MADDA WALABU UNIVERSITY
COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES
DEPARTMENT OF BIOLOGY

MEDICINAL PLANTS USED TO TREAT HUMAN AND LIVESTOCK DISEASES IN DODOLA DISTRICT, WEST ARSI ZONE, OROMIA REGIONAL STATE, ETHIOPIA

BY: KASO ADEM BERISO
ADVISOR: AYALEW SEBSIBE (ASST. PROF.)

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Medicinal Plants Used to Treat Human and Livestock Diseases in Dodola District, West Arsi Zone, Oromia Regional State, Ethiopia

A Thesis Submitted to Department of Biology, Madda Walabu University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Botanical Science

By

Kaso Adem Beriso

Advisor: Ayalew Sebsibe (Asst. Prof.)

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DEDICATION

I dedicated this thesis to my beloved wife, Asmu Hussein, my Sons Kanani and Kush Kaso and my brother Jemal Adem for their love and dedicated partnership support, especially for their prayer in my academic success and life.

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DECLARATION

First, I declare that this thesis entitled “Medicinal Plants Used to Treat Human and Livestock Diseases in Dodola District, West Arsi Zone, Oromia Regional State, Ethiopia” is my own and all sources used for this thesis have been duly acknowledged. This thesis has been submitted in practical fulfillment of the requirement for M.Sc. degree at the MaddaWalabu University and is deposited at 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.

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Department: Biology

Place: Madda Walabu University

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External Examiner name	Signature	Date
Dr.Birehanu Kebede	_____	_____
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LIST OF ABBREVIATIONS AND ACRONYMS

CSA	Central Statistical Agency
DDAO	Dodola District Agriculture Office
FAO	Food and Agricultural Organization
FGD	Focus group discussion
IBC	Institute of Biodiversity Conservation
IK	Indigenous Knowledge
IUCN	International Union for Conservation of Nature
MPs	Medicinal plants
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization

ABSTRACT

Medicininal plants have been used for the treatment of human and livestock ailments since ancient times.The study was conducted to investigate the medicinal plants used to treat human and livestock diseases in Dodola district, West Arsi Zone, Oromial Regional State, Ethiopia. Both quantitative and qualitative research methods were used. More specifically, cross sectional study design was used. The purposive sampling techniques wereused to select key informants, and simple random sampling techniques were used to select the general informants. Ten (10) kebeles were selected purposefully from 27 kebeles in the district. A total of 84 (60 males and 24 females) above the age of 20 were randomly selected through simple random sampling technique.Data were collected using semi structured interviews, field observations and focus group discussions.Data were analyzed using descriptive statistics frequency and percentage, preference ranking, paired comparison, direct matrix ranking, informant consensus, and informant consensus factor, fidelity level index and jaccard's coefficient of similarity. A total of 128 medicinal plants belonging to 114 genera and 56 families were documented. The Asteraceae family had the most species with 14 (10.9 %), followed by Solanaceae with 12 (9.39%). Of these 86 species were used for the treatment of human ailments, 24 species for both human and livestock ailments and 18 species were used to treat livestock ailments. Herbs were the most widely used plants, which were accounting for 56(43.75%) followed by shrubs50 (39.06%), trees 14 (10.93%), climbers8 (6.25%). The most frequently used plant part was the leaves accounted for 50 (39.06%) followed by root 21 (16.40%). The most widely used method of preparation was pounding 40 (31.25%). The most common route of medicine administration was ora l50 (39.06%).The most commonly used application of medicinal plant was drinking 50 (39.06%). There was high preference for Allium sativum in treating stomachache while paired comparison showed Croton macrostachys the most preferred species in treating febrile illense. Eucalyptus globulus was shown the most multipurpose use species while agricultural expansion was considered as major threat to plants in general and medicinal plants in particular. Hence, raising awarness is vital to save medicinal plants from further loss.

Keywords: Dodola district, Ethnobotany, Human and livestock diseases, Indigenous

1. INTRODUCTION

1.1. Background of the Study

People in different parts of the world depend on plant resources for their basic needs and are aware of many useful species occurring in their ecosystem. They have continuously developed their traditional knowledge of plant uses and plant resource management (Assefa *et al*., 2010). Medicinal plants are one part of the plant resources that have a potential capacity for treatment of various diseases. Plants are great source of medicines, especially in traditional medicine, which are useful in the treatment of various diseases (Bako *et al*., 2005) and used in the commercial production of drugs. Ethnobotany is a scientific field that focuses on the study of plants and their various uses within indigenous cultures.These uses encompass wide range of applications, including food, medicine, construction, fuel, clothing, and shelter (Khan *et al*., 2019). Due to the unavailability of modern health services, people in rural areas depend mainly on natural assets (Tali *et al.,* 2019). More than 80% of the global population depends on indigenous medicine for basic health care needs (Ibrar *et al.,* 2017; Rehman *et al*., 2023). Plants are fundamental components of many ecosystems on earth, forming the productive bases and physical structures that produce resources to support diversity of organisms. Many medicinal plant species have multiple uses, providing essential materials for human survival including food and building materials as well as supporting many ecological processes (Assefa *et al.* 2021; Kebede *et al*., 2017, Nigussie and Dong, 2019). Since the ancient period, medicinal plants have been widely used as medicine for a variety of diseases by people all over the world (Zatout *et al*., 2021). Medicinal herbs have long been used in both developing and developed countries (Kidane *et al*. 2018; Hu *et al*., 2020; Elfrida *et al*., 2021; Pathy *et al*., 2021).

According to the World Health Organization (WHO, 2019), herbal medications are utilized by roughly 80% of the world's population for health care systems particularly in rural regions (Hu *et al*., 2020), owing to the country's lack of modern health facilities. These traditional medicines have evolved into a source of low-cost primary healthcare (Aziz *et al*., 2018). According to the (WHO, 2019) around 21,000 plant species can potentially be used as medicinal plants. The role of medicinal plants in health care is significant in developing countries (Smith-Hall *et al,.* 2012; Sofowora *et al.,* 2013; Kassa

et al., 2020).In developed nations, during the COVID-19 pandemic, the demand for medicinal plants has increased. In a study conducted in several countries, increased consumption of ginger, garlic, onion, turmeric, and lemon as 'immune boosters' during the pandemic was reported (Pieroni, 2020; Vandebroek, 2020).

In Africa, more than 80% of the population uses traditional medicine for their health care practices (WHO, 2019).Traditional medicine is the major source of treatment for large portions of human populations in developing countries. Particularly in resource poor communities, local therapy using traditional medicine is the only means of treatment (Hailu Atnafu *et al.,* 2018). Medicinal plants play a vital role in the treatment of human and livestock ailments. Plant resources have remained an integral part of human society throughout history. After fulfilling the primary needs like food and shelter, man has sought for a suitable remedy among plants for curing various diseases (Jima and Megersa, 2018).

Ethiopia is the fifth major country in tropical Africa in terms of the diversity of flora, next to Tanzania, Cameroon, Congo, and South Africa (Jadán *et al.*, 2021). In the Flora of Ethiopia and Eritrea, about 6,027 vascular plant species (including subspecies), with about 10.74% endemism, will be documented (Ensermu Kelbesa and Sebsebe Demissew 2014). From the total vascular plants, 1,882 are common in both countries, while 3,875 have been recorded from Ethiopia and 270 from Eritrea only. Similarly, in the diversity of plant groups, angiosperms and dicotyledons were the most dominant, which estimated about 5,815 and 4,413 species (including subspecies), respectively.Hence it is necessary to enhance ethnomedicinal surveys to document and conserve this valuable traditional information to avoid its extinction (Khan *et al.,*2019). Even though a country with a great variety of cultures and diversity of medicinal plants, the alarming population growth with increasing demand and consumption is distracting medicinal plants resources from their natural habitat (Meaza *et al.*, 2015). Threats to medicinal plants in Ethiopia include human migration, agricultural expansion, forest fires, and drought (Kidane *et al.*, 2018; Tefera and Kim 2019).Thus, in this country, studies and research are much needed on conservation, management, cultivation, and ethnobotanical knowledge, including medicinal plant species (Asnake *et al.*, 2016; Kassa *et al.*, 2020).Despite the significant role of medicinal plants in treating both

human and livestock ailments in Ethiopia, a very limited attempt has been made to explore, document, and promote these widely used medicinal plants in the country (Assen *et al*., 2021). Hence, plant research and related indigenous knowledge should be an urgent task to protect and save the indigenous knowledge to transfer this knowledge to future generations. Many studies have been done in Ethiopia on ethnobotanical medicinal plants (Gijan and Dalle, 2019; Assefa *et al*. 2021; Ayalw and Merawi 2021; Abdella et al., 2022; Megersa et al., 2022; Megersa and Woldetsadik 2022; Nuru et al., 2024). However, little research has been done so far in the Dodola district.The objective of this study was to investigate and document the traditional medicinal plants used by local people for the treatment of human and livestock aliments, to record and document the current status of traditional knowledge and utilization of medicinal plants in Dodola District, West Arsi Zone of Oromia Regional State, and Ethiopia.

1.2. Statement of the Problem

Traditional medicine in Ethiopia faces a sustainability problem due to loss of taxa, loss of habitat, and loss of indigenous knowledge. Indigenous knowledge is unique knowledge held by a given culture or society that involves practices acquired over time, based on traditional practices (Negi *et al.,* 2021) although there is still a gap in the document and records on medicinal plants in the country.In Ethiopia, indigenous knowledge about traditional medicinal plants is transferred secretly from generation to generation orally. Due to this, there is a gap in the documentation of medicinal plants by the community in the country.Plant species reduced severely environmental degradation, modern education, overexploitation, loss of forests, fire; overgrazing, firewood collection, and urbanization appear to be the major threats to medicinal plants of Ethiopia (Megersa *et al.,* 2021).

However, study on medicinal plants is not enough when compared to the diverse vegetation and indigenous knowledge the country has. Compared to previous studies conducted in Ethiopia, the present study found a low and high number of medicinal plant species. For example, Timar et al. (2022) collected 10 plant species used by Dodola town to treat human diseases. On the other hand, Kassa et al. (2020) collected 266 plant species used by Sheka zone communities to treat human and livestock diseases. Teka et al. (2019) reported using 244 medicinal plants by Gurage

communities. In a similar study, Alemneh (2021) collected 112 medicinal plant species in the Yilmana Densa and Quarit districts of the Amhara region. Therefore, the three authors reported more medicinal plants than the present study. Whereas, Belayneh et al. (2012), and Assefa et al.(2021) reported 51 and 30 species of medicinal plants, respectively.The difference in the number of medicinal plants could be due to the vegetation of the district, the number of informants involved in the study, the timing and duration of data collection, and the culture.

Therefore, the present study was initiated to investigate and document medicinal plants used to treat human diseases only but this study to document medicinal plants used to treat human and livestock ailments in Dodola district, West Arsi Zone of Oromia Regional State, Ethiopia. In Oromia region, there is habitat and species loss due to continued deforestation and agricultural expansion, as well as loss of associated indigenous knowledge. The Dodola district is suffering from the loss of medicinal plants due to agricultural expansion, firewood collection, overgrazing, forage, charcoal, overuse of medicinal plants, and the expansion of other infrastructures in the study area. Furthermore, there is no data documentation on medicinal plants in Dodola district of west Arsi zone of Oromia regional state until now. Therefore, the main objective of this study was to document medicinal plants used to treat human and livestock diseases, and associated indigenous knowledge. More specifically, objectives of the study were to identify the main threats and conservation methods used by local communities and to identify plant parts used in preparation of traditional medicine by the community in the in Dodola district, West Arsi Zone of Oromia Regional State, Ethiopia.

1.3. Objectives of the Study

1.3.1. General objective

The general objective of this study was to document medicinal plants used to treat human and livestock diseases in the Dodola district, West Arsi Zone, Oromia Regional State, Ethiopia.

1.3.2. Specific objectives

The specific objectives of the study were the following.

1. To identify most preferred medicinal plants in the Dodola district.
2. To identify plant parts used to treat human and diseases in the Dodola district.

3. To document medicinal plant preparation methods and ways of administration in Dodola district.
4. To assess the main threats and conservation status of medicinal plants in the Dodola district.

1.4. Research Questions

1. What are the best preferred medicinal plants in the Dodola district?
2. Which parts of plant species are used for the treatment of human and diseases by local people in the study area?
3. How do the local community and traditional healers prepare and administer medicinal plants in the Dodola district?
4. What are the current status and the main threats and conservation practices of medicinal plants in the Dodola district?

1.5. Significance of the Study

The purpose of this study was to investigate the ethnobotanical study of medicinal plants used to treat human and livestock diseases in the Dodola district, west Arsi Zone of the Oromia Regional State, Ethiopia. The finding of this study was the first of its kind used by the local community as they get valuable information on medicinal plants and also helps people in the study area to be aware of problems associated with medicinal plants and to pay attention to the threatened species of medicinal plants. These findings was used to raise awareness to improve the knowledge of the local community about the importance, conservation and management of medicinal plants, primarily to consider the conservation of wild medicinal plants in situ to ensure their sustainable use. Furthermore, documentation of indigenous knowledge of medicinal plants can be part of the source of information for those who want to conduct further research on phytochemical and pharmacological studies in the future.

2. LITERATURE REVIEW

2.1. Concepts of Ethnobotany

The term ethnobotany was first coined by an American botanist John Harshburger in 1896, in an attempt to study the plants used by the primitive and aboriginal people. Since then, it has been defined as the traditional knowledge of indigenous communities about diversity of surrounding plants and how various people make use of indigenous plants found in their localities. When people started to select their food from nearby plants, they must have kept some of those, which they found to cure some of their ailments or which they thought would cure diseases (UNESCO, 2017).

Ethnobotany is a broad term referring to the study of direct interrelations between humans and plants (Martin, 1995; Balick and Cox, 1996). The indispensable dependency of human up on plants for their livelihood was primarily started by domestication and dates back10, 000 years (Martin, 1995).Ethnobotany is the study of peoples interactions with natural invironment ;ho they classify,manage and use plants available around them(Getaneh, 2019; Alemneh.,2015).Most available literatures indicate that ethnobotanical studies on medicinal plants are carried out in south, southwest, central, north and north west while studies in eastern part is scanty (Anteneh *et al*. 2012).

Indigenous knownledge refers to the knowledge, rules, standards, skills and mental sets generated by and keptin custodyof local people in a particularArea and it is the result of many generations and trial and error experiments (Ensermu Kelbessa 2015).The relationship between plants and people is studied in Ethnobotany, a field focusing on the studyoftheindigenous knowledge on how plants are perceived, used and managed (Ensermu Kelbessa 2015). Africa is a continent greatly endowed with an abundance of medicinal plants, which indigenous people are familiar with and have used over time (Getachew Alebie and Abas Mehamed, 2016). Around 80% of African population uses traditional medicinal plants for the treatment of various diseases, and ethnobotanical surveys have shown that traditional medicines have been deemed effective against those diseases, which are a great concern to most of the sub-Saharan African nations (WHO, 2002). African traditional medicine is the oldest, and perhaps the most assorted, of all therapeutic systems. Africa is considered to be the cradle of mankind with a rich biological and cultural diversity marked by regional differences in healing practices

(Gurib-Fakim, and Mahomoodally, 2013).

Traditional medicine is dominant in the African health care system. This can be attributed to major factors. The first one is inadequate access to allopathic medicines and western forms of treatments, whereby the majority of people in Africa cannot afford access to modern medical care either because it is too costly or because there are no medical service providers. Second, there is a lack of effective modern medical treatment for some ailments such as malaria and/or HIV/AIDS, which, although global in distribution, disproportionately affect Africa more than other areas in the world (Mahomoodally, 2013).

Medicinal plants are the most commonly practiced traditional medicine in Africa. Medicinal plants are easily accessible health resource to the community in many parts of Africa. In fact, Africa has enormous biodiversity resources and it is estimated to contain between 40 and 45,000 species of plant with a potential for development and out of which 5,000 species are used medicinally. This is due to Africa is located within the tropical and subtropical climate (Manach *et al*. 2004).

Ethiopia is among the countries which have high indigenous knowledge accumulation.The traditional societies in Ethiopia have good plant use and management knowledge, which willhave valuable contribution to conservation activities in the country.This knowledge is still underutilized resource in the development process of Ethiopia. But, Indigenous knowledge of medicinal plants in Ethiopia is unevenly distributed among community members (Zemede Asfaw, 2001). Thus, a great effort is needed to understand and disseminate this knowledge via ethnobotanical studies (Tilahun Teklehaymanot and Mirutse Giday, 2007).

2.2. Medicinal Plants

Medicinal plants are an important source of traditional medication used to treat various ailments. Due to the unavailability of modern health services, people in rural areas depend mainly on natural assets (Tali *et al.* 2019). More than 80% of the global population depends on indigenous medicine for basic health care needs (Ibrar *et al.* 2017; Msomi and Simelane 2017; Rehman *et al.* 2023). But currently, indigenous knowledge is facing rigorous threats due to modernization in rural communities and changing lifestyles (Shinwari and Gilani 2023).

Medicinal plants are essential sources of indigenous medication and are used to cure different diseases without having any side effects (Singh *et al*. 2018). Medicinal plants are very important to offer the people with traditional medicines, which are used to treat various human and livestock diseases. Medicinal plants may be defined as those plants that are commonly used in treating and preventing specific ailments and diseases and that are generally considered to be harmful to humans. These plants are either “wild plat species “those growing spontaneously in selfmaintaining population in natural or semi natural ecosystems and could exist independently of direct human actions or the contracting “Domesticated plants species “those that have arisen through human actions such as selection or breeding and depend on management for their existence herbal medicines proved to be the major remedy in traditional system of medicine. They have been used extensively in medical practices since ancient times. (Oladeji O, 2016). Ethiopia is one of the six rich regions in plant biodiversity in the world due to various types of climatic, topographic, and soil characteristics (Talia et al., 2019), Approximately 80% of the world’s population, especially millions of people in the vast rural areas of developing countries, uses plant-derived drugs for primary healthcare needs (Tadesse et al., 2018).

2.3. Medicinal Plants and Traditional Medicine in Ethiopia

The oldest written record of the use of medicinal plants for the preparation of medicines was identified on a Sumerian clay slab from Nagpur, about 5000 years old. It consisted of 12 recipes for the preparation of medicines relating to over 250 different plants, some of them alkaloids, such as poppy, henbane and mandrake (Petrovska, 2012).The Chinese Root and Grass Book "Pen T'Sao," written by Emperor Shen Nung about 2500 BC, describes 365 medicines (dried sections of medicinal plants),many of which are still used today, such as Rhei rhisoma, camphor, Theae folium, Podophyllum, the great yellow gentian, ginseng, jimsonweed weed, cinnamon bark, and ephedra (Petrovska, 2012).The Ebers Papyrus, written circa 1550 BC, represents a collection of 800 proscriptions referring to 700 plant species and drugs used for therapy such as pomegranate, castor oil plant, aloe, senna, garlic, onion, fig, willow, coriander, juniper, common centaury, etc (Petrovska, 2012).

It is estimated that there are between 750,000 and 1,000,000 plant species on the world.

The 500,000 of them have been identified and named. Around 2000 new flowering plant species are identified and named in each year.The number of plants which have been used for treatment since ancient time's shows a steady increase. According to a report released by the WHO, the number of plants used for treatment is estimated to be around 20,000. The studies on medicinal plants and active substances derived from them have increased the interest in these plants in recent years (Keskin, 2018).

Traditional medicine is defined as indigenous medicine that is used to maintain health and to prevent, diagnose, and treat physical and mental illnesses differently from allopathic medicine based on theories, beliefs, and experiences (WHO, 2012). Indigenous knowledge of medicinal plants has made, and can still make, a significant contribution to resolving local problems such as human and livestock diseases. Furthermore, indigenous knowledge contributes to science in many fields related to plant-based use for developing modern medicine. However, due to rapid changes in the way of life, low awareness of the importance of indigenous knowledge, lack of written documentation, the disappearance of indigenous practices, and loss of biological species, indigenous knowledge is threatened (Langton and Rhea 2005; Megersa *et al*. 2013).

Trends in the use of traditional and complementary medicine are increasing in many developed and developing countries. According traditional remedies are the most important and sometimes the only source of therapeutics for nearly 80% of the worldwide population. For instance, about 85% of world population uses herbal medicines for prevention and treatment of diseases and the demand is increasing in developed and developing countries (Kelbesa 2015).The Ethiopian people use traditional medicine over the past period and categorize plant species indigenously. However, indigenous knowledge about traditional medicinal plants is transferred secretly from generation to generation orally in developing countries like Ethiopia. Therefore, there were many misconceptions on the efficacy of medicinal plants because of lack of interest of modern society and way of knowledge transfer by elders. It the main sources for a large majority of people in Ethiopia, about 80% of the human population depend on traditional medicines treating health problems (Abebe et al., 2022).

Ethiopia contributes to a rich biodiversity and it is believed to be home for about 6027species of higher plants with approximately 10% endemism (Ensermu Kelbessa and Sebsebe Demessiew 2014). Medicinal plants species are also part of those many plant species of the country. Like all other parts of the world, plants are used as a source of medicine. Although a significant number of people in Ethiopian societies use traditional medicinal plants for their primary health care, it is not easy to get traditional medicinal knowledge of the healers as they claim that the knowledge is their own and wanted to transfer their knowledge only to a person they want to pass to, mostly to the eldest son. Ethiopia is also a country with many languages, beliefs and highly diversified culture.

2.4. Traditional medicinal plants in Human and Livestock Ailments

2.4.1. Traditional Medicinal plants in human health care system

In Africa, up to 80% of the population relies on medicinal plants for their primary healthcare (WHO, 2002).The dependence of the population on traditional medicine is linked with poverty, the inadequacy of health services and a shortage of drugs. The locals of Ethiopia use traditional medicinal plants to relieve many diseases. Almost 80% of the Ethiopian population uses traditional remedies, in which approximately 95% of the preparations are of plant origin (Behilu Aseffa *et al*. 2021). About 80% of Ethiopians rely on traditional medicine to meet their health care needs (Girma Zenebe *et al*. 2012). The wide-spread use of traditional medicine could be attributed to cultural acceptability, perceived efficacy against certain types of diseases, physical accessibility, and affordability compared to modern medicine (Girma Zenebe *et al.* 2012).

2.4.2. Traditional Medicinal plants in Livestock Health care system

Medicinal plants played a pivotal role in the treatment of various problems in Ethiopia (Fekadu, 2007).The use of ethno-veterinary medicine to control livestock diseases has been cited by the World Health Organization (2019), who estimated that 80% of people in developing countries depend on traditional medicine to treat livestock diseases. In the 19th century, medicinal plants have gained importance in the management of animal health care in African countries and led to the discovery of some effective ethnoveterinary products. In developing countries, traditional medicines are considered inexpensive, safe and readily available to resource-limited farmers (Mthi, 2018).

Millions of people around the world have an intimate relationship with their livestock. Many people depend on their livestock: animals provide them with food, clothing, labor, fertilizers and cash, and act as a store of wealth and a medium of exchange. Animals are a vital part of culture and in many societies are regarded as equal to humans. To keep animals healthy, traditional healing practices have been applied for centuries and have been passed down orally from generation to generation (Raikwar and Maurya, 2015). Ethnoveterinary alternatives are an option for small-scale livestock farmers who cannot use allopathic drugs or for those larger conventional farmers whose economic circumstances prevent the use of veterinary services for minor livestock health problems. It comprises traditional surgical and manipulative techniques, traditional immunization, magicoreligious practices and beliefs, management practices, and the use of herbal remedies to prevent and treat a range of disease problems encountered by livestock holders (Tena Regassa, 2016).

2.5. Threats and Conservation of Medicinal Plants

2.5.1. Threats to medicinal plants

According to Ensermu kelbessa *et al.(*2013)*,* medicinal plants of Ethiopia as elsewhere in Africa were highly threatened. Now day's herbal practioners have to walk far distances for the collections of herbs. This is because of availability of plants in general and medicinal plants in particular have been affected by dramatic decrease in areas of native vegetation. Zemede Asfaw (2001) made note that medicinal plants are at conservation risk due to over use and destractive harvesting like root collection.As a general, overgrazing, drought, firewood collection, charcoal production, urbanization, agricultural expansion and constractions are the major threated factors to medicinal plants and all vegetations (Giday, *et al.* 2003).

2.5.2. Conservation of medicinal plants

Conservation of medicinal plants refers to the use of medicinal plants in a sustainable way and when necessary conserving those species which are critically endangered. According to Demissie (2001), conservation should be aimed at conserving maximum diversity within each species to make available for future generation. Conservation is an act of careful preservation and protection of natural resources or habitats of medicinal plants, especially through planned management. It will keep an eye on their rational and

legal collection and maintain their biodiversity in the wild (Santosh et al., 2020).

Increasing demand for medicinal plants leads to irrational deforestation of the forests, leading to their depletion in the wild.Medicinal plants are considered to be at conservation risk due to over use and destructive harvesting like take roots and barks collection (Nciki, 2015).This type of conservation of medicinal plants can also be possible in home gardens, as the home garden is strategic and ideal farming system for the conservation, production and enhancement of medicinal plants (Nigussie Amsalu *et al.,* 2018). According to Kindie *et al. (*2021), in situ and ex situ conservations is conservation methods that have been carried out around the world aimed at protecting threatened medicinal plants from further destruction. The issue of medicinal plant conservation in Ethiopia today calls for study and documentation before the accelerated ecological and cultural transformation distorts physical entities and the associated knowledge (Kindie *et al.,* 2021).

Local people of Ethiopia use traditional medicinal plants to get relief from numerous diseases. Nearly 80% of the Ethiopian population use traditional remedies, of which about 95% of the preparations are of plant origin (Abebe et al. 2001). To assess the medicinal values of these plants, various ethnobotanical studies have been conducted in Ethiopia. Most of the studies were carried out in the Oromia, South Nation and Nationalities of Peoples (SNNP), and Amhara regions (Alebie et al. 2017; Muluye and Ayicheh 2020). However, the reported medicinal plants are still minimal compared with Ethiopia's multicultural and floral diversity (Bekele and Reddy 2015; Chekole 2017). The ethnomedicinal knowledge varies even in the same ethnic group as various authors reported different medicinal plants and use. For instance, in the Oromo ethnic group of Ethiopia, other research groups said diverse use of medicinal plants to cure their ailments. Among the studies on medicinal plants used for human diseases treatment in the Oromia region include; Lulekal et al. (2008) in Mana Angetu district, Demie et al. (2018) in Dirre Sheik Hussen, Jima and Megersa (2018), Barbare district.

3. MATERIALS AND METHODS

3.1. Description of the Study Area

3.1.1. Geographical location

The Dodola district is the capital town of the district, located about 320 km from the southeast of Addis Ababa, the capital city of the country and 75 km from the southeast of Shashemene, the capital of the West Arsi Zone. It is located at 06°59' N and 39°11' E, with an altitude range of 2362–2493 meter above sea level and area of 1432.46km^2(DDADO, 2023). Dodola district is bordered on the south by Nensebo, on the west by Kokosa, on the north by the Shebelle River which separates it from the Kofale and Gedeb Hasasa, and on the east by Adaba other towns include Herero, Edo, Serofta, and Negelle metama (Figure 1).The city of Dodola is the administrative center of the Dodola district (DDADO, 2023).

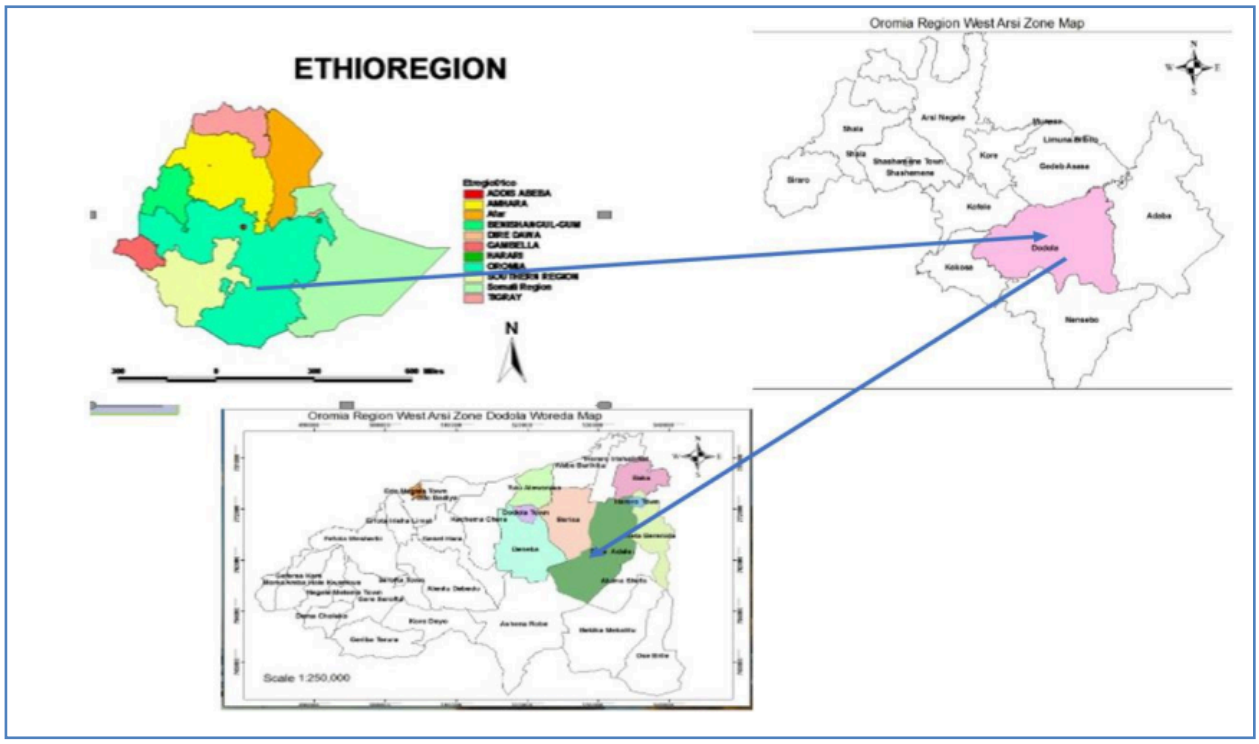


Figure: 1 Map of Dodola District, West Arsi Zone, Oromia Regional State, Ethiopia.

3.1.2. Topography of the study area

According to Dodola District Agricultural Office (DDAO, 2023), the altitude of the study area ranges from 2362-2493 meter above sea level and area of 1432.46km^2(DDADO, 2023). The District has various topographic features. About 45, 683.29000ha (62%) of the land area is plain, 25, 102.900 ha (17%) hilly, and mountains and Clifts account for 20,055.0012 ha (13%) and 2,525.390 ha (8%) respectively.The mountain ranges which form the water shade for Wabe Shebele River, basis as consists number of well-known peaks which includes, mountain Ilale (3655 m) mountain Korduro (3625 m), and mountain Somkeru (3753 m).The most majority of the district rivers drained to Wabe Shebele Rivers basin. Unlike the rivers of neighboring district the over whelming rivers of the district contributed for the irrigation purpose, river Keresa,Ukuma,Negeso,Meribo and Gudeye(Dodola district Agriocultural office, 2023).

3.1.3. Soils type of the study area

The major soil types are clay loom, covering about 17371.68 ha (60%), sandy soil that stretches over an area of 10133.49 (35%) and clay constitutes 1447.64 ha (5%). The latter two soil types are suitable for agriculture including for cultivation of cereal crops including maize (*Zea mays*), sorghum (*Sorghum bicolor*) and 'teff' (*Eragrostis tef*) (Dodola district Agricultural Office, 2022).

3.1.4. Vegetation of the study area

The vegetation of the study area consists of varies shrubs, trees and herbaceous species. Some common plant species in the district are *Eucalyptus globulus, Juniperus procera, Ficus spp, Olea europea spp, Podocarpus falcatus, Acacia abyssinica, Cordia africana, Croton macrostachyus, Calpurnia aurea, Vernonia spp* and *Hagenia abyssinica* (DDAO, 2023).The vegetation of the study area mainly falls in to the Dryevergreen afromontane forest (1600-3300 m) and the subafroalpine (3200-3500 m) vegetation type (Amente, 2006).The forest formation changes along the altitudinal gradient. At the altitude between 2,850-3,000 m a.s.l., *Juniperus procera* is dominant in association with few *Podocarpus falcatus*. At the upper zone between 3,000-3,400 m a.s.l., *Hagenia abyssinica, Hypericumrevolutum* and *Erica arborea* dominate the forest, sometimes mixed with *Juniperus procera*. *Erica arborea* occurs as a shrub at its upper most

distribution (Obsa, 2009).

3.1.5. Climate condition of the study area

The climate of the district is characterized as highland and midland. According to DDAO (2023), the district is divided into two major agronomic zones: highland (*Baddaa*, 95%) and midland (*Baddaa daree*, 5%). Based on the metrological data recorded at Adaba station for 26 years (1996–2022), the rainfall distribution of the district is bimodial. The major rainy season is locally called *'Ganna'* and it extends from May to August with the highest peak in June and August. The highest average monthly rainfall was recorded in June (4,026. mm) and the lowest in January (99.9 mm), with the hottest months from March to October.The maximum mean temperature was recorded in February and March (31.1°C) and the coldest months of the year stretch from November to January, the lowest temperature having been recorded in December and January (11.2°C). In general, the mean annual temperature and mean annual rainfall of the District are 18.8°C and 2,067 mm, respectively (Figure 2).

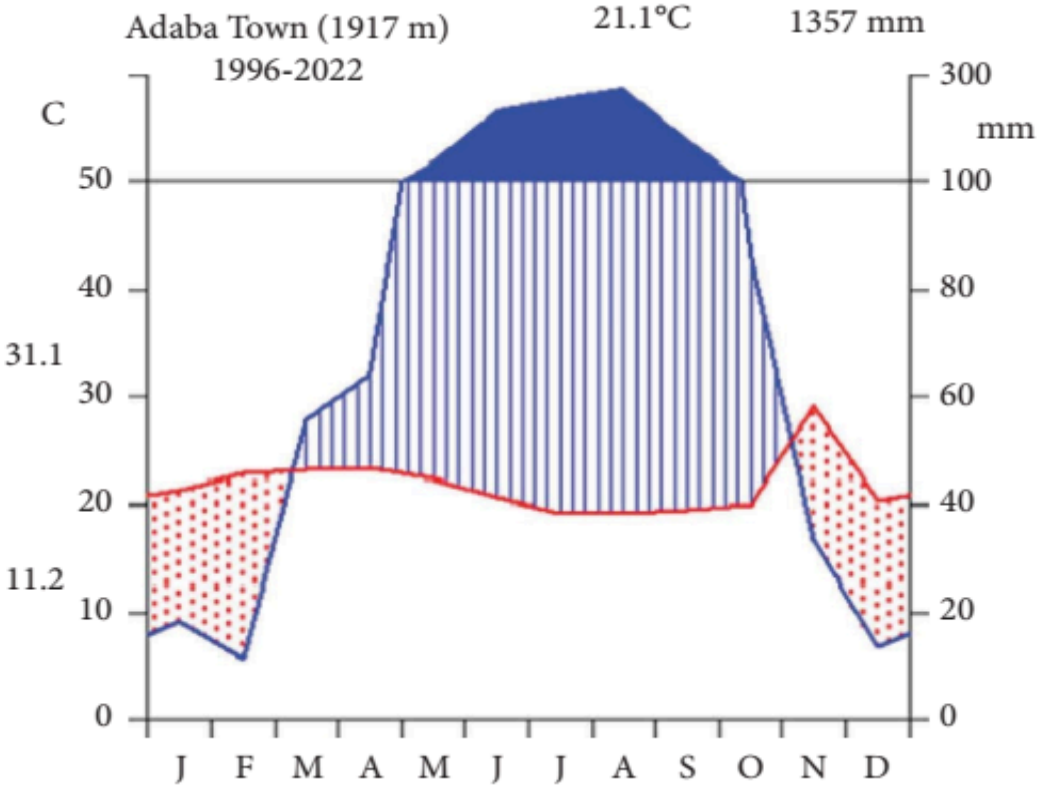


Figure 2 Climadiagram of the study area from (1996–2022) at Adaba Station, West Arsi Zone. (Data source: National Meteorological Service Agency).

3.1.6. Population and socio-economic conditions of the study area

The populations of the Dodola district in 2023 projected to be 301,403 according to the Central Statistical Agency (CSA 2023),with 147,565 (48.9%) are male and 153,838 (51.1%) are female, The urban population of 34,151(17.62%) is one of the largest in the zone. The largest ethnic group reported in Oromo was the Oromo (98.6%); all other ethnic groups made up 1.4% of the population. Afan Oromo was the dominant first language, spoken by 99% of the inhabitants; the remaining 1% spoke all other primary languages (Dodola district Agricultural and Rural development office, 2023). Agriculture in the district is predominantly smallholder, mixed subsistence farming. The cropping system is mainly based on continuous cropping without fallow periods (DDARDO 2023). In Dodola District, mixed farming with livestock is widely practiced. Wheat, barley Maize and sorghum are mainly grown in the area. Teff is also grown as an additional crop. Cultivation of Enset (*Ensete ventricosum*) is central to the cropping system on which the entire agricultural system is based, and the crop is the main source of food security and livelihoods (Olango et al. 2014).

3.1.7. Livestock population

In study areas, livestock is substantial contribution to the rural economy and most of rural farming system transport and source of income directly and indirectly. Livestock population is relatively high in Dodola district. However, their productivity is very low as in most places in the country. Their performance (milk, meat, egg, honey production) and contribution to the regional and national economy is very low mainly due to poor management, low genetic potential due to inbreeding, inadequate and low quality feed supply, and the prevalence of various animal diseases.The livestock population of the district is estimated to be 210,549 cattle, 78,957 sheep, 58734 goats, 30,321 equines, 51,057 poultry, and bee hives 19,519 Annual Report of the Dodola District Agricultural and Rural Development Office (DDARDO, 2023).

3.1.8. Medicinal and Educational service

The human health resource improvement through public action of health, nutrition and education are a precondition for accelerating of growth. The ten most common diseases in the district are pneumonia, stomachache, diarrhea, tonsillitis, gastritis,

typhoid, Urinary Tract Infections (UTI), acute febrile illness, STDs, skin infections, intestinal parasites, helminths and eye diseases (DDHO 2023).These diseases mostly affect people living in the rural areas where the health services are scanty and do not satisfy their needs; as well they are unable to afford the high cost of modern drugs (DDHO, 2023).

The most important animal diseases in Dodola district include bacterial infections (black leg, pasteurellosis, anthrax, mastitis, fowl typhoid, avian salmonellosis), endoparasites (fascioliasis, paramphistomiasis, strongyloidiasis), ectoparasites (ticks, mites, lice, and insect flies), viral infections (rabies, African horse sickness, and foot and mouth diseases), and protozoal infections (trypanosomiasis, babesiasis, and coccidiosis) (DDHO, 2023).Regarding education service, the district has six nongovernmental kindergarten schools in the district.The district also has 52 first-cycle elementary schools (1–6), 24 second-cycle elementary schools (7–8), 5 secondary schools (9–12) (DDEO, 2023).

3.1.9. Land use drainage pattern

The district occupies a total of 145, 246 hector land with 301,403 people living there. It contains 23 rural and four urban kebeles.According to the information obtained from Dodola district Agricultural and Rural development office and Zonal planning and Economic Development office, the district covers a total area of 145, 246 hectares of which the largest, that is 68,662 ha (63.80%) is agricultural land followed by house and road converge land 10,583 ha (13.87 %) (DDAO: 2023).However, the district is potential rich particularly for farming practice its `agroclimatic condition (dominates by cool (alpine) 95% and Badda dare (sub-tropical 5%). This makes the district suitable for cereals crops such as Linseed, Wheat, Barley and Field peas. Among these cereals wheat covers the largest portion of cultivated land.

3.2. Study Site Selection

A reconnaissance survey of the study area was carried out from 20 to 30 January 203 to obtain information on the area's agroecology, vegetation condition, and indigenous knowledge on using plants for various purposes. A reconnaissance survey of the study area was carried out first to identify the study kebeles in the district. In addition; the study kebeles was selected based on the prior information gathered from community

leaders, knowledgeable elders, and health workers, in the district. Furthermore, the availability of many medicinal plants and traditional medicinal practitioners present was other criteria for the selection study kebeles.

Accordingly, Ten (10) Kebeles was selected purposively for ethnobotanical data collection of medicinal plants from 27 kebeles of the district. The study was conducted in ten kebeles of Dodola District, West Arsi Zone, and Southern Ethiopia. The kebeles selected for the study were Deneba, Berisa, Tulu Alawenso, Wabe Burkitu, Bura Adelle, Geneta, Barenda, Kechema Chere, Heraro and Aluma for ethnobotanical data collections (Figure1).The ten kebeles were purposively selected because of their relatively high plant diversity in the district, the practice of traditional medicine, and the recommendations of the district elders and local authorities. In addition, the two agro-climatic zones were also considered in the selection of the study sites. The district was stratified into two agroecological zones, i.e., highland and midland altitude, and followed by both purposive and random sampling techniques to select the kebeles and households from each stratum, respectively. These study sites were selected based on the presence/absence of traditional medicinal practitioners and recommendations of knowledgeable elders, kebele administrators, and health workers. Also, other infrastructures such as roads and transportation facilities and agroclimatic zones of the district were considered to select the study kebeles.

3.3. Informant selection

The informants were identified with the help of kebele leaders, religious leaders and knowledgeable elders. Accordingly, both key informants and general informants were selected from each study kebeles. KIs were selected based on comments and recommendations from religious leaders and elders.

3.4. Source of population

Ethnobotanical data were collected using both primary and secondary sources. Primary source of information were obtained from the field study and informants in the study area whereas secondary sources of information were obtained from governmental offices like health offices anddistrict Agricultural Office information from previously conducted research and published literature.The population source was the religious leaders, elders and users of the traditionally used medicinal plants for the treatment of

human and animals and herbalists from ten kebeles of Dodola district.

3.5. Sample size determination and sampling techniques

A total of 84 informants (60 men and 24 women) were selected with age range between 20-61 years including 20 key informants (16 men and 4 women) who are healers, elders and knowledgeable persons from the total 10 sampled kebeles. Women were less in number than men because information transfers from father to their elder son and males were moving outside the house.Key informants were selected by purposive random sampling based on the suggestion and comments of elders, farmers, local traditional healer association, local administrators, students, religious leaders and researcher's observation from the community group.and other informants were selected randomly from the local people of the study area.

3.6. Research Design

A cross-sectional study design was used to address all basic research in the study. This method is appropriate to describe emerging phenomena with the aim of justifying current condition and practice. Consequently, a qualitative and quantitative study was conducted using key informant discussions to evaluate the traditional treatment methods for human and livestock diseases from December 2023 to June 2024. Purposive sampling was used to select key informants, and a random sampling technique was used to select the general informants.

3.7. Methods of Data Collection

Ethnobotanical data were collected from December 22, 2023 to April 10, 2024. Qualitative and quantitative ethnobotanical data were collected from informants using a pre-prepared semi-structured interview method to Martin (1995) and Cotton (1996). Focus group discussion, field observation, and guided field walk were also applied. Ethnobotanical data collection sheet was prepared in English and translated to Afan Oromo language ahead of time to be used during ethnobotanical information retrieval from informants. Information was carefully recorded during an interview with an informant including local names of the medicinal plants, habitat of the plant, disease the plant treats, parts used, methods of remedy of preparation, ingredients added, dosage prescriptions, and routes of administration to Martin (1995) and Cotton (1996). Before data collection, written permission was obtained from the culture and tourism office of

the district as well as permission from the local administration of each selected kebele. Following this, the purpose of the study was briefly explained to each informant and prior verbal consent was obtained.

3.7.1. Semi structured interview

Semi-structured interviews were employed by informants to obtain indigenous knowledge of the local community about the health and vegetation of the locality. Based on Martin (1995), semi-structured interviews were prepared. Semi-structured interviews were carried out based on a checklist of questions prepared in English and translated into “Afan Oromo” the language of local people. During the interview, questions regarding name, age, sex, level of education, occupation, religion, and ethnicity of the informants were included. Moreover, informants were asked about the local name of the medicinal plants used, human and livestock diseases treated, plant parts used, condition of plant parts used (fresh or dried), other ingredients or additives if any, methods of remedy preparation, source of knowledge, methods of traditional knowledge transfer, and number of years of services as traditional healers were focused in detail.

3.7.2. Focus group discussions

Focus group discussions were conducted to gather further information on medicinal plant knowledge at the community level, ways of transferring their knowledge, major threats on medicinal plants, and indigenous conservation practices. Focus group discussions were taken place in each study kebeles prior to important collection of medicinal plants with 5-7 informants in order to understand the traditional medicinal system of the study site. At the time of discussion, medicinal plant knowledge gathered from all informants were recorded carefully using photo camera mobile-based records that were used in the data analyses and interpretation. Before collecting the data, written permission from the office of the district and permission from the kebele administrators was given before entering any kebele.

3.7.3. Field observation

Field observations were also carried out in areas where most medicinal plants are grown or cultivated.This method was used to obtain actual information from informants about identification (local names, habit, and habitat of species), distribution,

conservation status, and threats of medicinal plants.Several field observations were made during the feasibility study with the informants. Field observations with informants help to collect all relevant data including the vernacular (local) name of plants, the part used, the preparation methods and mode of administration, and disease condition treated as well as the strategies they used for the conservation of medicinal plants and the preservation of indigenous knowledge on medicinal plants.

3.7.4. Guided field walk

The method of guided field walk with the help of local guides from each study site was applied to make notes on the habit, habitat, morphological features, and association of the medicinal plants with other species. Moreover, it allowed seeing, smelling, and tasting the medicinal plants under investigation to understand the unique features of the species. The local field guides also played a crucial role in identifying the medicinal plants found in the field by proving their vernacular names.

3.7.5. Market survey

Market survey was done on two markets in order to see medicinal plants in trade based on Martin (1995).Two markets were encountered in the study area.During the study, a market survey was conducted to distinguish and record the type of herbal drugs sold on the local market. Two local markets in the study area Dodola town and Edo town were visited.The markets were chosen for the study. In order to record the names of medicinal plants, prices, and other aspects of herbal medicines sold in the local markets of the study area, market surveys were conducted. Semi-structured interviews were conduct with drug sellers or healers to assess the varsities and amounts of plant materials and to determine the value or income generated from such practices.

3.7.6. Medicinal plant collection and identification

All plant species mentioned by the informants was collected based on the information provided by informants.The reported MPs were collected from natural vegetation during the field walks. Primary identification was carried out in the field. Identification of the unidentified specimen was done according to the botanical taxonomic key. Different volumes of Ethiopian and Eritrea flora and field guide manuals were used to identify species in the field. The samples of plants species were collected, pressed, dried and brought to Madda Walabu University for initial identification.

Moreover, it also recorded the local names of the plant species to aid the identification using Flora of Ethiopia and Eritrea. The identification was done mainly referring to Flora of Ethiopia and Eritrea (BekeleTesemma 2007; Edwards *et al.* 1995; 1997; 2000; Fichtl and Admasu 1994; Hedberg and Edwards 1989, 1995; Hedberg *et al.* 2004, 2006) was also used in the identification of the collected specimens and comparison with the already identified specimen used in a mini store of Madda Walabu University. In addition, vouchers for the identified medicinal plants specimens were stored in the Madda Walabu University mini store.The identification was further refined and then cross-checked for taxonomic updates by referring to the website Plants of the World Online (POWO) and International Plant Index (IPI). Finally, all the identified specimens were collected, processed, and stored in the mini store of Madda Walabu University.

3.8. Methods of Data Analysis

Ethnobotanical data were analyzed using descriptive statistics through Microsoft Excel spreadsheet software version 2016 following Cotton (1996) and Martin (1995). Ethnobotanical data were collected through interviews and FGDs were analyzed through descriptive statistics such as frequency and percentages using Excel spread sheets. The results are presented in tables and figures. In addition, Informant consensus, informant consensus factor, preference ranking, paired comparison, direct matrix ranking, index of fidelity level and Jaccard similarity coefficient were employed to analyze ethnobotanical data.

3.8.1. Descriptive statistics

Descriptive statistical methods such as percentage and frequency were employed to analyze and summarize the data on medicinal plants and associated knowledge Martin (1995).The most useful information gathered on medicinal plants reported by local people; medicinal value, condition of preparation, application, methods of preparation, route of administration, diseases treated, dosage, plant parts used, growth forms, and threatening factors were analyzed through descriptive statistics. Then, the results were presented with table and picure.

3.8.2. Preference ranking

Preference ranking was conducted following the recommendation byMartin’s (1995) and Cotton (1996) for the most preferred medicinal plants used to treat stomachache.

Preference ranking was conducted for five important medicinal plants to treat stomachache.The ten key informants were participated in this exercise to identify the best preferred medicinal plants for the treatment of the stomachache following Martin's (1995) procedures.The highest value was given to the medicinal plant thought to be the most effective in treating the stomachache (5), while the lowest was given to the least effective plant (1).The value of each species was summed up and the rank was calculated for each species based on the total ranking.

3.8.3. Paired comparison

Paired comparisons to indicate the efficacy and popularity of medicinal plant species used to treat febrile illness were employed as described by Martin (1995). A list of the pairs of selected items with all possible combinations was presented to the selected informant and their responses were recorded and total value was summarized.Then umbers of pairs are calculated by the formula, $n(n\text{-}1)/2$, where n is the number of items. An item with highest frequency of choices has the highest score.The total numbers of possible pairs Martin (1995) were obtained by applying the formula: Where,n is the number of medicinal plants being compared.Total ranks of paired comparison were obtained by summing the number of times each item was chosen. An item with the highest frequency of choices had the highest score.

3.8.4. Direct matrix ranking

Direct matrix ranking was employed following Cotton (1996) procedures to compare various importance of a particular plant species based on information gathered from key informants, several multipurpose species were selected out of the total medicinal plants, and use diversities of these plants were listed for eight randomly selected key informants to assign use values to each species. The usage values (5=best, 4=very good, 3=good, 2=less used, 1=least used, and 0= not used) were allocated to each selected vital informant. Then, the average value of use diversity given by informants for each species was taken, and the values were totaled and ranked.

3.8.5. Informant consensus

Informants were contacted two times for the same ideas in order to confirm the information he or she has given is correct. Accordingly, if the information of the informant were not harmony with the previous one, the information he has given was

rejected because of irrelevancy. Of the ten medicinal plants collected in the study area, the use of some medicinal plants to treat human diseases was frequently reported, while the use of others was less reported.

3.8.6. Informant consensus factor

The informant consensus factor (ICF) is a quantitative analytical parameter to evaluate the degree of agreement among informant's knowledge and is important in sorting plants for their applicability.The ICF was calculated for each category to identify the agreements of the informants on the reported cures for the group of ailments. The factor provides a range of 0–1, where a high value acts as a good indicator for a high rate of informant consensus.The ICF was calculated as follows: n_{ur} = the number of use citations in each disease category, n_t= the number of times a species is used n_{ur-1}= the number of use citations in eachcategory minus one (Heinrich, *et al.,* 1998). Here, ICF is informant consensus factor.

3.8.7. Jaccard's coefficient of similarity (JCS)

Jaccard`s coefficient of similarity (JCS) was measured to determine the composition of medicinal plant species and degrees of similarity between different areas. The similarity values were determined between the Dodola district and ethnobotanical studies conducted in other regions in different parts of Ethiopia. It was computed between the present study area and other areas, which were studied by other authors in different parts of the country. Accordingly, a, Number of species found only in Dodola district, b= Number of species found only in other district and c= number of species found in Dodola district and other district. JCS was calculated as follows (Kent and Coker, 1992). Where, JCS= Jaccard`s Coefficient of Similarity

a= Number of species which is found in habitat

b= Number of species found only in habitat B and

c= Number of common species found in habitat A and B.

3.8.8. Index of Fidelity level (FL)

Fidelity level (FL) was calculated for each medicinal plant reported to be used against human and livestock diseases to estimate its relative healingpotential using the formula below. Index of Fidelity level is computed by**FL=Ip/Iu X 100,** where**, Ip** is the number of informants who independently cited the importance of a species for treating a particular

disease and **Iu** the total number of informants who reported the plant for any given disease (Alexiades, 1996).

3.9. Ethical Consideration

Ethical clearance was taken from Madda Walabu University, department of Biology. All action was based on the cultural view of the local communities in the study area. Approaching of the informants is very systematic and was based on the rules and norms of the local community by telling the fact and convincing each informant to follow his or her culture strictly. They are also informed that the objective of the research is not for commercial purposes and is only for academic purposes. This is done by showing an official letter from Madda Walabu University.

4. RESULTS

4.1. Socio Demographic Characteristics of Respondents

In this study, the socio demographic characteristics of respondents were analyzed, and the results are summarized in table-1. A total of 84 respondents participated in the ethnobotanical survey of the Dodola District. Of these, 60 (71.4%) were men, 24 (28.5%) were women, and among them, 12 were key informants. The majority of respondents were more than 41-50 years old (42%), and 24 informants ranged in age between 31-40 and 61years (4.7%). From these, 47 were Illiterate, and 67 were married (Table 1).

Table 1 Demographic characteristic of respondents in the study area

Item	Categories	Frequency	Percentage
Gender	Male	60	71.4
	Female	24	28.5
	Total	84	100
Age	20-30	10	11.9
	31-40	24	28.5
	41-50	36	42.8
	51-60	6	7.1
	Above 61	4	4.7
	Total	84	100
Educational status	Illiterate	47	55.96
	Writing and reading	23	27.38
	Grade 8-12 complete	8	9.52
	>12 complete	6	7.1
	Total	84	100
Marital status	Married	67	79.76
	Single	11	13.09
	Divorced	6	7.14
	Total	84	100

4.2. Taxonomic diversity of medicinal plants

A total of 128 species of medicinal plants were collected from the study area.They are distributed in 114 genera and 56 families (Appendix 1).The most popular family was Asteraceae, which contributed 14 (10.9%) species in 10 genera followed by with Solanaceae 12 (9.3%) species in 7 genera, Fabaceae with 11 (8.5%) species in 8 genera and Lamiaceae with 8 (6.2%) species in 8 genera (Table 2).

Table 2: List of the MPs families and the number of genera and species in the study area

No.	Families	No. of genera	Percentage	No. of species	Percentage
1	Apiaccae	5	4.38	5	3.90
2	Asteraceae	10	8.77	14	10.9
3	Euphorbiaceae	4	3.50	4	3.12
4	Fabaceae	8	7.01	11	8.59
5	Lamiaceae	8	7.01	8	6.25
6	Polygonaceae	2	1.75	4	3.12
7	Cucurbitaceae	4	3.50	4	3.12
8	Solanaceae	7	6.14	12	9.37
	Other 48 families	68	59.64	66	51.56
Total 56		**114**	**100**	**128**	**100**

4.2.1. Habitat of Medicinal Plants in the Study Area

Residents of the Dodola district collect and prepare medicinal plants from different habitats. About 81 (63.28%) of the total medicinal plants were collected from the wild and 40 (31.25%) from homcgardens. The remaining 7 (5.46%) from both (Figure 2).This evidence indicatesthat the residents mostly depend on medicinal plants inhabited in the wild to prepare remedies in the study area. Moreover, the local people's potential and ability to cultivate around their farmlands is mostly very low.

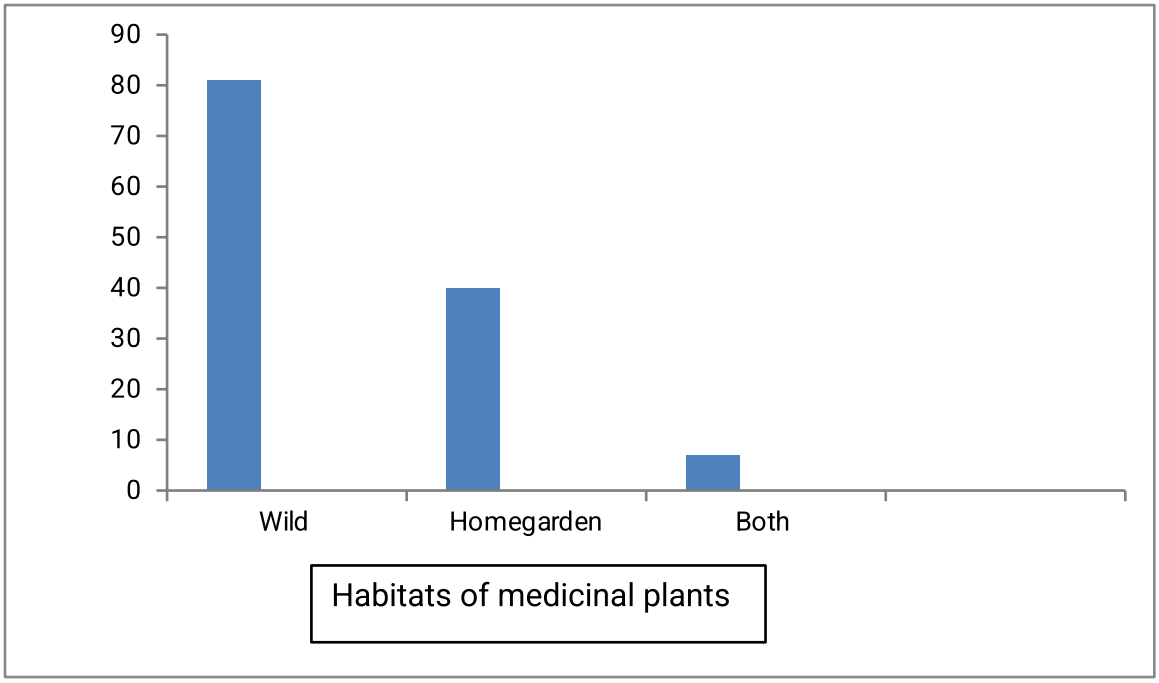


Figure 2: Habitat of Medicinal Plants in the Study Area

4.2.2. Growth forms (habit) of medicinal plants

Regarding the diversity of habits of medicinal plants in the study area, herbs constitute the largest category, with 56 (43.75%) species followed by shrubs with 50 (39.06%) species. Trees and climbers accounted for 14 (10.93%) and 8 (6.25%) species respectively (Figure 3). This result showed that the most widely used medicinal plants habit in the study area were herbs followed by shrubs. This is because the local communities simply get the herb species plant and the plant species were found high in number in the study area.

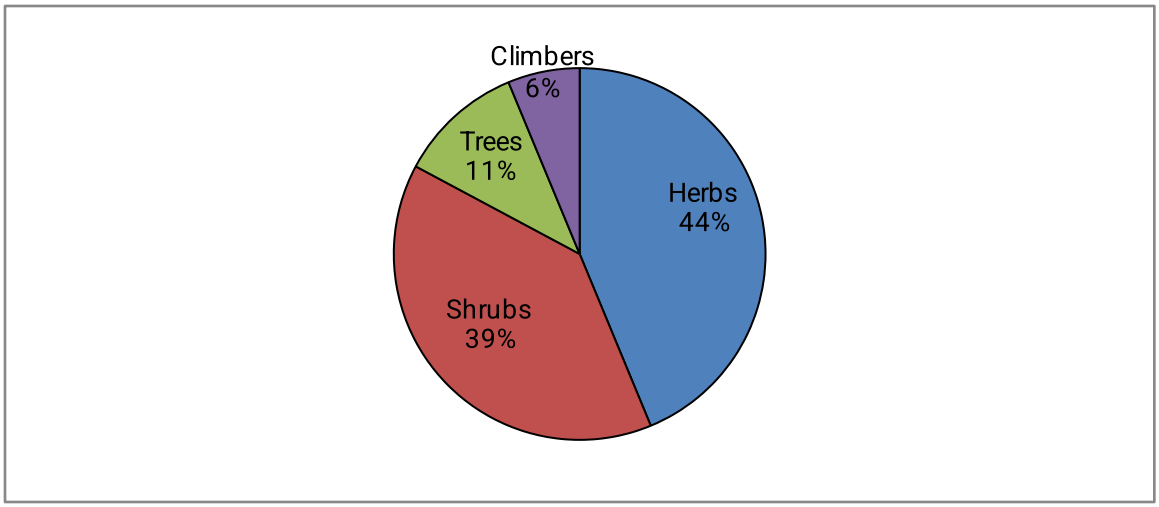


Figure 3: Growth habit of medicinal plants in the study area

4.2.3. Plant parts used to treat human and livestock diseases

The study showed that the plant parts widely used for the preparation of' the remedies in the study area were 50 (39.06%) leaves followed by 21(16.40%) roots (Table 3).

Table 3:Plant parts used for the treatment of Human and Livestock

Plant part used	Total	Percentage
Leaf only	50	39.06
Root only	21	16.40
Roots and leaves	12	9.37
Whole part	8	6.25
Seed only	6	4.8
Fruits and leaves	5	3.9
Fruit only	4	3.12
Seed only	2	1.56
Stem bark	2	1.56
Bulb	2	1.56
Root and leaf	2	1.56
Bark and root	2	1.56
Flower	2	1.56
Flower and leaf	2	1.56
Rhizome	2	1.56

Seed and leaf	1	0.78
Roots and fruit	1	0.78
Roots and flower	1	0.78
Leaves and seed	1	0.78
Latex	1	0.78
Total	128	100

4.2.4. Formulation and condition of use of plant parts

In the collection of data concerning the preparation of medicine, in formants reported various skills associated with herbal preparations. The result of the study indicated that, the local people prepared the remedies from fresh, dry, and both fresh and dry material. The results showed that most remedies were prepared from dried (22.65%) and the remaining (10.93%) were prepared from both dried and fresh species. The study also revealed that the majority of the remedies were prepared from fresh material of the plants which accounted for 84 (65.62%) of the species and the remaining preparations were distributed in dried and fresh anddried conditions as shown in (Figure 4).

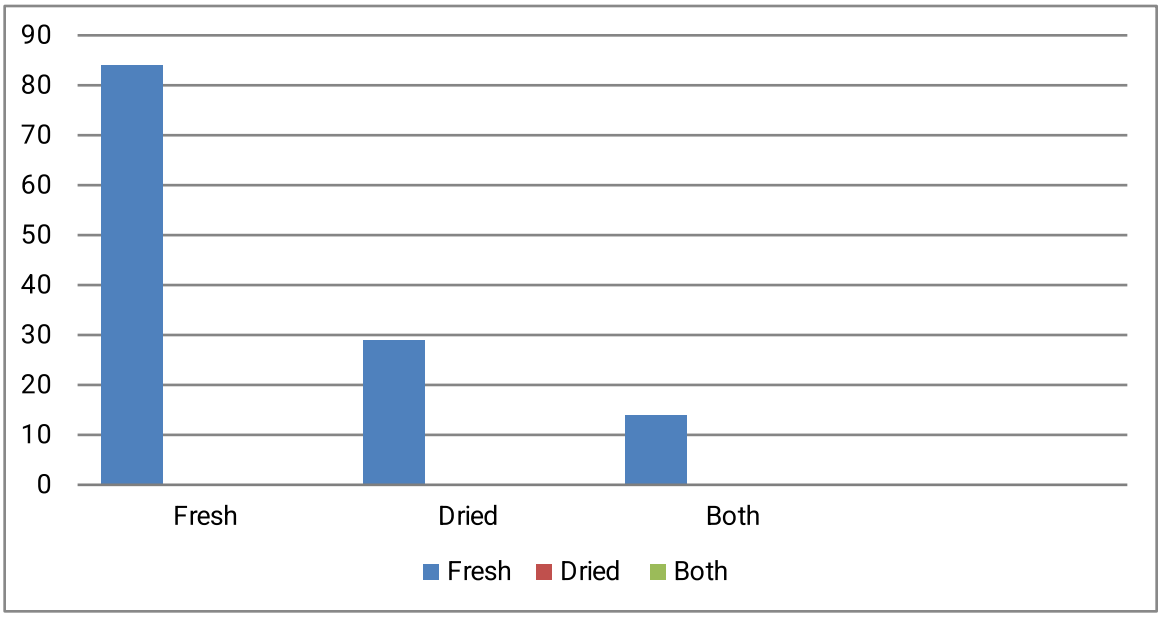


Figure 4: Proportions and conditions of preparation of remedies

4.2.5. Methods of preparation

The major methods employed in the study area for plant remedy preparations were pounding, which accounted for 40 (31.25%) species, followed by pounding and squeezing with water in the cases of 28 (21.87%) species, powdering 14 (10.93%) species, pounding and boiling 11 (8.59%) species and Unprocessing 9 (7.03%) species and the remaining proportion is accounted by methods like, powdering and boiling, roasting and powdering, crushing, squeezing, pounding and and others as shown in (Table 4).

Table 4: Methods of preparation

Method of preparation	Number of preparations	Percentage
Pounding	40	31.25
Pounding and squeezing	28	21.87
Powdering	14	10.93
Pounding and boiling	11	8.59
Unprocessing	9	7.03
Powdering and boiling	8	6.25
Chewing	7	5.46
Pounding,chewing and squeezing	5	3.90
Squeezing	4	3.12
Roasting and powdering	2	1.56
Total	**128**	**100**

4.2.6. Mode of administration

People of the study area mostly administer traditional medicine orally.Traditional medicine preparations are administered through different modes of administration.The modes of administration in the study area included: oral, dermal, nasal, anal, and ocular and others. In this study, the most popular way of administration of herbal medicine was oral which accounted for 50 (39.06%) species followed by dermal for 39 (30.46%) species, both oral and dermal for 22 (17.18%) species and others as listed in (Table 5).

Table 5: Route of administration in the study area

Route of administration	Preparations	Percentage
Oral	50	39.06
Derma/oral	39	30.46
Oral and dermal	22	17.18
Oral and nasal	10	7.81
Nasal	5	3.90
Dermal, oral and nasal	1	0.78
Oral, dermal and eye	1	0.78
Total	128	100

4.2.7. Mode of application

These prepared traditional medicines are applied by a number of modes of application, like drinking, eating, smearing, tied on, adding, inhaling, applying and etc. Drinking accounted for the largest mode of application 50 (39.06%), followed by tied on and smearing, painting, 30 (23.43%) and 9 (9.37%) respectively (Table 6).

Table 6: Application of prepared remedies

Application of prepared	Number of plant parts	Percentage
Drinking	50	39.06
Tied on	30	23.43
Smearing/painting	12	9.37
Eating	9	7.03
Inhaling	7	5.56
Appling	4	3.12
Swallowing	4	3.12
Adding	4	3.12
Put on	2	1.56

Washing	2	1.56
Warming	2	1.56
Hanging on	2	1.56
Total	128	100

4.2.8. Dosage administered and unit of measurement

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

4.2.9. Medicinal plants used to treat human, livestock and both human and livestock diseases

Out of the total of 128 species of medicinal plants collected and documented from the study area, 86 (67.18%) species were noted to treat only human ailments, while the rest of the species 43 (33.59%)were used to treat livestock diseases, and both human and livestock diseases as shown in (Figure 5).

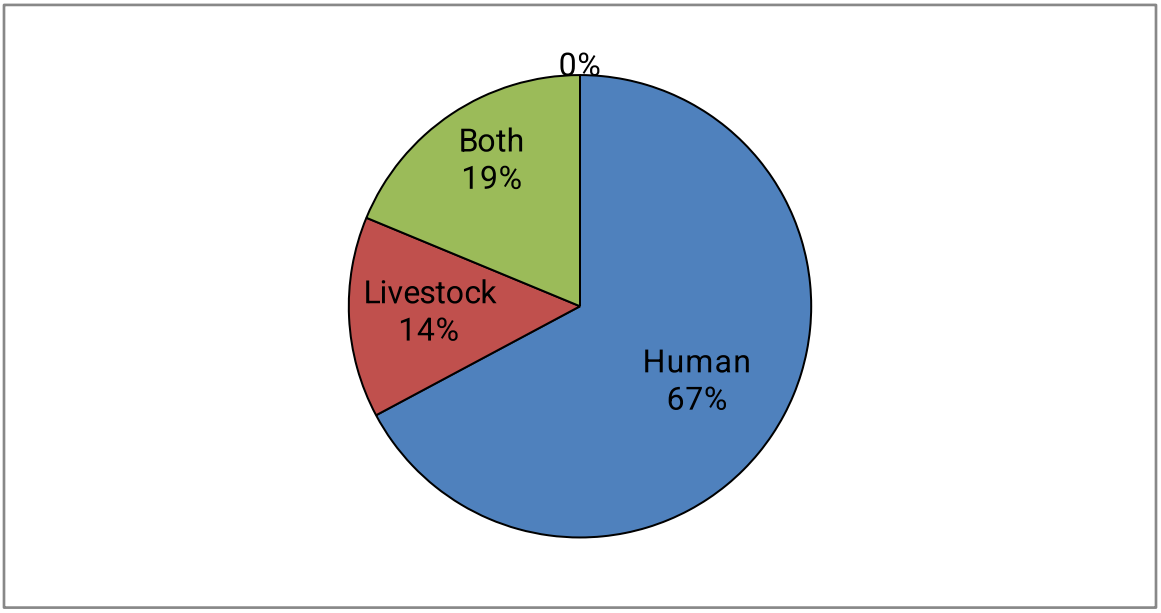


Figure 5: Medicinal plants treat human, livestock and both human and livestock disease

4.2.10. Transfer of medicinal plants knowledge

This study found that the main sources of traditional medicinal plant knowledge transfer are elder son, parent, relatives, and others mostly descended orally. This oral transfer of knowledge without documentation ceases the knowhow of future generation about different traditional medicinal plant usage in the study area. Most respondents transfer their knowledge to their family. This means that most of the traditional knowledge of medicinal plant is passed along the family line. First-born children in the family are the main holder of responsibility in keeping the information and they are successor of their parents as well. Few others share the traditional knowledge to trustworthy and lovely neighbors and other blood relation persons.

The indigenous knowledge on medicinal plants was mainly transmitted orally from generation to generation, and now, it has declined when compared to the previous generation. In the study area, as explained by most informants the most frequently cited sources of knowledge were from family elder son 55(65.47%), followed by observation from others parent and relatives 20 (23.80%) and 5 (7.14%) respectively (Figure 6). This knowledge is threatened due to the death of healers, lack of written document, influence of modernization and other factors.

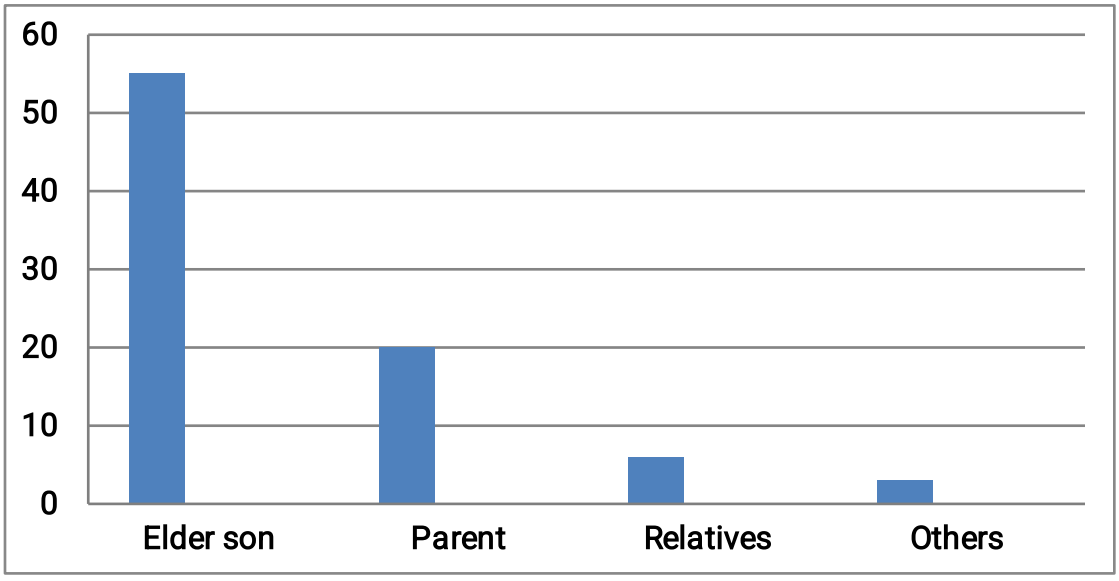


Figure 6:

Transfer of medicinal plants knowledge

4.3. Importance of Medicinal Plants in the Study Area

4.3.1. Informant Consensus

The result of this study showed that all informants do not uniformly know important medicinal plants. Some medicinal plants (MPs) are more popular than others. Informants were frequently cited those medicinal plants for treatment of certain diseases. Among medicinal plants in the district, *Allium sativum* is predominant to be cited by most of the informants 66 (78.57%) followed by *Ruta chalepensis* 64 (76.19%) (Table 8).

Table 8: List of most common medicinal plants with high informant's consensus

Scientific name	Number of informants	Percentage (%)
Allium sativum	66	78.57
Carissa spinarum	54	64.28
Cordia Africana	42	50
Croton macrostachyus	61	72.61
Datura stramonium	59	70.23
Eucalyptus globules	62	73.8
Linum usitatissimum	36	42.85
Nicotiana tabacum	58	69.04
Ruta chalepensis	64	76.19
Zingiber officinale	51	60.71

4.3.2. Informant Consensus Factor (ICF).

The results of the analysis of ICF indicated that some medicinal plants are effective in treating certain diseases. Medicinal plants that are effective in treating certain disease and well known by community members also have higher informant consensus factor (Table 9).The highest ICF value was obtained from diseases categories gastritis (0.81) followed by common cold, cough, headache, fever and Asthma (0.78). Spider poison and snake bite had the lowest (0.52) this is may be due to the rare occurrence of the disease and the disease is mainly treated by healers.

Table 9: Informant consensus factor by category of diseases in the study area

Disease category	No.of species	Use citation	ICF
*G*astritis, stomachacheand febrile illness	16	85	0.81
Common cold, cough, headache, fever, Asthma	16	76	0.78
Toothache, Tonsillitis,wound	17	64	0.73
Blood pressure, heart problem,	16	57	0.71
Leech, black leg, bloating, and epidemics	15	68	0.77
Diarrhea, Amoeba, tape worm	14	36	0.61
Eye diseases, ear diseases, mumps and meningitis	14	31	0.54
Lung, Kidney and Liver Diseases	12	35	0.65
Hemorrhoid, anthrax, gonhrrae, hepatitis	11	25	0.56
Spider poison and snake bite	12	25	0.52

4.4. Ranking of Medicinal Plants in the Study Area

4.4.1. Preference ranking

Preference ranking was carried out on medicinal plants used to treat stomachache. The result of this study showed that *Allium sativum, Ruta chalepensis,* and *Lepidium sativum* were ranked first, second, and third, respectively, based on its degree of treating stomachache. *Zingiber officinale* and *Ocimum basilicum*medicinal plants were used for stomachache treatment purpose though they were least preferred (Table 10).

Table 10: Preference ranking of medicinal plants used to treat stomachache

Medicinal plants used	Informants (Respondents R1-R10)										Total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10		
Allium sativum	3	5	5	4	5	3	4	4	4	5	42	1st
Ruta chalepensis	4	3	3	4	5	4	5	3	5	4	40	1st
Lepidium sativum	3	4	2	3	3	4	4	5	3	4	36	3rd

Eucalyptus globules	4	3	3	4	5	4	5	3	5	4	32	4th
Coffea Arabica	2	4	3	5	4	3	1	3	3	3	31	5th
Vernonia amygdalina	2	4	4	3	2	4	2	3	3	2	30	6th
Podocarpus falcatus	1	3	2	3	2	2	2	5	3	1	28	7th
Carissa spinarum	2	4	3	3	3	4	2	3	2	2	24	8th
Zingiber officinal	1	3	2	3	3	4	2	3	4	2	22	9th
Ocimum basilicum	2	1	1	3	1	4	2	3	1	2	21	10th

4.4.2. Paired comparison

A paired comparison was made to determine the most preferred medicinal plants among the eight species that were used to treat febrile illness in the study area. The responses of ten key informants showed that *Croton macrostachyus* ranked first followed by *Eucalyptus globules* while *Ocimum lamiifolium* the least favored over the other plant species cited in treating febrile illness (Table 11).

Table 11: Paired comparison of medicinal plants used to treat febrile illness

Medicinal plants used	Informants (Respondents R1-R10)										Total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10		
Croton macrostachyus	4	4	5	5	5	5	5	5	5	5	48	1st
Eucalyptus globules	4	4	5	5	5	5	5	5	4	4	46	2nd
Cordia Africana	3	4	5	5	4	3	3	5	5	3	40	3rd
Guizotia abyssinica	5	3	4	4	2	3	5	3	4	4	37	4th
Zehneria scabra	3	5	1	3	3	2	5	2	4	5	33	5th
Clematis simensis	2	3	4	2	1	3	4	4	3	4	30	6th
Ruta chalepensis	3	4	2	5	2	4	1	1	3	3	28	7th
Ocimum lamiifolium	2	3	2	2	2	4	2	2	2	3	24	8th

4.4.3. Direct Matrix Ranking

In the study area, plant species with multiple uses were studied. Key informants selected 10 plant species with multiple uses. Common uses include medicine, .firewood, charcoal, construction, fencing, and others. Fourteen medicinal plants were reported for seven uses other than medicinal value.Thus, direct matrix ranking was done using eight use categories.Among the use categories, the category of firewood was top-ranked with

a score of 41 and followed by medicine 40.Therefore, other environmental-friendly alternative energy sources such as biogas should be sought to minimize the burden. The result sshow that *Eucalyptus globulus* ranked top to be used highly for the eight use categories. The fact that *Eucalyptus globulus* is being highly exploited shows its possible reduction in its distribution and abundance unless care is taken. Therefore, it deserves significant attention, not lost it. Moreover, ecological investigation on its regeneration status in the study area should be investigated to understand its conservation status (Table 12).

Table 12: Direct matrix ranking of medicinal plants with different uses

Medicinal plants species	Use categories								Total	Rank
	Cha	Con	Fen	Fw	Fod	For	Fur	Med		
Eucalyptus globules	5	5	5	5	4	4	4	5	37	1st
Podocarpus falcatus	5	5	5	5	0	0	5	5	30	2nd
Syzygium guineense	3	5	5	5	1	1	5	4	29	3rd
Juniperus procera	3	4	4	4	0	0	4	5	27	4th
Prunus africana	4	4	3	5	0	3	3	3	26	5th
Croton macrostachyus	5	3	4	4	0	0	4	5	25	6th
Vachellia abyssinica	5	2	1	4	1	4	2	2	21	7th
Ficus sur	2	3	1	3	3	3	1	3	19	8th
Vernonia amygdalina	2	0	3	3	0	4	1	4	17	9th
Premna schimperi	2	2	0	3	0	1	1	4	13	10th

4.4.4. Fidelity Level Index

Fidelity Level (FL) values were calculated for some commonly used medicinal plants versus some commonly reported ailments. Results showed that *Hagenia abyssinica* (tape worm), had the highest fidelity level, and followed by *Podocarpus falcatus* (stomachache).Analysis of percentage of informants claiming the uses of a certain plant species for the same major purposes could not be taken as the only criteria in proving the efficacious of plant species. Furthermore, fidelity level index could be calculated to see the medicinal use values of species. The medicinal plants that are widely used by the local people to treat one or very few ailments will have higher FL values than those that are less popular.

Table 13: Fidelity Level (FL) index of most commonly used medicinal plants

Therapeutic Category	Medicinal plant	Ip	Iu	FL	FL (%)
Hagenia abyssinica	Tape worm	34	36	0.94	94
Podocarpus falcatus	Stomachache	30	32	0.93	93
Juniperus procera	Wound	28	34	0.82	82
Eucalptus globulus	Common cold	22	29	0.76	76
Ruta chalepensis	Evil eye	20	29	0.69	69
Coffee arabica	Diarrhea	19	30	0.63	63
Datura stramonium	Toothache	17	28	0.60	60
Ocimum lamiifolium	Fibrils illness	14	24	0.58	58
Croton macrostachyus	Wound	12	24	0.54	54
Allium sativum	Rheumatism	10	21	0.47	47

4.4.5. Jaccard`s Coefficient of Similarity (JCS)

The Jaccard similarity coefficient (JSC) was used to calculate the degree of similarity and the difference in composition of the medicinal plant (MPs) among the ten selected Kebeles in the Dodola district. The documented and identify medicinal plant from the Dodola district were compared with similar plants documented byother researchers from other study areas, the Dodola district had a higher Jaccard similarity index with the Nensebo district 64 (22.7%), followed by the Kofale district 45 (18.5), and the least similarity was observed with the study conducted in the Mojana Wadera District 10 (6.4%) of North Shewa Zone, Amhara Region, Ethiopia (Table 14).Calculated values of Jaccard`s Coefficient of Similarity displayed that medicinal plant species were not evenly distributed when compared with other places. This was also true, even by itself in the study area medicinal plants were not equally distributed. The highest similarity in distribution between the study area and Nensebo district may be due to they share some similar geographic environments, socio-economic relationships as well as cultural similarity using medicinal plants (Table 14).

Table 14: Jaccard Index of similarity of the present study area across different district

Districts	A	B	C	JCS (%)	Reference
Dodola District	128	-	-	-	The study area
Kore District	97	40	0.176	17.6	(Nega and Girma, 2022)
Kofale District	106	45	0.183	18.3	(Nuro et al. 2024)
Nensebo District	127	64	0.227	22.7	(Abdela, et al.,2022)
Hawassa Zuria	105	25	0.111	11.1	(Tefera and Kim 2019)
Mojana Wadera	56	10	0.064	6.4	(Ayele et al. 2022)
Berbere District	70	15	0.085	8.5	(Jima and Megersa 2018)
Heban Arsi District	120	35	0.142	14.2	(Nuro et al. 2024)
Shashemane district	125	54	0.175	17.5	(Makuria and Abduro 2022)
Sheka zone	266	28	0.066	6.6	(Kassa et al. 2020)
Gurage	244	38	0.092	9.2	(Teka et al. 2019)
Damot Woyde District	57	12	0.075	7.5	(Megersa and Woldetsadik 2022)

4.5. Threats and Conservation Status of Medicinal Plants in the study area

4.5.1. Threats to Medicinal Plants

People need plants for their daily life activity. this result showed that only a few number of medicinal plant species are available as remedies for the treatment of livestock diseases as compared to the number of plant species used to cure human diseases. The cause of threats to medicinal plants can be generally grouped into natural and human induced factors. However, in the study area as reported by the informants, most of the causes for the threats to medicinal plant are the anthropogenic factors such as agricultural expansion, fire wood collection, fence, construction, and medicine. Some natural factors that are well known factors in the study area are drought and wildfire.Anthropogenic factors such as agricultural expansion, drought, over grazing, cutting trees down for fire wood, charcoal and construction are the major threatening factors in the study area.To rank these factors according to their degree of damage, ten informants were selected to give the value '5' to the most threatening factor and '1" to

the one which is the least threatening. As a result, agricultural expansion was the most threatening factor in the study area scoring 48, followed by fire wood collection and charcoa45 and 41 respectively (Table 15).

Table 15: Threatening factors of medicinal plants in the study area

Threatening factors	Informants (Respondents R1-R10)										Total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10		
Agricultural expansion	5	5	5	4	5	4	5	5	5	5	48	1s
Fire wood collection	5	5	4	5	5	5	5	4	5	3	45	2nd
Charcoal production	4	4	5	2	4	3	4	5	4	4	41	3rd
Overgrazing	3	3	3	4	3	4	2	2	2	2	28	4th
Construction	1	2	2	3	2	2	1	5	5	1	24	5th
Fence	2	1	2	2	2	1	4	2	2	2	20	6th
Drought	3	1	1	3	1	1	3	1	1	3	14	7th

4.5.2. Conservation of Medicinal plants in the study area

Conservation of natural resources in general and medicinal plants in particular maximizes the benefit of creatures. This conservation practice whatever in-situ (in their natural habitat) or/and ex-situ (out of their natural habitat) has been practiced. The source of most medicinal plants in the district is wild, so low conservation of wild medicinal plants causes scarcity. Through conservation approaches were not sufficient; people of the district have been practiced in variety of wise use aspects such as nursery sites: such site propagates and distributes various plant species to increase wealth of plant resource. Protected areas: mainly in mountains and religious practice centers in forests are protected and reserved. The reason why Churches and Mosques preferably harbor plant diversity is because, their thought prohibited to cut plant resources from these sacred groves. This possibly preserves both medicinal plants as well as indigenous knowledge. In the Dodola district, patchy remnants of old-aged Afromontane forests that contain many medicinal plants can be found mainly around Churches and Mosques.

5. DISCUSSIONS

5.1. Ethnobotanical study on medicinal plants

The results of this study showed that a total of 128 plant species belonging to 114 genera and 56 families were identified.The most popular family was Asteraceae, which contributed 14 (10.9%) species in 10 genera followed by with Solanaceae 12 (9.3%) species in 7 genera, Fabaceae with 11 (8.5%) species in 8 genera and Lamiaceae with 8 (6.2%) species in 8 genera (Table 2). The Asteraceae families were the most common medicinal species in this study area. Similarly, a study in Kofale District, West-Arsi Zone, Oromia RegionaL State, Ethiopia (Nuro et al. 2024) showed that Asteraceae were ranked first, contributing nine species, followed by Solanaceae with seven species. This result agrees with others finding that Asteraceae were the most dominant taxa (Uzun and Koca 2020). Similar to our findings, various studies in Ethiopia (Yohannis et al. 2018; Tesfaye et al. 2020; Teka et al. 2020) and elsewhere globally (Hachlafi et al. 2020) have reported Asteraceae as the most dominant medicinal plant family. In contrast, other studies found that Fabaceae (Kidane et al. 2018; Tefera and Kim 2019), Euphorbiaceae (Jima and Megersa 2018), and Lamiaceae (Kefalew et al. 2015; Tamene et al. 2020) were dominant over others.

One hundred twenty eight medicinal plants distributed to 114 genera and 56 families were identified and recorded in this study. Compared with the previous studies conducted in Ethiopia, this study reported high and low numbers of medicinal plant species. For instance, Kasa et al. (2020) collected 266 plant species used by communities of Sheka Zone for the treatment of human and livestock ailments. In a similar study by Teka et al. (2019) collected 244 medicinal species, from Gurage, Mareqo, Qebena, and Silti, South-Central Ethiopia.The two authors reported a higher number of medicinal plants compared with this study. However, (Abdella et al. 2022;Turi et al. 2022;Nuro et al. 2024) reported 127, 109, and 120 species of medicinal plants, respectively. Vegetation type of the district, number of informants involved in the study, data collection time, and duration and culture could be the reason for the difference in the number of medicinal plants.

Of the 128 species of medicinal plants collected from the study area, the majority of them 40 (31.25%)) were obtained from the wild habitat. This finding is evidenced in other similar studies as medicinal plants are harvested mainly from wild habitats than home gardens (Chekole et al. 2017; Jima and Megersa 2018; Kasa et al. 2020).

5.2. Growth Forms and Plant Parts Used of Medicinal plants

Herbaceous species accounted for 56 (43.75%) followed by shrubs with 50 (39.06%) species of the therapeutic plants collected in the Dodola District. Furthermore, this result is consistent with a study conducted by Amsalu et al. (2018) in Gozamen Woreda East Gojjam Zone, in which herbs were the dominant growth forms. Also, this result is consistent with different parts of the world in which herbs were the dominant growth forms (Mahwasane et al. 2013; Hong et al. 2015; Khan et al. 2015; Hu et al. 2020). This may be due to the fact that herbs are more readily available and plentiful in the surrounding areas than shrubs and trees (Assen et al. 2021). In contrast to the present finding, shrubs or trees were the dominant life forms as a contributor of medicinal plants in other findings (Weldeareagay and Awas 2021; Assefa. 2021; Jima and Megersa 2018.;Zakariya et al. 2021).The predominance of shrubs or trees over other forms of growth may be due to their annual availability and their relative ability to withstand drought, which may be useful for wide spread use (Maroyi, 2011).The more recent studies conducted by Demie et al. (2018), Jima and Megersa (2018) also reported the dominance of shrubs for the preparation of traditional medicines.

Local people of Dodola District used various plant parts for the preparation of traditional medicine. This study indicated that leaves were the most commonly used part of the plant. Similar studies list leaves and roots as the most common parts of plants used to prepare medicines. The studies that reported the leaves as the most utilized plant parts are (Chaachouay et al. 2021; Gonfa et al. 2020;Eshete and Molla 2017; Girmay et al. 2021;Zakeriya et al. 2021). The studies that reported the dominance of roots over other plant parts are (Kefalew et al. 2015; Jima and Megersa 2018; Tolosa et al. 2013). Leaves are preferred over other plant parts due to their ease of availability and ease of medication preparation. Furthermore, secondary metabolite storage is beneficial to the medicinal plant's biological characteristics (Chaachouay *et al.,* 2021). Because roots and bark take longer to recover than leaves, harvesting them enhances a plant's

vulnerability.

5..3. Preparation Methods, Condition, and Route of Administration of Remedies

Pounding is the most common preparation method in the study area.The major methods employed in the study area for plant remedy preparations were pounding, which accounted for 40 (31.25%) species, followed by pounding and squeezing with water in the cases of 28 (21.87%) species. The study also revealed that the majority of the remedies were prepared from fresh material of the plants which accounted for 84 (65.62%) of the species and the remaining preparations were distributed in dried and fresh anddried conditions as shown in (Figure 4). Similar findings were also recorded in different studies from other parts of Ethiopia (Jima and Megersa 2018; Tefera and Kim 2019; Kassa et al. 2020). The preference for fresh plant parts is related to the efficacy of medicinal plants in treating diseases compared with dried parts (Kassa et al. 2020). The utilization of fresh plants or plant parts could have a detrimental impact on plants through systematic collection compared to dried pieces. Once the plant part is collected and dried, it can be used for later use; however, local people made minimal efforts in storing dried plant material for later use, as reported in the results of Kassa et al. (2020).

5.4. Dosage Determination and Antidotes

In this study, the most popular way of administration of herbal medicine was oral which accounted for 50 (39.06%) species followed by dermal for 39 (30.46%) species, both oral and dermal for 22 (17.18%) species and others as listed in (Table 5). In similar studies, other researchers reported oral administration of medicine as the leading route of application (Demie et al. 2018; Kassa et al. 2020). This finding could indicate internal ailments are commonin the study area. However, researchers recommend that care be given while taking the remedy, as overdosage could cause severe internal problems (Chekole 2017; Kassa et al. 2020). Dermal application of traditional medicine as the dominant way was also reported by Giday et al. (2009) and Tesfaye et al. (2020).

5.5. Ranking of Medicinal Plants

The study revealed that all medicinal plants are not equally important for treating ailments. Local communities prefer one over another mainly based on efficacy and availability. In the preference ranking *Allium* sativum*, Ruta chalepensis,* and *Lepidium sativum* were ranked first, second, and third, respectively was the most preferred and

ranked medicinal plants used to treat stomachache. In a similar study conducted in Sheka Zone of Ethiopia (Kassa et al. 2020),*C. macrostachyus* was reported to be the most preferred medicinal plant against gastrointestinal problems. Similar finding for Hawassa Zuria showed that the most preferred medicinal plant reported to treat abdominal stomachache was *Eucalyptus globulus* (Tefera and Kim 2019*).* The various findings in different parts of Ethiopia indicate that local communities in their locality have their own preferred medicinal plants against different human and livestock ailments. The result sshow that *Eucalyptus globulus* ranked top to be used highly for the eight use categories. The fact that *Eucalyptus globulus* is being highly exploited shows its possible reduction in its distribution and abundance unless care is taken

The direct matrix ranking indicated that *Eucalyptus globulus*and *Podocarpus falcatus* ranked first and second in the study area as a multipurpose plant species, respectively. *Podocarpus falcatus* was reported to be used mainly as medicine, firewood, and fencing. On the other hand, *Eucalyptus globules* reported mainly for its use in construction and furniture. A various groups of researchers in Ethiopia reported different medicinal plants as a multipurpose plant species. For instance, (Tefera and Kim 2019) reported as *Ensete ventricosum* (Welw.) Cheesman was the most preferred medicinal plant used for various purposes by the local people of Hawassa Zuria District. Jaccard's similarity index indicated some similarity in the composition of medicinal plants between the study area and the Nensebo district (Abdella et al. 2022) and Kofale district (Nuro et al. 2024). In contrast, less similarity was found between Mojana Wadera District(Ayele 2022) and Damot Woyde District (Megersa and Woldetsadik 2022).The similarity and dissimilarity between the present study and other districts could be due to cultural and agroclimatic conditions, as Tefera and Kim (2019) stated.

5.6. Threat and conservation of Medicinal Plants

According to the responses from informants, the leading causes of the loss of medicinal plants in the study area were agricultural expansion, fire wood collection, charcoal drought, overgrazing, and recurrent fire. Similar to the present finding, other studies on threats to medicinal plants in Hawassa Zuria district, Tefera and Kim (2019), indicated agricultural expansion is the primary threat to medicinal plants. According to the responses from key informants, the main causes of medicinal plant loss in the study

area were agriculture expansion, firewood collection, overgrazing, and drought. Other researchers reported a similar finding to this study where agricultural expansion was the most threat to medicinal plants of Damot Woyde District (Megersa and Woldetsadik 2022) and Mojana Wodera (Ayele et al. 2022).The other reported threats to the medicinal plants of Ethiopia were climate change and the spread of invasive species. As a result, plant species like *Cordia africana, Juniper procera, Ficus species, Podocarpus falcatus, Olea europea, and Hagenia abyssinica* are selected as threatened and near threatened species, respectively, in the study area. The documentation of the eroding plants and the associated indigenous knowledge can serve as a basis for the development of management plans for the conservation and sustainable use of traditional medicinal plants in the study area.

The conservation of medicinal plants in the study area was minimal; rather, the utilization of leaves for the preparation of traditional medicine may have some contributions to the conservation of medicinal plants as also reported by another study. In addition, traditional beliefs are also reported to have their own unintentional role in the conservation of medicinal plants. The identification of various threats by current studies and other studies conducted in Ethiopia has shown that different conservation approaches are needed to save medicinal plants from further loss.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

An ethnobotanical study of medicinal plants used by local people of Dodola District, West Arsi Zone, Oromia National Regional State, Ethiopia, was conducted. One hundred twenty eight medicinal plants distributed in 114 genera and 56 families that are used to treat various human and livestock ailments were documented from the study area. From total medicinal plants, the majority were observed in the forest and river side, followed by in agriculture and grazing land and home garden.

Out of the total of 128 species of medicinal plants collected and documented from the study area, 86 (67.18%) species were to treat only human ailments, while the rest of the species 43 (33.59%)were used to treat livestock diseases, and both human and livestock diseases as shown in (Figure 5).In conclusion, the results of this study show the existence of indigenous knowledge of medicinal plants used in Dodola District. A total of 128 medicinal plants were identified in the study area. They belonged to 56 families; from these, Asteraceae and Solanaceae were the most representative families. Most medicinal plants are used to treat human ailments. The growth forms of medicinal plant species are mostly herbs. The major plant parts were the mixture of leaves and roots to prepare a remedy. The route of administration of the prepared remedy is mainly orally. The key informants in the woreda are trusted by the community and certified by its residents. These key informants secretly pass on their knowledge to their children. This, in turn, contributes to the spread of knowledge. Therefore, today's study is a late way to discover new drugs

6.2. Recommendations

Based on the conclusions and findings of the study, the following recommendations are given:

- Local people should participate in cultivating medicinal plants in home gardens mixing with crops in the farmlands and live fences in addition to wild.
- Gender, age, and educational status of respondents were found to influence knowledge of medicinal plants of the local community.Therefore, training and awareness about conservation methods should be given to traditional healers and

the local community.

- Moreover, traditional healers should be encouraged to transfer their indigenous knowledge to their family and relatives so as to preserve for the next generation.
- We need to raise awareness to improve local community's knowledge on the importance, conservation, and management of medicinal plants largely to consider in-situ conservation of wild medicinal plants to ensure their sustainable use.
- The government should give recognitions and encourage the local herbal medicine practitioners to enhance the use of traditional medicine through licensing or certification and other incentives or by organizing them at community or district level, which popularizes their indigenous knowledge and medicinal plants use value.
- Training should be given to local people to have positive attitude toward traditional healers and to give prior emphasis to medicinal plants and multipurpose use tree species.

REFERENCES

Abadi Birhanu and Fato Haji (2017).Ethnobotanical study of medicinal plants used for the treatment of human and livestock ailments in DaweKachen District of Bale Zone, Southeast Ethiopia*. International Journal of Emerging Trends in science and technology,* (4):5043-5055.

Abeba Haile (2022).Ethnobotanical study of medicinal plants used by local people of Mojana Wadera Woreda, North Shewa Zone, Amhara Region, Ethiopia, *Asian Journal of Ethnobiology*,(5)1:35-43.

Abiyot Tedesse, Biranu Kagnew, Firew Kebede and Mulugeta Kebede (2018).Ethnobotanical study of medicinal plants used to treat human ailment in Guduru district of Oromia Regional State, Ethiopia; 10 (3), 64.

Abraha Teklay, Balcha Abera and Mirutse Giday (2013).An ethnobotanical study of medicinal plants used in Kilte Awalaelo District Tigray Region, of Ethiopia,*"Journal of Ethnobiology and Ethnomedicine*, (9)65:1-23.

Alemayehu Kefalew (2015).Ethnobotany of medicinal plants in Ada'a district, Oromia regional, Ethiopia.*Journal of ethnobiology and ethnomedicine.*

Alemtshay Teka, Zemede Asfaw, Sebsebe Demissew, Patrick Van Damme (2020).Traditional uses of medicinal plants practiced by the indigenous communities in Gurage Zone, south central Ethiopia , *Ethnobotany Research and Applications*:19.

Amare Bitew, Seid Mohammed, and Abeba Kassa (2022).Ethnobotanical study of traditional medicinal plants used to treat human and animal diseases in Sedie Muja District, South Gondar, Ethiopia, *Evidence-based Complementary and Alternative Medicine.*

Amsalu Nugussie (2015). An ethnobotanical study of medicinal plants in Farta District, Gondar Zone of Amhara Region, Ethiopia, 28–55.

Assen Yimer, Woldearegay Mesfin and Abeba Haile (2021).Ethnobotanical study of medicinal plants in Kelala district, South Wollo Zone of Amhara Region, Northeastern Ethiopia ,*Evidence-Based Complementary and Alternative Medicine*,10.

B. Abebe and Teferi,(2021).Ethnobotanical study of medicinal plants used to treat human and livestock ailments in Hulet Eju Enese Woreda, east Gojjam zone of Amhara region, Ethiopia,*Evidence-based Complementary and Alternative Medicine*, 11.

Behailu Assefa, Moa Megersa and TilahunTolosa Jima(2021). Ethnobotanical study of medicinal plants used to treat human diseases in Gura Damole District, Bale Zone, Southeast Ethiopia. *Asian Journal of Ethnobiology*,4(1): 42-52.

Behailu Etana (2010). Ethnobotanical Study of Traditional Medicinal Plants of Goma Wereda, Jima Zone of Oromia Region, Ethiopia,M.Sc Thesis.Addis Ababa University, Addis Ababa, Ethiopia.

Bekele Kindie, Chala Tamiru and Tahir Abdala (2021). Ethnobotanical study of medicinal plants and conservation status used to treat human and livestock ailments in Fadis district, Eastern Ethiopia. *International Journal of Homeopath Natural Medicines*,7(1):7-17.

Central Statistical Authority (CSA), The 2023 Population Projection of Ethiopia, Central Statistical Authority (CSA),Addis Ababa, Ethiopia,

Chaachouay N, Benkhnigue O, Fadli M, El Ibaoui H, Zidane L. (2019). Ethnobotanical and ethnopharmacological studies of medicinal and aromatic plants used in the treatment of metabolic diseases in the Moroccan Rif.*Heliyon* 5 (10).

Chekole Getnet (2017).Ethnostudy of medicinal plants used against human ailments in Gubalafto district, Northern Ethiopia,*Journal of ethnobiology and ethnomedicine.*

Cotton, C.M. (1996). Ethno botany: Principles and Applications. John Wiley and Sons Ltd., Chichester, England, 347-374.

Cunningham, A.B. (1996). People, Park and Plants use recommendations for multiple use zones and development alternatives around Bwindi: Impenetrable National Park, Uganda.In: People and Plants: Working Paper 4,18-25. UNESCO, Paris.

DDAO, (2023), Dodola District: Annual Report on Population Size and Agriculture of the District, DDAO, Dodola, Ethiopia.

DDARDO (2023). Dodola District Agricultural and Rural Development Office Annual Report

DDEO, (2023).Dodola District: Annual Report on Number of Schools in the District, DDEO, Dodola, Ethiopia.

DDHO (2023), Dodola District: Annual Report on Top Ten Human Diseases in the District, DDHO, Dodola, Ethiopia.

Derebe Alemneh (2021). Ethnobotanical study of plants used for human ailments in Yilmana Densa and Quarit districts of West Gojjam Zone, Amhara region, Ethiopia, *BioMed Research International,*18.

Dubey, S.And Sao, S., (2018). Antimicrobial activity of crude stem extracts of some medicinal plants against skin disease causing microbes from Chhattisgarh Region. *International Journal of Engineering Technology Science and Research*, (5)1:2394-3386.

Ermias Lulekal, Ensermu Kelbessa, Tamrat Bekele, and Haile Yineger (2008).An ethnobotanical study of medicinal plants in Mana Angetu Wereda, southeastern Ethiopia,*" Journal of Ethnobiology and Ethnomedicine,* Vol. 4, Issue 10.

Ermias Lulekal, Zemede Asfaw, Ensermu Kelbessa and Damme, P.V. (2013).

Ethnomedicinal Study of plants used for human ailments in Ankober District, North Shewa Zone, Amhara Region, Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 9(63):1-13.

Eskedar Abebe (2011). Ethno botanical study on medicinal plants used by local communities in Debark distirct, North Gondar zone, Amhara regional state.

FAO (2019).The future of livestock in Ethiopia; Opportunities and Challenges in the face of uncertainty.

Firew Bekele (2019).Ethnobotanical studies of medicinal plants used to treat human and livestock ailments in Southern Nations, Nationalities and Peoples, Region, Ethiopia: A Systematic Review : *Journal of Plant Studies*;(8)1.

Garuma Gerbaba (2020). Plant diversity and ethnobotanical study of traditional medicinal and wild edible plants in Yayo and Hurumu districts, Ilu Abba Bor Zone of Oromia Region, Southwest Ethiopia;.*International journal of advanced research*,5(3):1607-1613.

Gemedi Abdela, Zerihun Girma and Tesfaye Awas(2022).Ethnobotanical study of medicinal plant species in Nensebo District, south-eastern Ethiopia,*Ethnobotany Research and Applications* 24:6

Getnet Chekole(2017). Ethnobotanical study of medicinal plants used against human ailments in Gubalafto District, Northern Ethiopia.*Journal of Ethnobiology and Ethnomedicine,* 13 (1): 1-29.

Getnet ChekoleZemede Asfaw and Ensermu Kelbessa (2015).Ethnobotanical Study of Medicinal Plants in the environs of Tara- Gedam and Amba Remnant Forests in Libo Kemkem District,*" Journal of Ethnobiology and Ethnomedicine,* Vol. **1**, Issue **4**.

Getu Alemayehu (2017).Ethnobotanical study of plant diversity and ethnobotany of medicinal and wild edible plants in Amaro District Of Southern Nations, Nationalities And Peoples Region And Gelana District Of Oromia Region,

Southern Ethiopia.

Getu Alemayehu, Zemede Asfaw and Ensermu Kelbessa (2015).Ethnobotanical study of medicinal plants used by local communities of Minjar-Shenkora district, North Shewa Zone of Amhara Region, Ethiopia. *Journal of Medicinal Plants Studies*; 3(6):1-11.

Gideon Woldemariam, Sebsebe Demissew, and Zemede Asfaw (2021).An ethnobotanical study of traditional medicinal plants used for human ailments in Yem ethnic group, south Ethiopia, *Ethnobotany Research and Applications*,(22) 8.

Habtamu Tedila and Getu Dida (2019). Ethnobotanical study of traditional medicinal plants used for treatment of human and livestock ailments by traditional healers in Goba woreda, Bale Zone, Oromia, Southeast Ethiopia. *Journal of Natural Sciences Research* ;9(10).

Hailu Atnafu, Tesfaye Awas, Sisay Alemu and Sisay Wube (2018).Ethnobotanical study of medicinal plants in Selale Mountain ridges, North Shoa, Ethiopia.

Hamilton A.C.(2004). Medicinal plants, conservation and livelihoods .biodiversity conserve.

Jarsso Belay (2016). Ethnobotanical Study of Traditional Medicinal Plants used by Indigenous People of Jigjiga Wereda, Somali Regional State, Ethiopia,MSc. Thesis.Haramaya University, Haramaya, Ethopia.

Kedir Adem Usman, Meseret C. Egigu, J. Sasikumar Mahalingam, (2022). Ethnobotanical study on traditional medicinal plants used by Oromo ethnic people of Goro district, Bale zone of Oromia region, Ethiopia , *Ethnobotany Research and Applications*:(24)8.

Kent M, and Coker P, (1992). *Vegetation Description and Analysis: A Practical Approach*, Belhaven press, London, UK,

Leul Kidane and Gebremedhin Gebrecherkos and Beyene Tesfaye (2018).Ethnobotanical study of medicinal plants in Ganta Afeshum District, Eastern Zone of Tigray, Northern Ethiopia*Journal of Ethnobiology and Ethnomedicine*,14: 64.

Marshet Gijan and Gemedo Dalle (2019).Ethnobotanical study of medicinal plant in Negalle Arsi Disrict,West Arsi Zone of Oromia ,Ethiopia.*Journal of Natural Sciences and research*;9 (13):1-19.

Martin, G. J. (1995). Ethnobotany: A method Manual. Chapman and Hall, London. Pp. 265- 270.

Melaku Masresha (2019).Knowledge and Use of Medicinal Traditional Plant Species Ailments in Haramaya, Ethiopia.*International Journal of Environmental Chemistry*3(1):18-23.

Mengistu Gebrehiwot (2010). An Ethnobotanical Study of Medicinal Plants in Seru Wereda, Arsi Zone of Oromia Region, Ethiopia,M.Sc Thesis. Addis Ababa University, Addis Ababa, Ethiopia.

Mersha Ashagre, Ensermu Kelbessa and Gemedo Dalle (2016). Ethnobotanical study of medicinal plants in Guji Agro-pastoralists, Blue Hora district of Borana Zone, Oromia Region, Ethiopia; 4(2):170-184.

Misbahu Aman and Zemede Asfaw (2020).Medicinal Plants Used for Treating Human and Livestock Ailments in Tiyo District, Arsi Zone of Oromia, Ethiopia;*Addis Ababa University College of Natural Sciences*,1- 37.

Moa Megersa and Nugussie Tamrat (2022).Medicinal plants used to treat human and livestock ailments in Basona Werana district, North Shewa Zone, Amhara Region, Ethiopia, *Evidence-Based Complementary and Alternative Medicine*,18.

Moa Megersa and Samuel Woldetsadik (2022). Ethnobotanical study of medicinal plants used by local communities of Damot Woyde district, Wolaita Zone, Southern Ethiopia .*Nusantara Biosci,* 14:10-24.

Moa Megersa, Tesfaye Nedi and Shiferaw Belachew (2023).Ethnobotanical Study of Medicinal Plants Used against Human Diseases in Zuway Dugda District, Ethiopia. *Evidence-Based Complementary and Alternative Medicine,*22.

Mulugeta Kuma (2014).Use and Managment of Medicinal Plants by Indigenous People of Jima Rare District in Oromia Region, Ethiopia,M.Sc. Thesis.Haramaya University, Haramaya, Ethiopia.

Nestanet Gonfa, Dereje Tulu, Kitesa Hundera, and Dasalegn Raga (2020).Ethnobotanical study of medicinal plants, its utilization, and conservation by indigenous people of Gera district, Ethiopia,*Cogent Food & Agriculture*,(6)1.

Nigussie Amsalu (2010). An Ethnobotanical Study of Medicinal Plants in Farta Woreda, South Gondar Zone of Amhara Region, Ethiopia," M.Sc Thesis, Addis Ababa University, Addis Ababa, Ethiopia.

Nigussie Amsalu ,Yilkal Bezie ,Mulugeta Fentahun, Addisu Alemayehu, and Gashaw Amsalu (2018).Use and conservation of medicinal plants by indigenous people of Gozamin woreda, East GojjamZoneofAmharaRegion,Ethiopia:*Evidence-Based Complementary and Alternative Medicine*, 1-23.

Nuro, G. B., Tolessa, K., and Giday, M. (2024). Medicinal plants used by Oromo community in kofale district, West-Arsi zone, Oromia regional state, Ethiopia*. J. Exp. Pharmacol.* 16, 81–109.

Oladeji O (2016).The characteristics and roles of medicinal plants: some important medicinal plant in Nigeria. *National product Indian Journal,*12(3):102

Pieroni A, I. Vandebroek, J. Prakofjewa et al., (2020). Taming the pandemic, the importance of homemade plant-based foods and beverages as community responses to COVID-19,*Journal of Ethnobiology and Ethnomedicine*, (16) 75.

Reta Regassa, Tesfaye Bekele and Moa Megersa(2017).Ethnobotanical study of traditional medicinal plants used to treat human ailments by Halaba people,

southern Ethiopia,*Journal of Medicinal Plants Studies*,5(4): 36-47.

Singh AG, Kumar A, Tewari DD. (2022). An ethnobotanical survey of medicinal plants used in Terai forest of Wstern Nepal.*J Ethnobiol Ethnomed*, 8 (19):1-14

Sultan Suleman and Tamirat Alemu (2012).A survey on utilization of ethnomedicinal plants in Nekemte town, East Wellega (Oromia), Ethiopia,*" Journal of Herbs Spices and Medicinal Plants,* Vol, 18, Issue, 1, pp. 34-57.

Tadesse Abiyot (2018). Ethnobotanical study of medicinal plants used to treat human ailment in Guduru district, Oromia, Ethiopia.*Journal of Pharmacognosy and Phytotherapy.*

Tamene S, Addisu D, Debela E. (2020). Ethno-medicinal study of plants in Boricha district: Use, preparation and application by traditional healers, Southern Ethiopia. *J Med Plants Res* 14 (7): 343-353.

Tebkew Mekuanent, Asfaw Zebene and Zewudie Solomon (2015).Ethnobotanical Study of Medicinal Plants in Chilga District, Northwestern Ethiopia,*" Journal of Natural Remedies,* Vol. **15,** Issue **2**.

Tefera BN, Kim YD. (2019). Ethnobotanical study of medicinal plants in the Hawassa Zuria District, Sidama zone, Southern Ethiopia.*J Ethnobiol Ethnomed* 15: 25.

Tena Regassa (2016).Vascular plant diversity and ethnobotanical study of medicinal and wild edible plants in Jibat, Gedo and Chilimo Forests, West Shewa Zone of Oromia Region, Ethiopia Addis Ababa University .Addis Ababa, Ethiopia.163 -165

Tewodros Tesfaye (2016). Use and management of medicinal plants by people of Melka Belo district, East Hararghe,Oromia Region, Ethiopia: M.Sc. Thesis.Haramaya University, Haramaya.

Tilahun Tolossa and Moa Megersa (2018). Ethnobotanical study of medicinal plants used to treat human diseases in Berbere District, Bale Zone of Oromia Regional State, South East Ethiopia. *Evidence-based Complementary and*

Alternative Medicine,16.

TilahunTeklehaymanot and Mirutse Giday (2007).Ethnobotanical Study of Medicinal Plants used by People in Zegie Peninsula, Northwestern Ethiopia,*" Journal of Ethnobioogyl and Ethnomedicine*, Vol. **3**, Issue **12**.

Tizazu Gebre (2005). An ethno botanical study of medicinal plants in konso special wereda, southern Nations, and nationalities and people's regional state, Ethiopia,*"* M.SC.Thesis.Addis Ababa University, Addis Ababa.

Trotter R, (1986). Informant Consensus: A New Approach for Identifying Potentially Effective Medicinal Plants. In: Etkin NL, editors. *Plants in Indigenous Medicine and Diet: Biobehavioural Approaches*.

WHO (2002): World Health Orginazation traditional medicine strategy 200-2009: Geneva

WHO, (2019): *Global Report on Traditional and Complementary Medicine 2019*, World Health Organization, Geneva, Switzerland.

World Health Organization (WHO).(2002). WHO Monographs on Selected Medicinal Plants, Volume 2.WHO, Geneva, Switzerland.

World Health Organization (WHO).(2011). The World Traditional Medicines Situation, in Traditional medicines: Global Situation, Issues, and Challenges. WHO, Geneva, Switzerland.

Wubetu M, Abula T, Dejenu G. (2017). Ethnopharmacological survey of medicinal plants used to treat human diseases by traditional medical practitioners in Dega Damot district, Amhara, Northwestern Ethiopia. *BMC Res Notes* 10: 157.

Yirga Giday(2010). Ethnobotanical Study of Medicinal Plants in and Around Alamata, Southern Tigray, Northern Ethiopia.*Current Research Journal of Biological Sciences* 2(5): 338-344.

Zerihun Girma, Gemedi Abdela and Tesfaye Awas (2022). Ethnobotanical study of medicinal plant species in Nensebo District, south-eastern Ethiopia ,*Ethno*

APPENDICIES

Appendix 1 Checklist of questions used as basis for discussion and interview

Mada Walabu University

College of Natural and Computational Sciences

Department of Biology

This semi structured interview is designed to assess Ethnobotanical study of medicinal plants used to treat human and livestock Dodola District, West Arsi Zone, Ethiopia."The researcher kindly reminds the informants that the response given by them was used only as an input for the research work. In addition, the researcher would like to be grateful to the informants the sacrifices they paid in the interview.

I. General information.

I. Personal Information about informants:

Date of the interview_____ Kebele_____

Name of interviewer_____

Name of respondent_____

1. Gender A. Male B Female
2. Age 20-30 years, 31-40, 41-51years, Above 61
3. Level of education status A. Illiterate; B. Grades1-4 C. Grades 8-12 D. Grades 12 complete
4. Marital statusA. Married B. Single C. Divorced

Questionnaires and interview

1. What are the main common human health problems or disease in your locality?
2. What are the most common livestock health problems or diseases?
3. List plant species used to treat a given disease in your area?
4. List plants used treat both human &livestock disease?
5. Which plant do you use to treat that particular health problem?
6. Are medicinal plants easily accessible?
7. How do you assess a accessibility of medicinal plants whencompared with the past decade?
8. Dothe local people conserve the medicinal plants separately from other plants? A/yes B/no

9. Are the people in your area aware of the highly threatenedtraditional medicinal plants? A/Yes B/No.

10. If your answer for question #10is yes, are they ready to conservenot to lose the left?

Appendix 2: List of medicinal plants used for the treat human, livestock and both human and livestock diseases in the study area with growth (H:herb, T: tree , shrub S, C:climber)

Scientific Name	Family	Afaan Oromoo name	Habit	Coll. No.
Vachellia abyssinica Hochst. ex Benth.	Fabaceae	Laaftoo	T	KB-007
Acacia mearnsii De Wild.	Fabaceae	Hindheessaa faranjii	T	KB-008
Vachelli aseyal Del	Fabaceae	Waaccuu	T	KB-009
Aegopodium podagraria L.	Apiaceae	Qiinxaa	C	KB-127
Aframomum corrorima (Braun) Jansen	Zingebraceae	Koroorimaa	H	KB-052
Allium sativum L.	Amaryllidaceae	Qullubbii adii	H	KB-052
Anacamptis coriophora (L.) R.M. Bateman	Orchidaceae	Weesii gogorrii	H	KB-019
Arundinaria alpina (K.Schum.) Stapleton	Poaceae	Leemmana	H	KB-037
Asparagus africanus Lam.	Asparagaceae	Sariitii	Sh	KB-030
Aspilia mossambicensis (Oliv.) Wild	Asteraceae	Hadaa	H	KB-035
Bersama abyssinica Fresen.	Francoaceae	Koraqaa	T	KB-049
Beta vulgaris L.	Amaranthaceae	Hundee diimaa	H	KB-052
Bidens pilosa L	Asteraceae	Maxxannee	H	KB-029
Brassica carinata A. Br.	Brassicaceae	Goommana	H	KB-037
Brucea antidysentrica J.F. Mill.	Simaroubaceae	Ciiroontaa	T	KB-138
Canarina eminii Aschers ex Schweinf.	Campanulaceae	Maaracaa	CEpi	KB-114
Capsicum annuum L.	Solanaceae	Darraa	H	KB-052
Capsicum frutescens L.	Solanaceae	Mimmixa	H	KB -001
Carica papaya L.	Caricaceae	Paappaayyaa	T	KB-037
Carissa spinarum L.	Apocynaceae	Agamsa	Sh	KB-115

Catha edulis (Vahl) Forssk ex Endl.	Celastraceae	Caatii	T	KB-111
Citrus aurantium L.	Rutaceae	Qomxaaxxee	T	KB-017
Citrus limon (L.) Burn.f.	Rutaceae	Loomii	T	KB-018
Clematis simensis Fresen.	Ranunculaceae	Hidda fiitii	Cl	KB-052
Clutia abyssinica Jaub. & Spach.	Euphorbiaceae	Ulee foonii	Sh	KB-0119
Coffea arabica L.	Rubiaceae	Buna	T	KB-037
Cordia africana Lam.	Boraginaceae	Waddeessa	T	KB-052
Coriandrum sativum L.	Apiaceae	Dimbilaala	H	KB-084
Croton macrostachyus Del.	Euphorbiaceae	Bakkanniisa	T	KB-004
Cucurbita pepo L.	Cucurbitaceae	Buqqee	H	KB-015
Cymbopogon citratus (DC.) Stapf	Poaceae	Marga citaa	H	KB-016
Cynodon dactylon (L.) Pers.	Poaceae	Coqorsa	H	KB-052
Cyperus rotundus L.	Cyperaceae	Qeexamaa	H	KB-019
Datura stramonium L.	Solanaceae	Banjii	H	KB-018
Discopodium penninervum Hochst	Solanaceae	Maraaroo	S	KB-103
Echinops amplexicaulis Oliv.	Asteraceae	Qoree harree	H	KB-116
Echinops ellenbeckii D. Hoffm.	Asteraceae	Sokorruu	S	KB-052
Echinops kebericho Mesfin	Asteraceae	Bursa	H	KB-109
Embelia schimperi Vatke	Myrsinaceae	Qanquu	Li	KB-107
Ensete ventricossum (Welw.) Cheesman	Musaceae	warqee	H	KB-050
Eragrostis tef (Zucc.) Trotter	Poaceae	Xaafii	H	KB-107
Erythrina brucei Schweinf.	Fabaceae	Waleensuu	T	KB-037

Eucalyptus globulus Labill	Myrtaceae	Bargamoo adii	T	KB-067
Euclea divinorum Hiern	Ebenaceae	Mi`eessaa	Sh	KB-005
Euphorbia ampliphylla Pax	Euphorbiaceae	Adaamii	T	KB-075
Ficus sycomorus L.	Moraceae	Odaa	T	KB-120
Ficus vasta Forssk.	Moraceae	Qilxuu	T	KB-120
Foeniculum vulgare Miller	Asteraceae	Inshilaala	H	KB-018
Girardinia bullosa (Steud.) Wedd.	Urticaceae	Arbooyyee	Sh	KB-079
Grewia bicolor Juss.	Tiliaceae	Harooressa	T	KB-080
Hagenia abyssinica (Brace) J.F.Gmel.	Rosaceae	Heexoo	T	KB-078
Hordeum vulgare L.	Poaceae	Garbuu	H	KB-026
Hypericum revolutum Vahl	Hypericaceae	Garambaa	T	KB-052
Juniperus procera Hochst. ex Endl.	Cupressaceae	Gaattiraa	T	KB-009
Juniperus procera Hochst. ex Endl.	Cuppressaceae	Hindheessaa gaatiraa	T	KB-020
Kalanchoe laciniata (L.) DC.	Crassulaceae	Bosoqqee	H	KB-048
Kalanchoe petitiana A. Rich.	Crasulaceae	Hancuurraa	H	KB-054
Lantana camara L.	Verbenaceae	Qorsoo sinbira	SH	KB-123
Lepidium sativum L.	Brassicaceae	Shinfaa	H	KB-067
Linum ustitatissimum L.	Linaceae	Talbaa	H	KB-052
Lobelia rhynchopetalum Hems	Campanulaceae	Taruuraa	S	KB-009
Lycopersicon esculentum (L.) Mill.	Solanaceae	Timaatima	H	KB-037
Melia azedarach L.	Meliaceae	Miimii	T	KB-100
Morus alba L.	Moraceae	Goraa	T	KB-052

Musa x paradisiaca L.	Musaceae	Muuzii	H	KB-006
Negella Sativa L.	Ranunculaceae	Abasuuda guraacha	H	KB-088
Nicotiana tabacum L.	Solanaceae	Tamboo	H	KB-095
Ocimum americanum L.	Lamiaceae	Bssoobilaa	H	KB-087
Ocimum basilicum L.	Lamiaceae	Kefoo	H	KB-094
Ocimum lamiifolium Hochst. ex Benth.	Lamiaceae	Qorsaa michii	Sh	KB-093
Olea europea L. subsp. *cuspidata* (Wall. Ex G. Don) cif.	Oleaceae	Ejersa	T	KB-052
Opuntia ficus- indica (L.)	Cactaceae	Shookaa	Sh	KB-009
Physalis peruviana	Solanaceae	Mujuloo	H	KB-037
Phytolacca dodecandra L Herit.	Phytolaccaceae	Andoodee	Li	KB-092
Pinus patula Schiede ex Schltdl.	Pinaceae	Shuwaashuwee	T	KB-090
Pisum sativum L.	Fabaceae	Atara	H	KB-066
Plectranthus edulis (Vatke) Agnew	Lamiaceae	Dinnicha oromoo	H	KB-001
Podocarpus falcatus (Thunb.) R.B. ex. Mirb.	Podocarpaceae	Birbirsa	T	KB-013
Pomoea abyssinica (Choisy) Schweinf.	Convolvulaceae	Anannoo	C	KB-011
Pouteria adolfi-friederici (Engl) Baehni	Sapotaceae	Qararoo	T	KB-085
Premna schimperi Engl.	Lamiaceae	Urgeessaa	T	KB-052
Prunus africana (Hook. F.) Kalkm.	Rosaceae	Hoomii	T	KB-019
Psychotria orophila Petit	Rubiaceae	Buruurii	T	KB-033
Rhamnus prinoides L Herit.	Rhamnaceae	Geeshoo	Sh	KB-052
Rhoicissus tridentata (L. f.) Wild & Drummond	Anacordiaceae	Gaaleewaata	Cl	KB-109

Rhus ruspolii Engl.	Anacardaceae	Xaaxessaa	T	KB-037
Ricinus communis L.	Euphorbiaceae	Qobboo	H	KB-052
Rumex abyssinicus Jacq.	Polygonaceae	Dhangaggoo	H	KB-019
Rumex nepalensi Spreng.	Polygonaceae	Shaabbee	H	KB-014
Ruta chalepensis L.	Rutaceae	Ciraaddama	H	KB-006
Schefflera abyssinica (Hochst. ex A. Rich.) Harms	Araliaceae	Gatamaa	T	KB-022
Schefflera volkensii (Engl.) Harms	Araliaceae	Anshaa	T	KB-036
Schinus molle L.	Anacardaceae	Qundoobarbaree	T	KB-112
Solanium nigrumL	Solanacaea	Xunayyee	Cl	KB-052
Solanum anguivi Lam.	Solanaceae	Hidii seexanaa	Sh	KB-009
Solanum gigantum Jacq.	Solanaceae	Hiddii saree	Sh	KB-057
Solanum incanum L.	Solanaceae	Hiddii loonii	Sh	KB-052
Solanum tuberosum L.	Solanaceae	Dinnicha	H	KB-002
Stephania abyssinica (Dillon & A. Rich.)Walp.	Mensipermaceae	Hidda kalaalaa	H	KB-037
Syzygium guineense subsp. *guineense* (Willd.) DC.	Myrtaceae	Baddeessaa	T	KB-052
Tagetes patula L.	Asteraceae	Qorsamichii	H	KB-007
Teclea nobilis Del.	Rutaceae	Hadheessa	Sh	KB-042
Thymus schimperi Ronninger	Lamiaceae	Xooshinee	G	KB-019
Tragia durbanensis Kuntze	Urticaceae	Laalessaa	C	KB-037
Verbascum sinaiticum Benth.	Scrophulariaceae	Gurra harree	H	KB-083

Vernonia amygdalina Del.	Asteraceae	Eebicha	Sh	KB-074
Vicia faba L.	Fabaceae	Baaqelaa	H	KB-072
Vigna vexillata L. A.Rich.	Fabaceae	Gurra hantuutaa	H	KB-079
Zingiber officinale Roscoe	Zingebraceae	Gijinbila	H	KB-028

Appendix 2:List of medicinal plants used for Human ailments treatment in the study area Key: Hab= Habit (H-Herb, ShShrub, T-Tree, Cl-Climber and Li-Liana), PU (R-Root, B-Bark, Fr-Fruit, La-Latex, L-Leaves, St-Steam, S-Seed, Fl-Flower, BU-Bulb, WP-Whole part), RA-Root of application (O-Oral, N-Nasal, Op-Optical, D-Dermal, Ear,) and CO-Condition (FFresh, D-Dried F/D-Fresh or Dried

Scientific name	Afaan Oromoo name	Family	Hab.	PU	Preparation and application	DiseaseTreated	RA	CO
*Acacia abyssinica*Hochst. ex Benth.	Laaftoo	Fabaceae	T	L	Dried leaves powdered. mixed with *Jasminium abyssinica* leaves and tied on the head with butter	Leismaneseis	N	F
Albizia schimperiana Oliv.	Sisaa	Fabaceae	T	B	Dried bark of *Albizia schimperiana* powdered and applied on affected part	Wound	D	D
Allium sativum L.	Qullubbii adii	Alliaceae	H	BU	Underground bulbs pounded with seeds of then mixed with water and drunk.	Malaria	O	F
Asparagus africanus Lam.	Sariitii	Asparagaceae	Sh	L	Leaves chewed, mixed with honey and then spat on the skin.	Skin infection	D	F
Bidens macroptera(Sch. Bip. ex Chiov.) Mesfin	Keelloo	Asteraceae	H	L	Leaves put on fire and rubbed on affected part	Athletisfoot	D	F
*Brassica carinata*A. Br.	Goommana	Brassicac eae	H	S	Powdered and mixed with water then dunk.	Common cold	O	D
Brucea antidysentrica J.F. Mill.	Qomany o	Simarou baceae	T	L	Crushed with Leaves of *Bersema abyssinica* and cooked With porridge and given for children	Ascaris	O	F

*Canarina eminii*Aschers ex Schweinf.	Maaracaa	Campanulaceae	Cl	L, R	Crushed together, chewed and swallowed	Headach e	O	F
Carica papaya L.	Paappaay yaa	Caricaceae	T	L	When the leaves become yellow, that means getting todry, powdered and boiled in water and drunk one cup of tea for 5 days.	Malaria	O	F,D
*Carissa spinarum*L.	Agamsa	Apocynaceae	Sh	B	Chewed early before having breakfast	Stomach ache	O	F
Catha edulis(Vahl) Forssk ex Endl.	Caatii	Celastraceae	T	L	Leaves of *Catha edulis* crushed and boiled in water with leaves of *Ruta chalepensis,* fresh leaves of *Periploca linearifolia* and fresh leaves of *Englerina woodfordioides* then sugar added while it is boiling, put off from the fire and make to cool finally a cup of tea drunk for four days.	Cough	O	F
*Citrus aurantium*L.	Qomxaax xee	Rutaceae	T	Fr.	Suck the content of the fruit when suffered byhypertension	Hyperte nsion	O	F
Citrus limon (L.) Burn.f.	Loomii	Rutaceae	T	Fr	Crush the fruit and apply the content on bleeding gum	Gumblee ding	O	F
*Clematis simensis*Fresen.	*Hidda fiitii*	*Ranuncul aceae*	Cl	R	*Root crushed and given for cattle by mixing in water to get relief from Internal parasite*	*Intestina l parasite*	O	F
Coffea arabica L.	Buna	Rubiaceae	Sh	Fr	The dried coffee bean roasted and powdered	Diarrhea	O	D

					then given to the patient by mixing with honey.			
*Cordia africana*Lam.	Waddeessa	Boraginaceae	T	L	Leaves of *Cordia africana,* leaves *of Acanthus polystachius* crushed together with Feces of goat then put on fire the ash mixed with butter and creamed on affected part.	Spider poison	D	D/F
*Croton macrostachyus*Del.	Bakkanisa	Euphorbiaceae	T	LA	Exudates put on the cut skin to stop bleeding	Skinbleeding	D	F
Croton macrostachyus Del.	*Bakkanniisa*	*Euphorbiaceae*	T	R	*Dried root of Croton macrostachyus* Del. powdered and given to dog with 'injera' which suffered by Rabies	*Rabies*	O	D
Croton macrostachyus Del.	*Bakkanniisa*	*Euphorbiaceae*	T	R	*Dried root of Croton macrostachyus* Del. powdered and given to dog with 'injera' which suffered by Rabies	*Rabies*	O	D
*Cucumis ficifolius*A. Rich.	Faca`aa	Cucurbitaceae	H	R	Roots chewed and the juice swallowed or Root pounded, squeezed with water, and then drunk.	Stomach ache	O	F
Cucurbita pepo L.	Dabaaqula	Cucurbitaceae	H	S	The dried seed roasted and eaten	Tapeworm	O	D
Cymbopogon citratus (*DC.) Stapf*	Margacitaa	Poaceae	H	R	Root chewed with salt to get relief from stomach ache	Stomach ache	O	F
*Cynoglossum lanceolatum*Forssk.	Maxxannee	Boraginaceae	H	L	Leaves smashed and the exudates dropped in ear	Eardisease	E	F

Datura strumanium L.	Banjii	Solanaceae	Sh	L	Fresh leaves smashed and smelled	Nasalbleeding	N	F
*Echinops hispidus*Fresen.	Kebercho o	Asteraceae	H	B	Dried bark put on fire and the smoke inhaled	Evil eye	D	D
*Embelia schimperi*Vatke	Qanquu	Myrsinaceae	Li	Fr	Fruit eaten early in the morning	Tapeworm	O	F
Ensete ventricossum Cheesman	warqee	Musaceae	H	L	The latex half cup of tea taken to get relief fromstomach ache	Stomach ache	O	F
Eucalyptus globulus Labill	Akaakltii adii	Myrtaceae	T	L	Fresh leaves boiled in water and then the patient laiddown in it in order to inhale the smoke	Commo n cold	D	F
*Euphorbia tirucalli*L.	Cadaa	Euphorbia ceae	Sh	La	The milky latex dropped on affected part	Hemorrhoid	D	F
Ficus sycomorus L.	*Odaa*	*Moraceae*	T	B	*Fresh bark crushed and mixed with water and One loiter is given for big cattle and half Litter for calf*	*Worm*	O	F
Girardinia bullosa(Steud.) Wedd.	*Gurgubbe e*	*Urticacea e*	Sh	R	*Root powdered and mixed in water and applied orally*	*Blackleg*	O	D
*Grewia bicolor*Juss.	*Haroores sa*	*Tiliaceae*	T	B	*Bark of Grewia bicolor* grinded and mixed in water and salt added finally given for the cattle which placenta is delayed during delivery	*Delayed placenta*	O	F
*Grewia bicolor*Juss.	*Haroores sa*	*Tiliaceae*	T	B	*Bark of Grewia bicolor* grinded and mixed in water and salt added finally given for the cattle which placenta is delayed during delivery	*Delayed placenta*	O	F

*Grewia bicolor*Juss.	*Haroores sa*	*Tiliaceae*	T	B	*Bark of Grewia bicolor* grinded and mixed in water and salt added finally given for the cattle which placenta is delayed during delivery	*Delayed placenta*	O	F
Guizotia abyssinica (L.f.) Cass.	Nuugii	Asteraceae	H	S	Seed roasted powdered and the decoction drunk	Swelling	O	D
Hagenia abyssinica (Brace) J.F.Gmel.	Heexoo	Rosaceae	T	Fl	The dried or fresh floral part powdered soaked inwater and left for four days and taken with coffee before having break fast	Tape worm	O	F/D
Hordeum vulgare L.	*Garbuu*	*Poaceae*	H	S	*Seed covered and left to let germinate then grinded and mixed with remnants of local beer or 'tella' and given orally*	Blotting	O	D
*Indigofera arrecta*Hochst. ex A.Rich	Heennaa	Fabaceae	Sh	L	Fresh leaves powdered and mixed with butter and applied on the affected part for five days	Spider poison	D	D
Justicia schimperiana(Hochst. ex Nees)T. Anders.	Dhummu ugaa	Acanthaceae	Sh	L	Leaves put on fire with leaves of *Brucea antidysentrica* and rubbed on head	Headach e	D	F
Lagenaria siceraria (Molina) Standl.	Buqqee seexanaa	Cucurbit aceae	H	Fr	Put on fire and burn the affected part	Dandruff	D	F
*Lepidium sativum*L.	Shinfaa	Brassicaceae	H	S	Seed powdered and eaten with injera to get cure from malaria or rubbed the body for protection	Malaria	O	D

					from mosquito bite			
Linum ustitatissimum L.	Talbaa	Linaceae	H	S	The hair washed by seeds of *Linum ustitatissimum* and used as a soap	Dandruff	D	D
*Maesa lanceolata*Forssk.	*Abbayyii*	*Myrsinac eae*	Sh	L	*Leaves crushed and rubbed on the body*	*Worm*	D	F
*Malva verticillata*L.	Liitaa	Malvaceae	H	L	Leaves cooked and the smoke inhaled to get relief from 'Mich'	Fibril illness	N	F
Mirabilis jalapa L.	Ababa diimaa	Nyctagna ceae	Sh	Fr	The fruit has creamy powder then rubbed on affectedpart.	Hemorr hoid	D	F
*Nicotiana tabacum*L.	Tamboo	Solanacea e	H	L	Leaves crushed and mixed with water and drunk	Snakebit e	O	F
*Ocimum lamiifolium*Hochst. ex Benth.	Kasee	Lamiaceae	Sh	L	Leaves crushed and smashed then the extracts rubbed on affected part	Fibril illness	D	F
Ocimum urticifolium Roth	Ancabbii	Lamiaceae	Sh	L	Leaves crushed and smashed then the extracts rubbed on affected part	Fibril illness	D	F
Olea europaea L. subsp. *cuspidata* (Wall. ex G. Don) Cif.	Ejersa	Oleaceae	T	R	Fresh root chewed and swallowed	Stomach ache	O	F
Panicum hochstetteri Steud.	Marga gogorrii	Poaceae	H	L	Leaves chewed and swallowed	Kidneypr oblem	O	F
Phytolacca dodecandra L Herit.	Andoodee	Phytolacc aceae	Li.	R	Few root powdered and mixed with water and drunk for two days	Gonorrh ea	O	F
Plectranthus edulis(Vatke) Agnew	Dinnicha oromoo	Solanaceae	Sh	R	Root boiled and eaten	Loss ofappetit e	O	F

Prunus africana (Hook. f.) Kalkm..	Hoomii	Rosaceae	T	B	Powdered and tied for five days	Wound	D	D
*Rhamnus prinoides*L Herit.	Geeshoo	Rhamnaceae	Sh	L	Fresh leaves chewed and swallowed	Tonsillitis	O	F
Rhus ruspolii Engl.	Xaaxessaa	Anacardaceae	T	L	Leaves crushed and rubbed on affected part	Worm	D	F
Ricinus communis L.	Qobboo	Euphorbiaceae	H	R	Crushed and mixed with water and taken one cup of tea for 3consecutive days.	Rabies	O	F
*Rumex abyssinicus*Jacq.	Dhangaggoo	Polygonaceae	H	L	Leaves crushed and smashed then applied on affected part	Scabies	D	F
*Rumex nepalensis*Spreng.	Timijjii	Polygonaceae	H	R	Few root chewed and swallowed	Stomach ulcer	O	F
Ruta chalepensis L.	Ciraaddama	Rutaceae	H	L, R	The two parts chewed together and swallowed	S.ache	O	F
Saccharum officinarum L.	Shankora	Poaceae	Sh	St	Steam put in fire and eaten when get hot in order to getrelief from common cold	common cold	O	F
Schinus molle L.	Qundoobarbaree	Anacardaceae	T	S	Chewed and swallowed	Tonsillitis	O	F
*Solanum gigantum*Jacq.	Hiddii saree	Solanaceae	Sh	R	Root crushed and taken with coffee	Rabies	O	F
Solanum incanum L.	Hidi lonii	Solanaceae	Sh	Fr	Break the fruit and drop its content on wound to stopbleeding	Wound	D	F
Stephania abyssinica(Dillon & A. Rich.)Walp.	Hidda kalaalaa	Mensipermaceae	H	WP	The whole part of *Stephania abyssinica* crushed and boiled in water then the smoke will be inhaled until the patient	Common cold	O	F

					getting sweat			
Vernonia amygdalina Del.	Eebicha	Asteraceae	Sh	L	Leaves crushed and soak in water and the exudates drunkfor five days	Malaria	O	F
Vicia faba L.	Baaqelaa	Fabaceae	H	S	Seed chewed to get relief from gastric	Stomach ulcer	O	D
*Zingiber officinale*Roscoeae	Jinjibila	Zingebraceae	H	R	Chewed and swallowed	Tonsillitis	O	F