livelihood security (Hamilton, 2003, 2004; Abdul *et al*., 2004). Traditional medicine has also drawbacks as various authors stated (Amare, 1976; Sofowora, 1982; Dawit, 1986). Lack of precision and standardization is one drawback for the recognition of the traditional healthcare system. Lack of precise dosage which could lead to toxicity is also the other disadvantage of traditional medicine (Dawit, 1986). The measurements used to determine the dosages are not standardized and depend on the age and physical appearance of the patient, socio-cultural explanation of the illness, diagnosis and experience of individual herbalist (Dawit and Ahadu, 1993; Pankhurst, 1995).

2.4. Importance of Traditional Medicinal Plants in Human Health

One of the most significant uses of plant is the pytho-medicinal role, i.e. the benefits of medicinal plants have contributed to modern medicine. Traditional medicinal plants have remained as the most affordable and easily accessible source of treatment in the primary health care system of resource poor communities and the local therapy is the only means of medicinal treatment for such communities.

Like any other developing and less developed nations of the world, the available modern health care services of Ethiopia are not only insufficient but also inaccessible and unaffordable to the majority (Haile *et al*., 2005). This problem along with the rapidly increasing human population and cultural resistances towards the use of modern medicines means that the majority of the people in developing countries are dependent on traditional medicines of mainly plant origins to manage various human ailments (Dawit, 2001). This is true in Ethiopia where nearly 80% of population still relies on plants to prevent and cure various health problems (Dawit and Ahadu, 1993). In developing countries leaning to and favoring traditional medicinal plants is mainly due to inaccessibility of modern medical system, economic and cultural factors (Abbie, 1996). According to Konno (2004), easily accessibility, efficacy on treatment and affordable cost in

getting health services are main reasons in preferring traditional medicine than modern medication.

Plant has been indispensable and the most important sources of both preventive and curative traditional preparation for human beings and livestock since time immemorial. According to Mekonen (1990) and Tesema *et al*. (2003), about 80% of human population and over 90% livestock in Ethiopia rely on traditional medicine. And thus, today in Ethiopia there is a large magnitude of use and interest in medicinal plant due to socio-cultural acceptability, accessibility, affordability and biomedical benefits of the traditional medicinal plants. 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 (Konno, 2004; Mwambazi, 1996; WHO, 2013).

2.5. Plants in Ethnoveterinary Medicine

In Ethiopia as well as in most developing countries, animal disease remains one of the principal causes of poor livestock performance, leading to an ever increasing gap between the supply of, and the demand for, livestock products (Teshale Sori *et al*., 2004). Livestock disease has often been described as serious of constraints to both macro-level economic development in Africa and the well-being of millions of poor livestock keepers (Andy, 1999). The document also stated that disease related economic losses have been estimated at 4 billion US dollar annually for Africa as a whole.

Ethnoveterinary medicine and related study is one of the most important means of controlling livestock diseases. Ethnoveterinary medicine which refers to traditional animal health care knowledge and practices comprising of traditional surgical and manipulative techniques, traditional immunization, magic religious practices and beliefs, management practices and the use of herbal remedies to prevent and treat array of diseases encountered by livestock holders (Tafesse and Mekonnen , 2001).

Ethnoveterinary medicine provides traditional medicines, which are locally available and usually cheaper than standard treatments. Livestock offers in many harsh environments the only way of

survival and constitutes a driving force for food security and sustainable development in developing countries like Ethiopia. Stock raisers, both farmers and herders have developed their own ways of keeping their animal health and productivity. They treat and prevent live-stock diseases using sometimes age old homemade remedies, surgical and manipulative techniques. These indigenous local animal health care beliefs and health care practices constitute an ethno veterinary medicine.

In Ethiopia, livestock production plays an important role in the livelihood and economy of majority of the population. Ethiopia is one of the leading countries of Africa in livestock population (Mirutse and Gobena, 2003). Although Ethiopia is rich in its livestock population, it is one of the countries in the world 18 with the lowest unit output. The poor health condition and of its livestock has partially been responsible for the low productivity (Mirutse and Gobena, 2003). The ever declining provision of animal health services has resulted in the appearance of a number of epizootic diseases reducing the economic efficacy of livestock production in Africa (Mirutse and Gobena, 2003).

In spite of its permanent importance as livestock health care system, the various traditional veterinary practices remained undocumented in Africa and Ethiopia (Dawit and Ahadu, 1993). Thus creation of awareness on Ethnoveterinary medicine emphasizing on useful plants used for treatment of livestock has paramount importance to livestock management.

In addition, proper documentation and understanding of farmer's knowledge, attitude and practices about the occurrence, cause, treatments, prevention and control of various ailments is important in designing and implementing successful livestock production (Tafesse and Mekonen, 2001).

2.6. Ethnobotanical Research on Medicinal Plants in Ethiopia

Traditional medicine has been practiced for the last several thousands of years but only found its legitimate place in the WHO program only about 35 years ago (WHO, 1978). Pharmaceuticals industries and western researches on plant based drugs have now rediscovered that plants have much to contribute to the discovery of new, effective, safe and profitable therapeutic agents

(Pistorius and VanWiik, 1993). Most pharmaceutical companies recently have developed mechanisms to involve indigenous people collect plant samples on the recommendations of the traditional practitioners. This approach is reported to be more successful than random collections of sample of medicinal plants (Alexiades, 1996; Balick and Cox, 1996; Asfaw *et al*., 1999).

WHO established a worldwide program to promote and develop basic and applied research in traditional medicine (WHO, 1978). Medicinal plants then have got special attention and regional offices were established by world health organization to coordinate basic and applied research activities on medicinal plants. To preserve indigenous knowledge of plant use in general and traditional medicine in particular, an ethnobotanical survey is very crucial. However, in Ethiopia, research and documentation on medicinal plants have been started. (Mesfin and Sebsibe, 1992). As this was neglected and considered irrelevant in the past (Dawit and Ahadu, 1993) only little effort has so far been made to record and document the medicinal plants use and the associated knowledge. And also a limited number of papers dealt with specific socio-cultural groups in specific areas when compared to the country's diverse flora and culture.

Among ethnobotanical study conducted on medicinal plants, in Ethiopia, 49 medicinal plants were reported from Afar people of Ada'ar District for the treatment of various livestock ailments, the majority of which (67.3%) were shrubs (Giday and Teklehaymanot 2013). Ethnomedicinal uses of 230 plants species were documented from Mana Angetu District, which is found in Bale Zone of Oromia Region. Of these, 181 (78.70%) were used as human medicine, 27 (11.74%) as livestock medicine and the remaining 22 (9.7%) were used for treating both human and livestock ailments. Similar study by Mirutse. (2001), on.

2.7. Threats to medicinal plants and their conservation efforts

2.7.1. Threats to medicinal plants

Although, plants play vital role in treating various human and livestock ailments, they are currently under pressure. Indigenous knowledge on usage of medicinal plants as folk remedies is getting lost through various reasons. According to Ensermu *et al.* (1992), habitats and species are being lost rapidly because of environmental degradation, agricultural expansion, deforestation

and urban development. According to Zemede (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 and Ahadu, 1993). In a study made by Kebu *et al.* (2004) the order of importance of the threat factors on medicinal plants in Fentalle area were harvest of medicinal plants for firewood, charcoal, drought, agriculture, house use and trade. Debela *et al.* (2004) also reported that modern education may have a negative impact on the medicinal plant knowledge. They pointed out that those students who attended modern schools are showing unwillingness to learn from their parents, which is an evidence for the gradually disappearing traditional knowledge. The study conducted by Tesfaye *et al.* (2009), showed that elders who are 41-50 years old have handled most of the knowledge on herbal remedies. This hints at the fact that ethnomedicinal knowledge is concentrated in the elderly members of the community and the relative difficulty in its transfer from the elders to the young generation. The finding of Mirutse Giday *et al*. (2009) revealed that acculturation of the young generation becomes a major threat to the continuation of traditional medicinal knowledge and practice.

Ethnomedicinal knowledge diminishes with the death of elderly knowledgeable members of society since only a few young people are willing to acquire the knowledge. In addition, invasion of alien weeds like *Parthenium hysterophorus* has adverse impact on medicinal plants and climate (Tesfaye *et al*, 2009).

2.7.2. Conservation of traditional medicinal plants

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 to biological resources. Although various threats have profound effect on medicinal plants, local people attempt to grow medicinal plants in home garden though the effort is minimal. The result of a study by Haile *et al.,* (2008), revealed that the effort of traditional healers in conserving ethnomedicinal plant species in Bale Mountain National Park was so minimal. Various authors gave their suggestion on how to conserve medicinal plants based on the threat they observed in their study. Home gardens are central target for *in-situ* and *ex-situ* conservation of traditional medicinal plants (Zemede, 2001).

Some traditional medicinal plants may have to be conserved *in-situ* in their natural habitats due to the difficulty for domestication and management or failure to produce the desired amount and quality of the active principle under cultivation (Franz, 1993; cited in Zemede, 2001). By *ex-situ* methods, traditional medicinal plants can be conserved in gene banks, botanic gardens and field gene banks (Zemede, 2001). In addition, tissue culture technique is also important in *ex-situ* conservation of traditional medicinal plants (Abebe, 2001).

3. MATERIALS AND METHODS

3.1. Description of the Study Area

3.1.1. Geographical Location

Adami Tulu Jido Kombolcha (ATJK) District lies between 7°35-8°05' north and 38°20'-38°55' east in the northern part of the Rift Valley. It is bordered to the North by Dugda Bora District, in the west by Southern Nations Nationalities Peoples Region (SNNPR), Arsi Negelle to the South and Arsi zone to the East. Batu is the center city of the District, which is 160 km away from Addis Ababa.

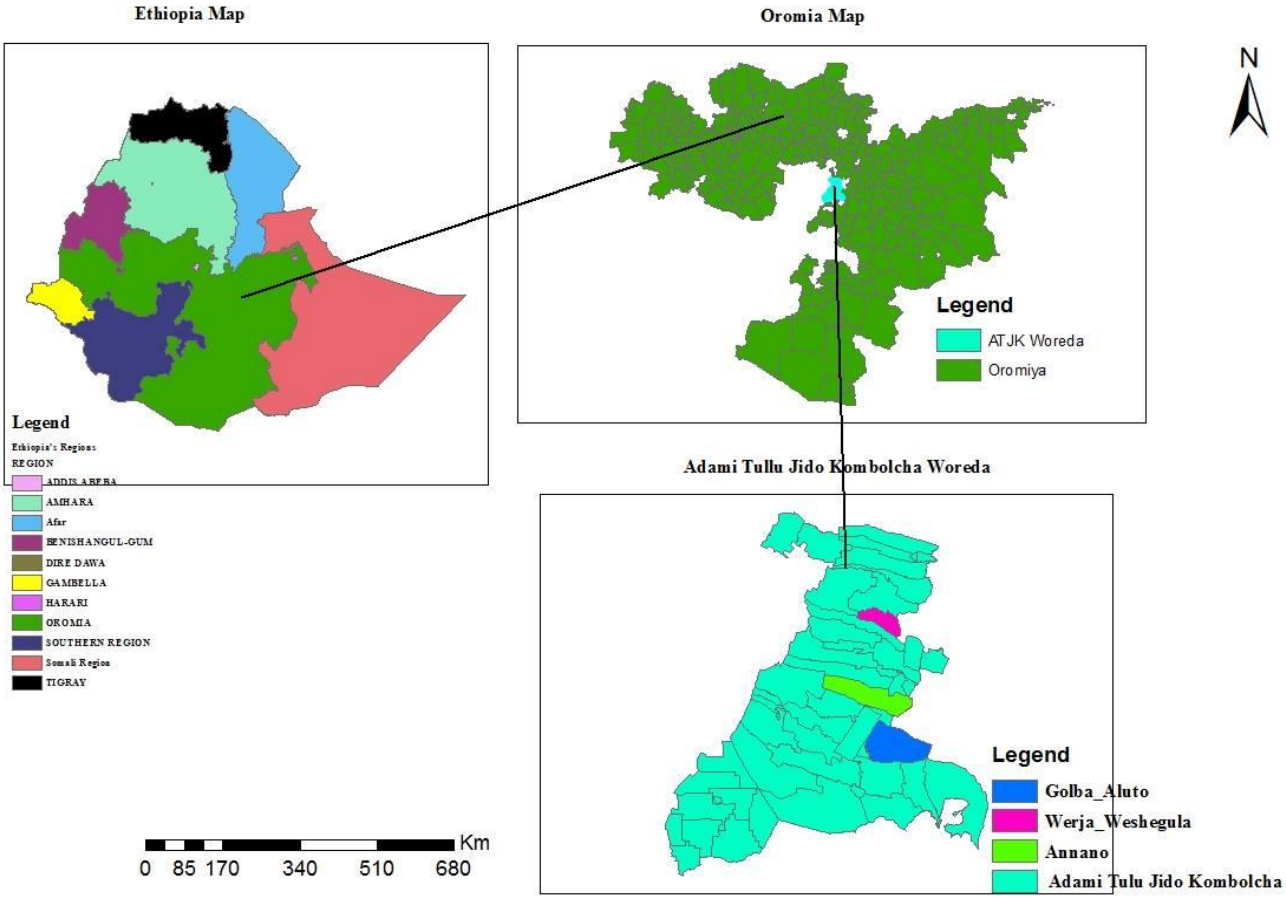

Figure 1.Map of the Study Area

3.1.2. Topography and climate

The area is characterized by plain and flat lands of volcanic origin with small mountains, hills and gorges extending from the most northern part of Central Rift Valley. The altitude ranges from 1500-2300 m.a.s.l. Adami Tulu Jido Kombolcha District has semi-arid and arid agro-climate zones. The District receives an average annual rainfall of 760 mm. The mean monthly temperature varies from 18.5^{o}C to 21.6^{o}C with mean annual temperature of 20^{o}C. Rainfall extends from February to September with a dry period in May to June, which separates the preceding short rains from the following long rains. The pH of soil is 7.88 fine sandy loams with sandy clay in proportion of 34, 48 and 18%, respectively (Adami Tulu Agricultural Research Center profile, 2004).

3.1.3. Vegetation

The vegetation of the area is categorized as tropical savannah dominated with Acacia species. Acacia trees are dominant and important means of livelihood for the local people.

3.1.4. Population

According to the District Agriculture and Rural Development Office, the total population of the District was estimated to be 164,321 for the year 2006 (computed from 1994 CSA population and housing census which accounts a 3% population increase every year) of which 14.5% urban and 85.5% rural dwellers. The average household size was 4.6 with 4.9 and 4.2 for rural and urban areas, respectively. The population density was 99 persons per square kilometer (CSA, 2015). With regard to ethnic and religious composition 78.7% are Oromos, 21.3% are other ethnic groups. Muslims are 72.4%, 27.4% Christian and 0.2% others.

3.2. Reconnaissance Survey and Selection of Study Sites

Adami Tulu Jido Kombolcha district has 38 kebeles. Reconnaissance survey was conducted from July 27 to 30 to select three potential kebeles, which included; Worja woshgullaa, Annanno and Golba alluto for ethnobotanical data collections.

These kebeles were selected based on the availability of traditional medicine practitioners, traditional medicine use history, and altitudinal variation between kebeles.

3.3. Ethnobotanical Data Collection

Prior to Ethnobotanical data collection, respondents were selected from the selected kebeles. Totally, 100 respondents (aged ≥25) 80 ordinary (non-traditional healers) residents and 20 key informants (traditional healers) were participated in this study. Key informants (traditional healers) were selected by purposive sampling from the study kebeles based on the information gathered from the local people while other 80 respondents were randomly selected. Ethnobotanical data were collected between August, 2017 and October, 2017 on two field trips made to the sites. Data collection methods were through semi-structured questionnaires and interviews, group discussions and guided field walks with key informants (traditional healers) for field observations. Key informants were first interviewed individually to mention about the local names of the plants they use to treat diseases, diseases treated, part(s) of plants used, methods of gathering, methods of preparation of remedies, route of administration of remedies, application of the remedies, dosage, side effects of the treatment, use of the plants other than medicine, types of threat and conservation problems. Thereafter, group discussions were made with them based on the checklist of questions and asked for field walk for *on site* observation of the plants. Similar procedure was also applied with randomly selected non-practitioners of traditional medicine. Voucher specimens were collected, pressed, and dried for identification. For some species, preliminary identification was done in the field using keys and illustrations. In addition, further identification of all specimens was done by comparison with authentic specimens, illustrations and taxonomic keys from Flora of Ethiopia and Eritrea, and with assistance of experts of Haramaya University. The identified specimens were deposited in Haramaya University Herbarium.

3.4. Data Analysis

Descriptive statistical methods (percentage and/or frequency) are employed to summarize ethnobotanical data.

Jaccard's Similarity Index (JI)

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

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

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

Informant Consensus Factor (ICF)

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.

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

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 (Teklehaymanot,2007).

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

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

Preference ranking

Preference ranking is used to compare the most effective medicinal plants used by the community to treat the particular disease. Preference ranking was conducted following Martin (1995) and Cotton (1996) for six most important medicinal plants used in treating bloating, as traditional healers treat it usually. For this, ten informants were selected to identify the best preferred medicinal plant species for treatment of the illness. Each informant was provided with six medicinal plants reported to cure Bloating with leaves of medicinal plant used being paper tagged then asked to assign the highest value (6) 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. This helps to indicate the rank order of the most effective medicinal plants used by the community to treat the disease.

Direct Matrix Ranking

Direct matrix ranking exercise was done following Martin (1995) and Cotton (1996) 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 was 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 informants was asked to assign use values (5=best, 4=very good, 3=good, 2=less used, 1= least used, and 0=not used). Accordingly, each key informants use values for the selected multipurpose medicinal plant species, average value of each use diversity for a species was taken and the values of each species was summed up and ranked.

4. RESULTS AND DISCUSSIONS

4.1. Some Socio-Demographic Information of the Respondents in the study Area

Based on degree of responsibilities to care for family health and assumed accumulation of traditional knowledge of the Oromo community, which is the largest inhabitants of the study area, respondents were categorized into three age classes. Age distribution of informants shows that the majority (48%) are between 41 and 60 years of age followed by 25-40 (40%) and >60 (12%). Marriage wise, 93% of the respondents were married, whereas 7% of them were unmarried. The majority (49%) of respondents had no formal education, whereas 24, 18 and 9% of them elementary school, high school and college level educations, respectively. Majority of the respondents 87% were males and 13% females. All the study participants were Oromos, 89% were Muslims and 11% Christians.

4.2. Ethnomedicinal Plant Species Used By People of The Study Area

A total of 89 species of medicinal plants used to treat 68 different health problems were gathered and documented from the study area. These plants belong to 81 genera and 47 Families. Out of these plants, 51 species (57.3%) and 13 species (14.6%) were noted to treat only human and livestock ailments only, respectively while 25 species(24.5%) were used to treat both human and livestock ailments (Appendix 1). This suggests that local people of Adami Tulu Jido Kombolcha District practice traditional medicine of plant origin besides modern medicine. In terms of species composition, family Asteraceae, Fabaceae, Euphorbiaceae and Solanaceae each consisted of 6 species. The remaining families contained one to three species each (Appendix 1). Jaccard`s Similarity index (JI) was computed in order to see the degree of similarities between the surveyed kebeles in terms of the number of medicinal plant species reported. Result showed that respondents from Annanno (1558 m) and Worja woshgulla (1492 m) kebeles reported the same 69 species with JI value of 1. The complete similarity between these two kebeles could be due to similarity in their environment. e.g., Altitude of Annanno (1558 m) and Worja woshgulla (1492 m) closer to one another and flow of information between the two kebeles residents about medicinal plants was the same.

The next higher similarity was observed between Golba alluto (1920 m) and Annanno (1558 m) kebeles with 50 common species (JI=0.88) in common. The least similarity was between Golba alluto and Worja woshgulla with 42 species in common (JI=0.56%). The least similarity between these two kebeles could be due to differences in their environment and flow of information between the two kebeles about medicinal plants was rare. The majority (39.3%) of medicinal plant species were obtained from wild followed by Home garden (32.5%), agricultural field (15.7%), live fence (8.9%), and road side (3.3%). The fact that high number of medicinal plant species was obtained from wild suggests that wilds are a good option to conserve medicinal plants in the study area.

Some plants were reported more frequently as medicinal plants than others to treat various ailments. For example, *Aloe macrocarpa* L. was cited by 75% of the respondents as a source of remedy for treating different internal parasites for both livestock and humans followed by *Carissa spinarum* L. cited by 63% respondents for evil spirit, stabbing pain, gonorrhea and malaria; *Allium sativum* L. by 58% respondents to treat colds, evil eye, malaria and wounds; *Croton macrostachyus* L. by 51% respondents to treat Ascaris, gonorrhea, bloating, jaundice and stomachache; *Vernonia amygdalina* Del. by 48% respondents to treat internal parasites, jaundice and diarrhea; *Dodonean angustifolia* L. by 41% respondents to treat different internal parasites, ear wounds, lice and wounds and *Hypoestes forskaolii* L. by 37% respondents to treat diabetes, tonsillitis and bleeding (stopping of bleeding completely) (Table 1)

Table 1.Some of the medicinal plants cited most by informants

Botanical Name of Medicinal Plants	No. of Informants	Percentage
Aloe macrocarpa Tod *(*Argiisa*)*	75	75.0
Carissa spinarum L. (Agamsa)	63	63.0
Allium sativum L.(Shunkurt adii)	58	58.0
Croton macrostachyus L. (Bakkanniisa)	51	51.0
Vernonia amygdalina Dell. (Eebicha)	48	48.0
Dodonean gustifolia L.(Ittacha)	41	41.0
Hypoestes forskaolii L.(Darguu)	37	37.0
Calpurnia aurea (Ait.)Benth (ceekaa)	35	35.0
Ocimum lamiifolium (Damaakasee)	29	29.0
Melia azedarach L. (Niimii)	21	21.0

Of the 89 medicinal plants collected, majority are herbaceous followed by shrub, tree and climbers (Figure 2).This shows that herbs and shrubs are most widely used medicinal plants of the study area. This may be due to the abundance of these habits in the study area compared to trees and climbers. Relatively high number of herbs and shrubs for medicinal purpose has also been reported previously by Alemayehu (2015) who studied medicinal plants of Ada'a District east Shoa zone.

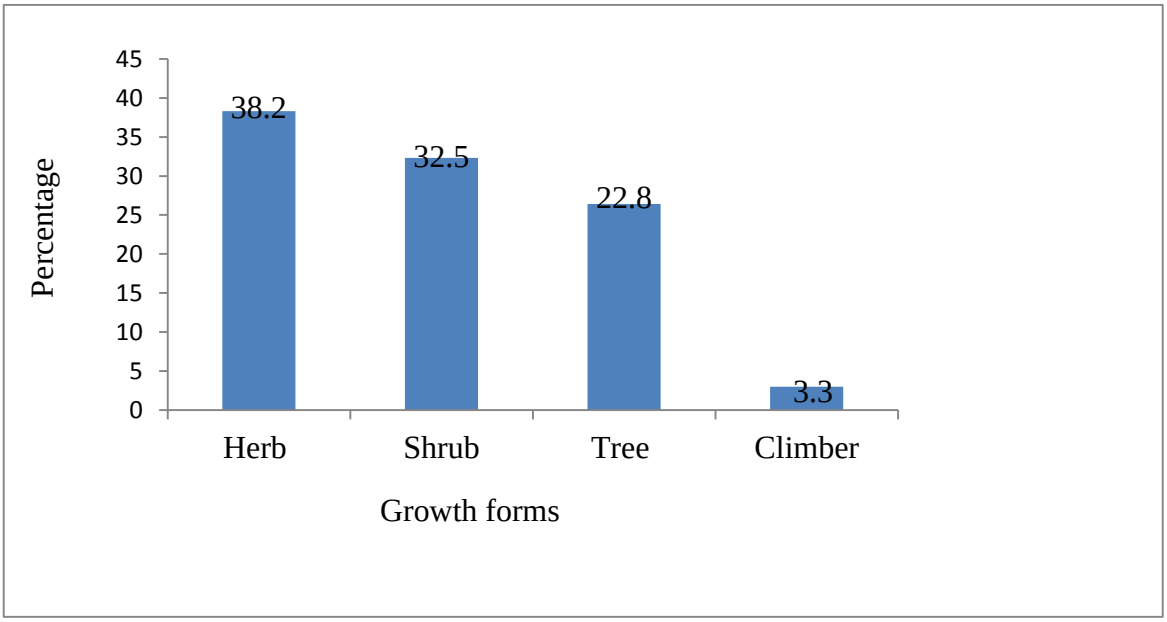

Figure 2. Growth forms of medicinal plants used for human and livestock ailments in the study

4.3. Plant Part(s) Used For Medicine, Preparations Methods and Conditions

Although different plants part were reported, the most cited plant part for remedy preparations was leaf followed by root, the whole part, seed and bark (Table 2). Other plant parts including fruit, bulb, stem, sap, latex were also reported (Table 2). This result agrees with some previous studies conducted in different parts of the country (Mirutse, 1999; Endalew, 2007; Jarrso, 2016, Mekonen 2013; Mulugeta, 2014). According to Dawit and Ahadu (1993), herbal preparation that involves roots, rhizomes, bulbs, barks, stems or whole parts have negative effects on the survival of the mother plants. In this study area use of root and entire plant part that require uprooting of plants will negatively affect their regeneration. The same is true with collection of bark and

seeds. Therefore, emphasis should be given not to excessively collect these plant parts in order to ensure their survival for future use.

Table 2. Plant parts used for traditional medicine preparations in Adami Tulu Jido Kombolcha District.

Plant parts	Total responses	% of total
Leaf	60	41.09
Root	33	22.60
Seed	15	10.27
Bark	15	10.27
Stem	6	4.10
Fruit	5	3.42
Bulb	4	2.73
Sap	3	2.05
Latex	2	1.36
Flower	2	1.36
Whole part	1	0.68
Total	146	100

Concerning the preparation of traditional medicine, the local people employ various methods of preparation of traditional medicines for different types of ailments. The preparations vary based on the type of disease treated and the actual site of the ailment. Pounding (44.1%), crushing (26.4%), cooking/boiling (19.5%), squeezing (6.8%) and smoking (2.9%) were the major remedy preparation methods reported. Preparations may involve using a single plant part or mixtures of different organs of the same plant. For example, fresh fruit of *Citrus limon* and bulb of *Allium sativum* are pounded together and mixed with honey and eaten with bread to treat a stomachache. In this study, the local people also use some other products as additives in their preparations. For example, water, oil, sugar, salt, milk, honeys are some of the additives that the local people reported to be used to improve the flavor and reduce adverse effects such as vomiting and diarrhea so that the efficacy of the traditional medicine would be maintained or increased. Such additives were also reported by some previous researchers (Mulugeta, 2014; Semayat, 2017; Fitsum and Mebrahtom, 2017).

Most (63.43%) remedy preparations were reported to be from fresh plant materials while 23.13% and 13.43% of preparations were from dried and fresh/dried plant materials, respectively.

Similarly, a study conducted by Teshale *et al*. (2004) in Borana, Oromia Regional State, south Western Ethiopia, showed that using fresh materials for different health problems is more than dry materials.

4. 4. Dosage, Route and Ways of Remedy Administration

The dosage of medicine to be administered is given by rough estimation of the age and physical condition of the patient. Hence there is no precision on the dosage of the remedy. Dawit and Ahadu (1993) reported that lack of precision in the dosage is one of the major drawbacks of practicing traditional remedy. As regards to route of administration, include through oral, dermal, nasal, and others. Overall, oral administration was reported as a dominant route of administration (60.13%) followed by dermal route (34.64 %) (Figure 3) both oral and dermal routes permit rapid physiological reaction of the prepared medicines with the pathogens and increase its curative power. This finding agrees with some previous reports (Kebu *et al*., 2004; Mulugeta, 2014).

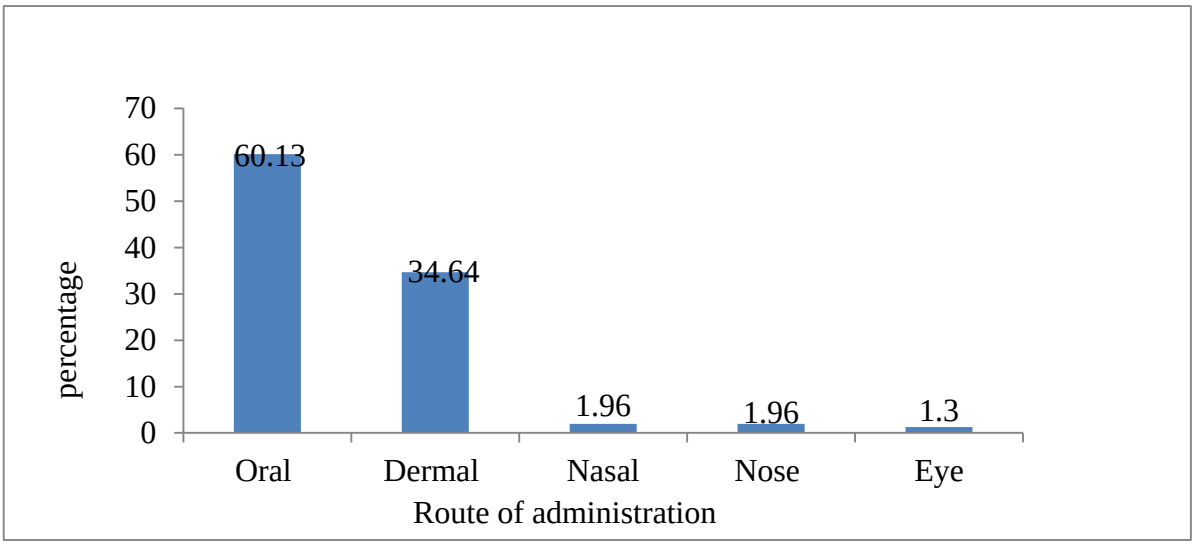

Figure 3. Percentage distribution of route of administration of plant remedies used for human and livestock.

4.5. Ways of Applications of Plant Remedies

The prepared traditional medicines are applied in a number of methods, among which drinking (41.66%), eating (20.37%), painting (7.40%), put on and tide (6.48%), smoking (5.55%), rubbing

(4.62%),washing (4.62), holding on (3.70%), put on (2.77%), inserting (1.85%), and sniffing (1.85%), were mentioned. In this study, drinking and eating account for the largest percentage (Table.3).

Table 3. Ways of application of plant remedies in human and livestock ailment treatment.

No.	Ways of Applications	Total Responses	Percentage (%)
1	Drinking	45	41.66
2	Eating	22	20.37
3	Painting	8	7.40
4	Put on & Tide	7	6.48
5	Smoking	6	5.55
6	Rubbing	5	4.62
7	Washing	5	4.62
8	Holding on	4	3.70
9	Put on	3	2.77
10	Inserting	2	1.85
11	Sniffing	2	1.85
	Total	108	100

4.6. Informant Consensus Factor (ICF) and Fidelity Level

The diseases of the study area have been grouped into different categories based on the site of incidence of the disease, condition of the disease as well as treatment resemblance of the disease to the local people. Analysis of ICF showed that values ranged from 0.77 to 0.93 for the diseases categories (Table.4). Of the disease categories, Malaria and head ache had the highest ICF value suggesting the common occurrence of these problems and agreement of the people on their remedy. It has been showed that medicinal plants that are effective in treating certain diseases and well known by community members have higher ICF values. Gonorrhea, kidney problem and Jaundice, had the lowest (0.77) ICF value, which may be due to the rare occurrence of these diseases.

Table.4. Informant Consensus Factor (ICF)

Disease categories	Nt	Nur	ICF
Malaria and Headache	7	100	0.93
Abdominal problems, Intestinal parasite, Diarrhea, Amoeba, urine problems and stomach ache	11	95	0.90
Common cold and Cough	10	87	0.90
Sensorial diseases (ear, eye and epilepsy)	7	60	0.89
Tonsillitis	8	64	0.88
Skin problems, Dandruff, Hair loss, Hemorrhoid, Swelling	9	57	0.85
wound	12	73	0.84
Rabies	6	34	0.84
Snake bite, Spider poison	4	15	0.78
Heart problems, Diabetes, Blood pressure	6	23	0.77
Tooth ache	6	23	0.77
Jaundice			

Fidelity level (FL) is an index, which shows the specificity of a given plant to effectively treat a particular disease. Fidelity level was then calculated for some commonly used medicinal plants to treat ailments. Result showed that *Allium sativum* had the highest FL followed by *Buddleia polystachya*, *Vernonia amygdalina*, *Aloe macrocarpa*, *Calpurnia aurea*, *Citrus Limon*, *Brassica carinata* and *Croton macrostachyus* (Table 5). The 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 less popular (Tilahun and Mirutse 2007; Mulugeta, 2014). High FL could also be an indication of efficiency of the reported plant to cure a specific ailment.

Table 5. Fidelity index of some medicinal plants

Botanical Name of Medicinal Plants	Examples of ailment treated	Np	N	FL	FL%
Allium sativum	Malaria	46	48	0.95	95
Buddleia polystachya	Diarrhea	40	45	0.88	88
Vernonia amygdalina	Bloat	35	41	0.85	85
Aloe macrocarpa	Intestinal parasite	31	38	0.81	81
Calpurnia aurea	Syphilis	28	36	0.77	77
Citrus limon	Stomach ache	25	34	0.73	73
Brassica carinata	Common cold	21	29	0.72	72
Croton macrostachyus	Ascaris	18	26	0.69	69
Dovyalis abyssinica	Rheumatic Pain	14	21	0.66	66
Carissa spinarum	Gonorrhea	12	19	0.63	63

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.

4.7. Preference Ranking and Direct Matrix Ranking

When there are different species prescribed for the same health problem, people show preference of one over the other. Preference ranking of six medicinal plants that were reported for treating Bloating was conducted after selecting ten key informants. The informants were asked to compare the given medicinal plants based on their efficacy and to give the highest number (6) for the medicinal plant which they thought most effective in treating Bloating and the lowest number (1) for the least effective plant in treating Bloating. *Aloe macrocarpa* scored 49 and ranked first indicating that it is the most effective in treating Bloating followed by *Capsicum annuum* and the least effective was *Cucurbita pepo* (Table 6)

Table 6. Preference ranking of medicinal plants used for treating bloating

List of medicinal Plants	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Total	Rank
Aloe macrocarpa	5	6	5	6	4	5	4	6	3	5	49	1st
Capsicum annuum	6	5	6	5	6	4	4	3	4	2	45	2nd
Croton macrostachyus	5	4	6	3	3	2	6	3	3	1	36	3rd
Vernonia amygdalina	6	2	2	3	5	4	3	3	2	1	31	4th
Hordeum vulgare	3	3	3	1	2	3	1	1	3	3	23	5th
Cucurbita pepo	2	2	1	2	1	4	1	2	1	3	19	6th

Key: - R= informant

In the study area, many medicinal plants were found to have different uses other than medicinal purpose. The major uses of plants reported were for firewood, charcoal making, construction, fencing, food, forage, furniture and medicine. The direct matrix ranking result showed that *Laggera tomentosa* ranked first followed by *Acacia etabaica, Acacia abyssinica, Cordia africana, Croton macrostachyus, Vernonia amygdalina, Dovyalis abyssinica, Carissa spinarum, Ficus sycomorus, Maytenus senegalensis* and *Olea europea* (Table 7).This result indicates that *Laggera tomentosa* and *Acacia etabaica* appear to have more demand than the others as they are used for more diverse purposes. The direct matrix ranking result also shows that the local people harvest the 11 multipurpose plant species mainly for firewood followed by charcoal, fencing, medicinal purpose, furniture, construction, forage and food (Table 7).

Table 7. Direct Matrix ranking for the eleven Selected Multipurpose Plant Species. Ranking was done based on the use criteria rated as 5 = best; 4 = Very good; 3 = good; 2 = less used; 1 = least used and 0 = no value).

Plant Species	**Use Categories**								**Total**	**Rank**
	Charcoal	**Constrction**	**Fencing**	**Fire wood**	**Food**	**Forage**	**Furinuture**	**Medicine**		
Laggera tomentosa	5	4	4	4	2	4	3	4	**31**	**1st**
Acacia etabaica	5	3	4	5	2	3	3	3	**28**	**2nd**
Acacia abyssinica	5	4	4	3	1	0	5	3	**25**	**3rd**
Cordia africana	3	4	2	2	2	1	5	4	**23**	**4th**
Croton macrostachyus	4	4	3	3	0	0	3	4	**21**	**5th**
Vernonia amygdalina	2	2	2	4	0	4	1	4	**19**	**6th**
Dovyalis abyssinica	1	2	5	3	1	2	1	3	**18**	**7th**
Carissa spinarum	2	3	3	4	0	0	2	2	**16**	**8th**
Ficus sycomorus	1	1	1	3	4	2	1	2	**15**	**9th**
Maytenus senegalensis	2	1	2	3	0	2	1	2	**14**	**10th**
Olea europea	4	1	1	3	0	1	1	2	**13**	**11th**
Total	**34**	**29**	**31**	**37**	**12**	**19**	**26**	**33**	**223**	
Rank	**2nd**	**5th**	**4th**	**1st**	**8th**	**7th**	**6th**	**3rd**		

4.8.Threats to Medicinal Plants and Indigenous Knowledge, and Conservation Efforts of Traditional Medicinal Plants

Rural people need plants for their livelihood in different aspects. In this study several factors both human and natural were found to contribute to the threats that affect survival of medicinal plants species in the study area. From the interview with informants various factors were recorded as the main threats to medicinal plants in Adami Tulu Jido Kombolcha District. Agricultural encroachment, firewood collection, charcoal production, plant use for house and fence construction, overgrazing and urbanization were reported to the factors for the dwindling of natural vegetation in general and medicinal plants in particular. As a result, according to the respondents, the accessibility of medicinal plants has become less when compared to the previous times.

Traditional healers also keep their knowledge on medicinal plants for the sake of securing means of income and a cultural belief that telling information may make plants ineffective to cure the ailments. Similar findings were reported elsewhere (Abebe, 2017; Fassil, 2001; Mirutse and Gobena, 2003). However, it was recognized that ethnobotanical knowledge on uses of some medicinal plants is transmitted orally to one or few family members to use in secrecy. They disclose their knowledge on medicinal plants at old age by the time when they most probably die before teaching the details of medicinal plants or when they are too old to walk to the field to show the plants in their habitats. According to the respondents, access to modern medication has also contributed to the loss of indigenous knowledge as new generations give less attention to traditional medicinal plants. As a result the indigenous knowledge seems to be endangered in the study area.

Indigenous people of the study area practice some conservation measures. For instance, some medicinal plants are found in majority of household gardens and farm borders in the study area, as they need these plants in their daily life as medicine or for other values. Medicinal plants are also maintained or protected near vicinity due to their fragrance, as live fences to avoid enemies, as spices and for food. Plants are also left as remnants of forest in agricultural field due to their uses for construction, fuel wood and other values. Here, the intermixing of multi-purpose plant

species by farmers on their farmland is evidence to management practices in the area. The healers conserved some medicinal plants by cultivated mixing with crops in agricultural field, planted in special places, such as, live fences of home gardens and fields.

5. SUMMARY,CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

This study was conducted in Adami Tulu Jido Kombolcha District, Oromia, Ethiopia with the objective of documenting ethnomedicinal plants and indigenous knowledge on their use for medicine. Hundred respondents have participated in this study as respondents. Data on medicinal plants use were collected through semi-structured interviews, field observation, and group discussion and guided field walk. Totally 89 medicinal plant species treating human and livestock diseases were documented. Herbs were found to be the dominant growth forms used for the preparations of traditional remedies followed by shrubs. Leaves were the most frequently used plant parts followed by roots for preparation of remedies. The most commonly used route of administration was oral followed by dermal. The major threats to medicinal plants and the associated knowledge in the study area are firewood collection, charcoal production, agricultural expansion, uses of plants for construction and using plants for fencing and furniture. Whereas threats that erode indigenous knowledge emanate from secrecy, oral based knowledge transfer, unwillingness of young generation to gain the knowledge, unavailability of the species, and influence of modern education are the major ones.

5.2. Conclusion

In conclusion, the study area revealed that people in the study area have substantial amount of indigenous knowledge on traditional medicine, which needs to be further strengthened by all age groups and gender. As this study revealed the knowledge of traditional medicine mainly reside in the hand of illiterate and aged groups. Indigenous people of the study area have their own ways of managing health problems of human and livestock as they are endowed with specific culture, tradition and ethical norms.

5.3. Recommendations

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

- In order to conserve medicinal plants and preserve indigenous knowledge, local people should be aware of cultivating medicinal plants in their home gardens mixing with crops and as live fences;
- Encourage the local herbal medicine practitioners to enhance the use of traditional medicine through licensing and other incentives;
- Attention should be given to standardization of measurement and hygiene of the medicines made from plants by training both the healers and other members of the local community;
- Biochemical profiles of plant species used for diseases categories of high ICF should be investigated for screening of the active principles.

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7. APPENDICES

Appendix 1. List of medicinal plants used for human and livestock diseases.

No.	Botanical Name and plant habit	Family	Local Name	Habitat	Health problem /disease treated	Part(s) used, conditions, mode of preparations & application	Route of Administration
1.	*Acacia abyssinica* Hochst.exBenth **Tree**	Fabaceae	Laaftoo	Wild	Back pain*	**Leaf**: Fresh crushed leaves are mixed with water and drunk.	Oral
					Eye disease**	**Leaf:** Fresh leaves are pounded, squeezed and the juice is added to the eye.	Eye
					Horse scabies**	**Root and bark**: Fresh root and bark grounded together and wash the animal with the solution.	Dermal
2.	*Acacia etabaica* Schweinf subsp. *etabaica* **Tree**	Fabaceae	Doddota	Wild	Internal parasite*	**Fruit**: Adding the dried fruit with sugar and drunken 3 to 4 cup.	Oral
3.	*Agavesisalana Perrine* ex.Engl. **Herb**	Agavaceae	Algee	Road side	Black leg**	**Root:** Fresh root is crushed, mixed with water and given to cattle.	Oral

4.	*Allium cepa* L. **Herb**	Alliaceae	Shunk urtii diimaa	Home garden	Poisoning*	**Root**: Tie up the dried root powder with the leaf concoction of *Vernonia amygdalina and Premna schimperi.*	Dermal
5.	*Albizia schimperiana* Oliv. **Tree**	Fabaceae	Ambal taa	Wild	Wound*	**Bark:** Dried bark of the plant powdered and applied on affected part.	Dermal
6.	*Allium sativum* L. **Herb**	Alliaceae	Qullub bii Adii	Home garden	Colds*	**Bulb**: The dried bulb is Pounded, mixed with honey and 2-3 teaspoon is eaten Every day for five days.	Oral
					Evil eye*	**Bulb**: The dried bulb is crushed together with one rhizome of *Zingiber officinale* with honey and 3 tea spoons are taken.	Oral
					Malaria*	**Bulb:** The fresh bulb is pounded, mixed with the crushed fresh leaves of *Ruta chalepensis*, and applied externally to prevent the disease.	Dermal
					Wound*	**Bulb:** The dried bulb is pounded and tied on the wound every two days for one week days.	Dermal
7.	*Acacia albida* Del. **Tree**	Agavaceae	Garbii	Wild	Eye bruise**	**Bark:** Fresh bark masticated and spitted out on the eye.	Dermal

8.	*Aloe macrocarpa* Tod. **Herb**	Aloaceae	Argiisa	Live fence	Intestinal parasite***	**Leaf:** Fresh leaves chewed and swallow the juice.	Oral
					Leprosy*	**Leaf**: Fresh Leaves of this plant are pounded and mixed with butter and applied on the skin.	Dermal
					Bloat**	**Leaf:** Fresh Leaves Chewed and mixed with water and given orally	Oral
					Nose bleeding*	**Leaf:** Fresh Leaves are crushed and tie on The wound and squeeze in to the nose. This helps to stop nose bleeding.	Nasal
9.	*Azadirachta indica* L. **Tree**	Meliaceae	Nimii/ niimii dhugaa	Wild	Lice**	**Leaf:** First fresh leaves are prepared and applied on cattle skin.	Dermal
					Tick**	**Stem:** Fresh stem grounded and polishing the bitten area.	Dermal
10.	*Beta vulgaris* L. **Herb**	Chenopodiaceae	Hundee diimaa	Home garden	Abdominal pain*	**Root:** Fresh root of the plant is collected and eaten.	Oral
11.	*Brassica carinata* A. Br. **Herb**	Brassicaceae	Goommana	Home garden	Common cold*	**Leaf:** The dried leaf Powdered and mixed with water then dunk.	Oral

12.	*Bidens macroptera* (Sch. Bip. ex Chiov.)Mesfin **Herb**	Asteraceae	Keelloo	Wild	Athletes foot*	**Leaf:** Fresh Leaves put on fire and rubbed on affected part.	Dermal
13.	*Buddleia polystachya* L. **Shrub**	Loganiaceae	Adaaddoo	Home garden	Diarrhea*	**Seed:** The dried Seeds are pounded, mixed with honey.	Oral
14.	*Calpurnia aurea* (Ait.) Benth. **Shrub**	Fabaceae	Ceekataa	Wild	Lice**	**Leaf:** Fresh leaves are pounded, mixed with water and wash the boy of the animal every morning until the parasites are eradicated.	Dermal
					Diarrhea***	**Leaf:** Fresh leaves is chewed and swallow for humans or the seeds are roasted, pounded, mixed with water and drunk by cup and leaf is pounded, mixed with water and given to animal until the diarrhea stops.	Oral
					Syphilis*	**Seed:** The dried seeds are crushed, mixed with honey and one teaspoon is eaten for five consecutive days.	Oral
					Leech**	**Leaf/seed:** Fresh leaf or seed are pounded together with leaf of *Nicotiana tabacum* and are applied through the nostrils.	Nasal

15.	*Capparis tomentosa* Lam. **Shrub**	Capparidaceae	Haran gamaa	Wild	Swelling**	**Root:** Fresh/dried root is pounded, mixed with butter and is applied to the affected breast.	Dermal
					Toothache*	**Leaf:** The fresh leaf of the plant is chewed and placed on the teeth for 2-3 hours.	Oral
					Evil eye*	**Leaf/root:** Dried Leaf or root is crushed, add to fire and smoked to the victim.	Dermal
16.	*Capsicum annuum* L. **Herb**	Solanaceae	Barberee	Home garden	Bloat**	**Fruit:** Dried fruit Pounded, mixed with water and given orally	Oral
17.	*Citrus limon* (L.) Burm.f. **Shrub**	Rutaceae	Loomi	Home garden	Stomach ache*	**Fruit:** Fresh Fruit of *Citrus limon* and bulb of *Allium sativum* are pounded together and mixed with honey and eaten with wheat bread.	Oral
18.	*Coriandrum sativum* L. **Herb**	Apiaceae	Dimbilaala	Home garden	Diffuse cutaneous leshmaniasis*	**Leaf**: The fresh leaf of this plant pound with leaf of *Croton macrostachyus* and creamed on pain area for 2-3 days.	Dermal
19.	*Carica papaya* L **Tree**	Carricaceae	Paappayyaa	Home garden	Jaundice*	**Seed:** Dried seeds are roasted, pounded and is drunk three coffee cups every morning for seven days.	Oral

20.	*Catha edulis* (Vahl) Forssk .ex Endl. **Shrub**	Celastraceae	Catii	Agricultural fields	Urine retention***	**Leaf:** Fresh leaf of *Catha edulis* is pounded, mixed with water add local areke or katkala and is given orally.	Oral
21.	*Carissa spinarum* L. **Shrub**	Apocynaceae	Agamsa	Wild	Evil spirit*	**Root:** Fresh root of *Carissa spinarum* is pounded and added to fire and smoke to the patient.	Dermal
					Stabbing Pain*	**Root:** Fresh Root is pounded, boiled in water and is drunk by cup.	Oral
					Gonorrhea*	**Root:** Fresh/dried root is crushed, boiled, add cow milk and is drunk after cooling.	Oral
					Malaria*	**Root:** Fresh root is pounded, insert into cold water, wait for day and is drunk.	Oral
22.	*Coffea Arabica* L. **Shrub**	Rubiaceae	Buna	Home garden	Wound *	**Seed:** Roasted fresh/dried seeds grounded, and tied on the wound.	Dermal
23.	*Cordia africana* Lam. **Tree**	Boraginaceae	Waddessa	Live fence	Bleeding/c Ontinous flow of menstruation*	**Bark**: Fresh or dried bark drunk with one coffee cup for four consecutive days.	Oral

24.	*Clutia abyssinica* Joub. & Spach. **Shrub**	Euphorbiaceae	Ulee foonii	Wild	Toothache*	**Leaf:** Fresh leaves hold in teeth for 30-40 minutes.	Oral
					Wound***	**Leaf:** Fresh leaf is pounded and the fine powder is mixed with butter and applied on the affected part.	Dermal
					Rheumatic Pain*	**Bark:** Fresh bark is crushed, boiled together with honey and drunk.	Oral
25.	*Croton macrostachyus* Del. **Tree**	Euphorbiaceae	Bakka nniisa	Agricultural field	Ascaris*	**Leaf and bark**: The tip of fresh young leaf and the bark is pounded, boiled, add butter, cool it and after it solidifies, five to ten tablets are made and three tablets for children, five to ten tablets for elders is given.	Oral
					Bloat**	**Bark:** The fresh bark of root is grounded, mixed with water and given to the animal by drinking material (merti/xaasaa).	Oral
					Jaundice*	**Leaf**: Fresh leaf Cooked, pasted with honey and eaten.	Oral
					Gonorrhea*	**Leaf**: Fresh five to ten shoot tips is cut, cooked and two spoonful of the solution is drunk per a day for five consecutive days.	Oral

					Stomach ache*	**Bark:** Fresh bark together with bulb of *Allium sativum*, is pounded, mixed with butter and eaten.	Oral
26.	*Clematis simensis* Fresen. **Shrub**	Ranunculaceae	Hidda fiitii	Wild	Intestinal parasite*	**Root:** Fresh root crushed and given for cattle by mixing in water to get relief from Internal parasite.	Oral
					Cough *	**Leave:** Place young fresh leaves in the nostrils.	Nose
27.	*Cucurbita pepo* L. **Shrub**	Cucurbitaceae	Dabaa quula	Home garden	Hookworm*	**Seed:** Fresh or dried Seeds are soaked in water overnight, chew and swallowed as they are.	Oral
					Bloat*	**Root:** Fresh root together with *Vernonia amygdalina* is pounded; local areke or katukala is added and given orally.	Oral
28.	*Cyphostemma cyphopetalum* L **Climber**	Vitaceae	Gaalee	Wild	Hemmoroids *	**Flower:** Fresh flower is squeezed and the flower is rubbed over the wound.	Dermal
29.	*Cynoglossum lanceolatum* Forssk. **Herb**	Boraginaceae	Chigo ogitii	Agricultural field	Mich*	**Leaf:** Fresh leaf together with *Ocimum lamiifolium* is pounded and drunk with coffee.	Oral

30.	*Datura stramonium* L. **Herb**	Solanaceae	Manjii	Road side	Cough*	**Leaf:** Dried or fresh leaf is pounded; one spoon is added to a cup of coffee and drunk every morning up to four days.	Oral
					Toothache*	**Seed:** Fresh or dried Seeds are boiled in water and inhaled the vapour.	Oral
					Eye disease*	**Leaf:** Fresh or dried Leaf is squeezed and the juice is applied to the eye.	Eye
31.	*Dodoneaan gustifolia* L.f. **Shrub**	Sapindaceae	Ittacha	Wild	Ear wound***	**Leaf**: Dried leaf Crushed mixed with butter and placed on the damaged part. .	Dermal
					Tapeworm* .	**Flower:** Fresh or dried flowers are crushed, soaked in water for a day and drunk with local katukala or farsoo.	Oral
					Internal Parasite**	**Seed:** Dried seed grounded, pasted with oat flour, bake and give to the animal.	Oral
					Wound***	**Leaf:** Fresh or dried leaf is grounded and apply to the wound after washing with squeezed leaf of *Calpurnia aurea*.	Dermal

					Lice**	**Leaf:** The fresh leaf of the plant is collected and adds water and applies on animal skin.	Dermal
32.	*Dovyalis abyssinica* (A.Rich.) Warb. **Shrub**	Flacourtiaceae	Koshommii	Live fence	Rheumatic Pain*	**Root:** Fresh or dried root powder is together with the pounded young shoot of *Cordia africana* is smoked.	Dermal
					Ascaris*	**Bark:** Fresh or dried Fine powder of pounded bark of *Dovyalis abyssinica* is mixed and taken at meal time.	Oral
33.	*Echinops macrochaetus* Fresen **Shrub**	Asteraceae	Kosorruu	Wild	Foot and mouth Disease**	**Stem:** Fresh stem of this plant is chopped and fumigated to sheep.	Dermal
34.	*Ehretia cymosa* Thonn. **Tree**	Boraginaceae	Ulaagaa	Agricultural field	Stomach ache***	**Leaf or root:** Fresh or dried Leaf or root is pounded, add katicala and given to cattle.	Oral
					Mich*	**Leaf:** Fresh leaf is crushed and is drunk.	Oral
					Taeniasis *	**Seed:** Fresh or dried seeds are grounded, mixed with water and is drunk.	Oral
35.	*Ensete ventricosum* (Welw.)	Musaceae	Warqee	Home garden	Stomachache*	**Root:** Dried root is crushed, mixed with honey and is drunk.	Oral

	Herb				Leech **	**Bark:** Fresh or dried bark is pounded, mixed with small amount of water and is added through the nostrils for two consecutive days.	Nasal
36.	*Eleusine floccifolia* Forssk. **Herb**	Poaceae	Coqorsa	Home garden	Snake bite*	**Above ground part:** Fresh above ground part pounded and paste on the skin.	Dermal
37.	*Epilobium hirsutum* L. **Herb**	Onagraceae	Ashuffee	Wild	Diffuse cutaneous leshmaniasis*	**Leaf:** The Fresh leaf of this plant put in fire by taking away from fire and by rubbing creamed pain area.	Dermal
38.	*Euphorbia tirucallii* L. **Shrub**	Euphorbiaceae	Cadaa	Live fence	Hemorrhage *	**Sap:** Fresh white milky sap of the plant carefully tapped on hemorrhage.	Dermal
39.	*Eucalyptus globulus* Labill. **Tree**	Myrtaceae	Baarzaafiiadii	Wild	Cough*	**Leaf:** Fresh young leaves are boiled in water and fumigate the vapour under sealed clothes at morning time.	Dermal
40.	*Euclea racemosa* Murr. **Shrub**	Ebenaceae	Mi'eessaa	Wild	Gonorrhea*	**Root:** Fresh or dried root is pounded, boiled in water and drunk with goat milk. .	Oral
					Internal Parasite*	**Root:** Fresh or dried Crushed root is boiled and drunk with sugar.	Oral

41.	*Euphorbia abyssinica* Gmel. **Tree**	Euphorbiaceae	Adaa mii	Live fence	Gonorrhea*	**Latex:** Fresh or dried very small amount of the milky latex is mixed with grain flour, bake and eaten for five consecutive days.	Oral
					Hemorrhage*	**Sap:** Fresh white milky sap of the plant carefully tapped on hemorrhage.	Dermal
42.	*Euphoriba depauperata* A.Rich. **Herb**	Euphorbiaceae	Anxarfaa	Agricultural fields	Eczema*	**Latex and seed:** Fresh Latex and pounded seed of *Calpurnia aurea* are mixed and applied at the part in the night for five days.	Dermal
43.	*Ficus sycomorus* L. **Tree**	Moraceae	Odaa	Wild	Abdominal pain***	**Fruit:** Eating the fresh fruits of the plant.	Oral
44.	*Ficus vasta* Forssk. **Tree**	Moraceae	Qilxuu	Wild	Worm**	**Bark**: Fresh bark crushed and mixed with water and two litters is given for big cattle and one Litter for calf.	Oral
45.	*Ficus sur* Forssk. **Tree**	Moraceae	Harbuu	Wild	Wound***	**Bark:** Fresh or dried fine powder of the bark is mixed with butter, applied to the wound and sit for 10-15 minutes under the sun.	Dermal
					Urine Retention***	**Leaf:** Fresh leaf *are* pounded, mixed with water and given.	Oral

46.	*Guizotia scabra* (Vis.) Chiov. **Herb**	Asteraceae	Hadaa	Agricultural field	Wound***.	**Whole part**: Fresh or dried The plant parts are crushed; the fine powder is mixed with butter and is applied to the wound.	Dermal
47.	*Grewia ferruginea* Hochst. ex A. Rich. **Tree**	Tiliaceae	Dhoqonuu	Wild	Dandruff*	**Leaf:** The hair washed by fresh or dried leaves of *Grewia ferruginea* and used as soap.	Dermal
					Taeniasis *	**Root:** The dried root is infused in water solution and three full cups of coffee is drunk.	Oral
48.	*Helianthus annuus* L. **Herb**	Asteraceae	Suufii	Agricultural field	Abdominal pain*	**Seed:** The dried seed collected and powdered and then add water and drink half of litter.	Oral
49.	*Hordeum vulgare* L. **Herb**	Poaceae	Garbuu	Agricultural field	Bloat**	**Seed**: fresh or dried Seed *is* crushed and sprinkled on the feed.	Oral
50.	*Hypoestes forskaolii* (Vahl) R.Br. **Herb**	Acanthaceae	Darguu	Wild	Bleeding**	**Leaf**: Fresh leaf is rubbed on the damaged part until the bleeding stops.	Dermal
					Diabetes*	**Leaf:** Dried leaves powdered and mixed in water and taken when need arise.	Oral

51.	*Juniperus procera* Hochst .ex Endl. **Tree**	Cuppressaceae	Gaatiraa	Wild	Toothache*	**Bark:** Dried Powder form mixed with fine powder of *Rumex nepalensis* in the presence of food oil is kept on the teeth.	Oral
52.	*Justicia schimperiana* (Hochst. ex Nees) T. Anders **Shrub**	Acanthaceae	Dhumuugaa/ Sansalii	Live fence	Jaundice***	**Leaf**: Newly growing fresh leaves milled on palms and the squeezed liquid added to a coffee cup 4. Drink the liquid every night time for a week.	Oral
					Eczema*	**Leaf:** The fine powder of dried leaf together with the powder of leaf of *Croton macrosrachyus* are pasted with butter and apply once a day for five.	Dermal
					Lice*** .	**Leaf:** Dried leaf decoctions of this plant are mixed with *Calpurina aurea* and wash the body.	Dermal
53.	*Lagenaria siceraria* (Molina)Standl. **Shrub**	Cucurbitaceae	Buqqee	Home garden	Evil eye*	**Seed:** Fresh Seeds are grounded and add to fire and smoke or drink with honey.	Dermal
					Snake bite*	**Leaf:** Fresh leaves are pounded and drunk in the presence of small amount of water.	Oral

54.	*Laggera tomentosa (*Sch.Bip.ex A.Rich.) Oliv. & Hiern **Tree**	Asteraceae	Ajoo	Wild	Any swelling expecting tuberculosis***	**Leaf:** Fresh Pounded leaf is tied on the smelling.	Dermal
55.	*Lantana camera* L. **Shrub**	Verbenaceae	Akayi sinbira a	Live fence	General malaise (Mich)*	**Leaf:** Fresh pounded together with leaf of *Ocimum lamiifolium* and the squeezed out liquid drink with tea.	Oral
56.	*Lippia adoensis* Hochst. ExWalp. **Shrub**	Verbanaceae	Kusaa yee	Wild	Intestinal Parasite*	**Root:** Fresh/ dried root together with the dried bark of *Croton macrostachyus* is crushed and eaten after breakfast.	Oral
					Cough*	**Leaf:** Dried leaf is pounded and boiled and a tea spoon of it is added to cup of coffee and drunk for four days every.	Oral
57.	*Linum usitatissimum* L. **Herb**	Linaceae	Talbaa	Agricu ltural field	Amoebisis*	**Seed:** The dried pondered seed is drunk in an empty stomach.	Oral
					Retention Of placenta***	**Root:** Dried root and seed is boiled and drunken days.	Oral
					Constipation***	**Seed:** The dried seeds are soaked in water over night and the water solution is drunk.	Oral

58.	*Lycopersicon esculentum* (L.) Mill. **Herb**	Solanaceae	Timaatima	Agricultural field	Common cold*	**Fruit:** Fresh fruit put in fire and eaten when get hot in order to get relief from common cold.	Oral
59.	*Maytenus senegalensis (*Lam.) Exell **Shrub**	Celastraceae	Kombolcha	Wild	Hemmoroids*	**Leaf:** Dried Leaf together with young stem of *Olea europea* and pounded mixed with butter and the paste is applied on it.	Dermal
					Diarrhea**	**Bark:** Fresh bark is pounded, mixed with water and local beer and given orally.	Oral
					Lice**	**Leaf:** The fresh leaf of the plant is collected and adds water and applies on animal skin.	Dermal
60.	*Mangifera indica* L. **Tree**	Anacardaceae	Maangoo	Home garden	Stomach ache**	**Leaf:** Dried leaf of powdered and mixed in water then given for the cattle.	Oral
61.	*Musa x paradisiaca* L. **Herb**	Musaceae	Muuzii	Home garden	Headache*	**Fruit:** Eating fresh fruits 1 to 2 when headache happen.	Oral
62.	*Melia azedarach* L.	Meliaceae	Nimii	Home garden	Toothache*	**Stem:** Fresh young stem is chewed and kept on the teeth.	Oral

	Tree				Anthrax**	**Bark:** The fine powder of dried bark is added to a glass of water and applied through the mouth twice.	Oral
63.	*Nicotiana tabacum* L. **Herb**	Solanaceae	Tomb oo	Home garden	Leech**	**Stem or leaf:** The fresh young stems and or leaf is ground, add salt then one glass of the mixture is given every morning for four days orally or through the nose.	Oral
					Epilepsy*	**Leaf:** Bath the patient with fresh leaf decoction of *Nicotiana tabacum* and *Ocimum lamii folium*, for five days.	Dermal
64.	*Ocimum basilicum* L. **Herb**	Lamiaceae	Basso biaa	Home garden	Flu*	**Leaf:** Fresh leaves together with root of *Aloe macrocarpa* concocted together and drink the solution.	Oral
65.	*Ocimum lamiifolium* Hochst. ex Benth. **Shrub**	Lamiaceae	Dama kese	Road side	Mich*	**Leaf:** Fresh leaf together with leaf of *Eucalyptus globules* is pounded, mixed with water and drunk.	Oral

66.	*Olea europaea* L. subsp.*cuspidata* *(*Wall. exG.Don) Cif. **Tree**	Oleaceae	Ejersa	Home garden	Itchy skin*	**Leaf:** Fresh leaf of *Olea europaea* is boiled in water and steam the vapour to the part.	Dermal
					Wound***	**Stem:** Partly dried stem is inserted into fire and the oily liquid produced from the stem is applied on the wound.	Dermal
					Gastritis*	**Stem**: A very small amount of the oily liquid produced from the dried stem is drunk after meal for four consecutive days.	Oral
67.	*Panicum hochstetteri* Steud. **Herb**	Poaceae	Margagogorrii	Agricultural field	Kidney problem*	**Leaf**: Fresh Leaves chewed and swallowed	Oral
68.	*Podocarpus falcatus* (Thunb.) R.B. ex. Mirb. **Tree**	Podocarpaceae	Birbirsa	Wild	Intestinal parasites*	**Bark**: Decoction of the dried fine powder of the bark, grounded garlic and honey are pasted and about two tea spoon is eaten at bed time for 2-4 days.	Oral
69.	*Phytolacca dodecandra* L. Herit. **Shrub**	Phytolaccaceae	Handoode	Live fence	Rabies***	**Root:** Fresh root of *Phytolacca dodecandra* is pounded, mixed with water, one arake glass of the solution is given for 7-10 day (for humans) for animals 15-20 for ten days.	Oral

					Malaria*	**Root:** Fresh root is grounded mixed with water and drunk in the morning for five consecutive days.	Oral
70.	*Plantago lanceolata* L. **Herb**	Plantagiaceae	Qorxoobii	Agricultural field	Mitch*	**Leaf:** Rub the body with the squeezed fresh leaves.	Dermal
71.	*Phoenix reclinata* Jacq. **Tree**	Arecaceae	Meexxi	Wild	Eye disease**.	**Leaf and stem:** Fresh or dried leaf and stem of *Phoenix reclinata* chewed together and spitted on cattle eye.	Dermal
72.	*Rhamnus prinoides* L. Herit. **Shrub**	Rhamnaceae	Geeshoo	Home garden	Leech**	**Leaf:** Fresh leaf together with *Nicotiana tabacum*, pepper is pounded mixed with water and goat butter, and then applied through the nose.	Nose
					Tonsillitis*	**Leaf:** Chew the fresh leaf and swallow twice a day for four days.	Oral
73.	*Ricinus communis* L. **Shrub**	Euphorbiaceae	Qobboo	Home garden	Tuberculosis sis(swelling)***	**Leaf:** The fresh leaf is warmed on fine and rubbed on the swelling.	Dermal
					Impotency*	**Seed:** The dried seeds are pounded, mixed with small quantity of latex from *Aloe* spp. And drunk two coffee cups before bed time for two days.	Oral

74.	*Rosmarinus officinalis* L. **Herb**	Lamiaceae	Urgoo ftuu	Home garden	Headache*	**Root:** Fresh root powder and drunk the solution when headache occur.	Oral
75.	*Ruta chalepensis* L. **Herb**	Rutaceae	Qinida abii	Home garden	Abdominal pain*	**Root:** Fresh root chewed and ingest the juice.	Oral
76.	*Rosa abyssinica* Lindley **Shrub**	Rosaceae	Goraa	Wild	Ascaris* .	**Leaf**: Fresh leaf is pounded, mixed with water a cup of the mixture is drunk once.	Oral
77.	*Rumex nervosus* Vahl. **Shrub**	Polygonaceae	Dhang aggoo	Wild	Wound ***	**Root**: Crushed fresh or dried root together with butter is placed on the wound.	Dermal
					Retained placenta**	**Leaf:** Grounding the fresh leaf and drinking one cup of the solution.	Oral
78.	*Senna italica* Mill. **Climber**	Fabaceae	Fitii	Wild	Cough*	**Leaf:** Fresh leaf infusion is inhaled or places the leaf in the nostrils again and again.	Nose
79.	*Solanum incanum* L. **Shrub**	Solanaceae	Hiddii	Home garden	Snake bite*	**Root:** Fresh root powder is drunk with coffee.	Oral
					Toothache*	**Root:** Fresh root is chewed and keep between the teeth.	Oral
80.	*Schinus molle* L. **Tree**	Anacardiaceae	Kundo berber e	Home garden	Wound on rectal area*	**Root:** Fresh root powder and fruit applied on the wound twice a day.	Dermal

81.	*Solanum tuberosum* L. **Herb**	Solanaceae	Dinnicha	Agricultural field	Loss of Appetite*	**Root**: Fresh root boiled and eaten.	Oral
82.	*Sacchharum officinarum* L. **Herb**	Poaceae	Shankora	Home garden	Common cold*	**Stem**: Fresh Steam put in fire and eaten when gets hot in order to get relief from common cold.	Oral
83.	*Snowdenia polystachya* (Fresen.) Pig. **Herb**	Poaceae	Muja	Home garden	Scabies**	**Root:** Fresh root boiled with root of *Carissa spinarium* and wash the animal.	Dermal
84.	*Stephania abyssinica* (Dillon& A.Rich.) **Climber**	Menispermaceae	Hiddahantuutaa	Wild	Rabies**	**Root**: Dry root of *Stephania abyssinica* will be powdered and backed with grain flour and given to cattle.	Oral
					Pasteurellosis**	**Root** and **leaf**: Dry root and leaf of *Stephania abyssinica* will be powdered together, mixed with water and given to the animal.	Oral
85.	*Toddalia* asiatica (L.) Lam. **Shrub**	Rutaceae	Haran gamaa	Wild	Evil eye*	**Bark:** The fresh or dried root is chewed and swallowed. Leaf is crushed and then the decoction is mixed with coffee and drunk. Fresh root is crushed and the infusion is taken, a cup of the solution once a day.	Dermal

86.	*Verbena officinalis* L. **Herb**	Verbenaceae	Dargu u	Wild	Tonsillitis*	**Root:** Fresh root is fumigated to the patient or fresh leaf is pounded, mixed with water and drunk.	Oral
					Mich*	**Root:** Dried root together with the root of *Verbena officinalis* and *Carissa spinarum* is fumigated to the patient.	Oral
					Diarrhea*	**Root:** Fresh root of this plant and bark of *Croton macrostachyus* is pounded mixed with water and then after a day is given.	Oral
87.	*Vernonia amygdalina* Del. **Shrub**	Asteraceae	Ibicha a	Home garden	Jaundice*	**Leaf:** Fresh leaf is pounded, mixed with water, filter and drunk.	Dermal
					Internal parasite**	**Leaf:** Fresh leaves chopped and added to local katukala and salt and will be given to the animal.	Oral
					Diarrhea*	**Leaf:** Fresh leaf is pounded together with coffee. Seeds, mixed with butter and eaten.	Oral
					Bloat**	**Leaf:** Fresh leaf Pounded, mixed with water and given orally	Oral

88.	*Vicia faba* L. **Herb**	Fabaceae	Baaqelaa	Agricultural fields	Stomach ache*	**Seed:** Dried or fresh Leaves decoction of this plant is drunk.	Oral
					Tapeworm*	**Seed:** Fresh seeds are soaked in water over night and eaten for five days.	Oral
89.	*Verbascum sinaiticum* Benth. **Herb**	Scrophulariaceae	Gurra Harree	Wild	Hemmoroids*	**Root/bark:** Fresh root are pounded, boiled in water, allow cooling and washing the affected part with it.	Dermal
					Nightmare**	**Root:** Dried root crashed, placed in a fire and fumigating.	Dermal

Key:-Animal disease******

Human disease*****

Animal and human disease*******

Appendix 2. Health problems treated by traditional medicinal plants in the study area.

English Name	Local Name (Afaan Oromoo)
Abdominal pain***	Dhukkubbii Garaa
Amoebisis*	Dhibee Ameebaa
Anthrax**	Abbaa Sangaa
Any swelling expecting tuber culosis***	Dhibee sombaa
Ascaris*	Magaa
Athletis foot*	Mimmi'oo
Back pain *	Waraansa
Black leg**	Abbaa gorbaa/Bishooftuu
Bleeding **	Dhiiguu
Bleeding/continuous flow of menstruation*	Garmalee dhiiguu
Bloat***	Bokoksuu
Colds*	Dhukkuba qorraa
Common cold*	Utaalloo
Constipation***	Garaan yoo goge
Cough*	Qakkee
Dandruff *	Daaraa mataa/Forofforrii
Diabetes*	Dhukkuba Sukkaaraa
Diarrhea***	Baasaa/Albaatii/Garaa kaasaa
Diffusecutaneous leshmaniasis*	Dhibee sinbiraa
Ear wound ***	Dhibee Gurraa
Eczema*	Chiffee
Epilepsy*	Gaggabdoo
Evil eye*	Budaa
Evil spirit*	Seexana/afuura jinni
Eye bruise**	Dhukkuba halluu ijaa jijjiiru
Eye disease*	Dhukkuba ijaa
Flu*	Dhukkuba argansuu

Gastritis*	Laphee gubaa
General malaise (Mich)*	Michii
Gonorrhea*	Cophxoo
Hemorrhage*	Dhiiguu
Headache*	Dhukkubbii mataa /bowwaa
Hemorrhoid*	Kormommuu
Hookworm*	Rammoo Hookkoo
Horse scabies **	Dhibee fardaa
Impotency*	Daddabinsa Saalaa
Internal parasite***	Maxxantoota Qaama keessaa
Intestinal parasite***	Rammoo Garaa
Itchy skin*	Dhibee dhaqna horii
Jaundice***	Simbirroo
Kidney problem *	Dhukkuba Kalee
Leech**	Hadhaandhula
Leprosy*	Qurcii
Lice***	Injiraan /cinii
Loss of appetite*	Nyaata Lagachuu
Malaria*	Busaa
Nightmare**	Dhukkuba abjuun Qajja'uu/iyyuu
Nose bleeding*	Funuuna
Poisoning*	Muraamuu/madaa'uu tasaa
Pasteurellosis**	Gororsiisuu
Rabies **	Dhukkuba Saree Maraattee
Retention of placenta***	Turuu Obbaatii/dilluu
Rheumatic pain*	Qurxummaata
Scabies**	Cittoo
Snake bite*	Hiddaa Bofaa
Stabbing*	Madaa'uu qaamaa
Stomachache***	Garaacha

Swelling**	Dhiita'uu
Syphilis*	Cophxoo
Taeniasis*	Robbii
Tapeworm*	Rammoo koosoo
Tick**	Silmii
Tonsillitis*	Huuba qoonqoo/ dhiitahuu
Toothache*	Dhukkuba Ilkaanii
Tuberculosis (swelling)***	Dhukkuba sombaa
Urine retention ***	Didiinsa fincaanii
Worm**	Raammolee
Wound***	Madaa

Key:-Animal disease**

Human disease*

Animal and human disease***

Appendix 3. Number of medicinal plant species in each family.

No.	Family	No. of genera	No. of plant species	Percentage of plant species (%)
1	Acanthaceae	2	2	2.24
2	Agavaceae	2	2	2.24
3	Alliaceae	1	2	2.24
4	Aloaceae	1	1	1.12
5	Anacardaceae	2	2	2.24
6	Apiaceae	1	1	1.12
7	Apocynaceae	1	1	1.12
8	Arecaceae	1	1	1.12
9	Asteraceae	6	6	6.74
10	Boraginaceae	2	3	3.37
11	Brassicaceae	1	1	1.12
12	Capparidaceae	1	1	1.12
13	Carricaceae	1	1	1.12
14	Celastraceae	2	2	2.24
15	Chenopodiaceae	1	1	1.24
16	Cucurbitaceae	2	2	2.24
17	Cuppressaceae	1	1	1.12
18	Ebenaceae	1	1	1.12
19	Euphorbiaceae	6	6	6.74
20	Fabaceae	6	6	6.74
21	Flacourtiaceae	1	1	1.12
22	Lamiaceae	2	3	3.37
23	Linaceae	1	1	1.12
24	Loganiaceae	1	1	1.12
25	Meliaceae	3	2	2.24
26	Menispermaceae	1	1	1.12
27	Moraceae	2	3	3.37
28	Musaceae	2	2	2.24

29	Myrtaceae	1	1	1.12
30	Oleaceae	1	1	1.12
31	Onagraceae	1	1	1.12
32	Phytolaccaceae	1	1	1.12
33	Plantagiaceae	1	1	1.12
34	Poaceae	3	5	5.6
35	Podocarpaceae	1	1	1.12
36	Polygonaceae	1	1	1.12
37	Ranunculaceae	1	1	1.12
38	Rhamnaceae	1	1	1.12
39	Rosaceae	1	1	1.12
40	Rubiaceae	1	1	1.12
41	Rutaceae	2	3	3.37
42	Sapindaceae	1	1	1.12
43	Scrophulariaceae	1	1	1.12
44	Solanaceae	4	6	6.74
45	Tiliaceae	1	1	1.12
46	Verbanaceae	3	3	3.37
47	Vitaceae	1	1	1.12
	Total	81	89	100

Appendix 5. Semi-structured interviews scheduled to be employed in the research area.

Name_____Sex: Male __ Female____Age:_____

Residence: Rural___ Urban___Keble___ Religion _____

Educational status: Elementary_____ High school ____Diploma____Degree____Religious Education ____Illiterate_____

Marital status: single___ Married____

Job _____

1. What are the most common diseases of humans in your area?
2. What are the most common diseases of animals in your area?
3. List plant species used to treat a given disease in your area?
4. List plants used to treat both human and livestock diseases?
5. Which plant do you use to treat that particular health problem/disease?
6. Morphological description of the plant(s)
7. For what other purposes do you use the medicinal plants? Beside its medicinal value

Scientific name	Local Name	Family Name	Hab	Habitat	RA.	Prep./ Ap/	Dosage	Disease tr.	Side effect	Other uses

8. How is the part(s) gathered? (Including the collected time)_____
9. Season/time of collection_____
10. Preferred maturity level_____
11. Any taboo/ restrictions in plant collections_____
12. Does the dose differ among men, women, children, and elders? _____
13. Any restrictions in taking remedies (pregnancy, age, etc.)?_____
14. Do you store the medicine? If yes, how and for how long_____
15. Are there conditions, which restrict taking of the medicine? _____
16. Are medicinal plants easily accessible? _____

17. How do you assess accessibility of medicinal plants when compared with the past decade?

18. Are there any beliefs linked with the utilization of medicinal plants in the study area? (Age, method, storage, time of collection, time of administration, condition like pregnancy)._____

19. Is the medicinal plant marketable? _____

20. How does modernization interfere with traditional medicine? _____

21. Are there economic groups who frequently use the medicinal plant? _____

22. How does the knowledge transfer take place from elders to younger? _____

23. What are the major threats to medicinal plants? As a group or individual species_____

24. How do you conserve medicinal plants? _____

Thank you!