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Ethnobotanical study of medicinal plants used to treat human and livestock diseases in Estie District, South Gondar Zone, Ethiopia,

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GRADUATE STUDIES OFFICE

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DEPARTMENT OF BIOLOGY

ETHNOBOTANICAL STUDY OF TRADITIONAL MEDICINAL PLANTS USED TO TREAT HUMAN AND LIVESTOCK DISEASES IN ESTIE DISTRICT, SOUTH GONDAR ZONE OF AMHARA REGION, ETHIOPIA

BY
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A THESIS SUBMITTED TO THE DEPARTMENT OF BIOLOGY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS OF SCIENCE DEGREE IN BIOLOGY (BOTANICAL SCIENCE)

BY
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JULY, 2023
BAHIR DAR, ETHIOPIA

DECLARATION

This is to certify that the thesis titled **"Ethnobotanical study of medicinal plants used to treat human and livestock diseases in Estie District, South Gondar Zone, Ethiopia**," submitted in partial fulfillment of the requirements for the degree of Master of Science in Biology (Botanical Science), Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree duely certificate. The assistance and help I received during the course of this investigation have been acknowledged.

Tirualem Adane _____ _____

Name of the candidate Signature Date

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ADVISOR'S APPROVAL FORM

Approval of thesis for defense

I hereby certify that I have supervised, read, and evaluated this thesis entitled "**Ethnobotanical study of traditional medicinal plants used to treat human and livestock diseases in Estie District, South Gondar Zone of Amhara Region, Ethiopia**" by Tirualem Adane, prepared under my guidance. I recommend the thesis be submitted for oral defense.

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Department head	Signature	Date

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EXAMINER'S APPROVAL FORM

Approval of thesis for defense result

We hereby certify that we have examined this thesis work entitled "**Ethnobotanical study of traditional medicinal plants used to treat human and livestock diseases in Estie District, South Gondar Zone of Amhara Region, Ethiopia"** by Tirualem Adane. We recommend that is approved for the degree of masters".

Board of Examiners

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Internal examiner's name	Signature	Date
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Chair person's name	Signature	Date

DEDICATION

I dedicated this thesis work to my husband Tewodros Gizaw who have played an unreserved role in the completion of the research, and to the people of Estie district, especially to my informants who have participated and shared their incredible knowledge in the study.

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ACRONYMS

EWAO	Estie Wereda Agricultural Office
EWARDO	Estie Wereda Agricultural and Rural Development Office
FL	Fidelity Level
IK	Indigenous knowledge
M.A.S.L	Meter Above sea level
MPs	Medicinal plants
MSc	Master of Science
TMPs	Traditional medicinal plants
WHO	World health organization

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ABSTRACT

Around 80% of the population uses plant based traditional medicine in Ethiopia. The primary goal of this study was to investigate and document medicinal plants used to treat human and livestock diseases in the Estie district. Ethnobotanical data were collected from January to March 2023 on trips made to six sites. In a total of 120 informants and 24(18 men and 6 women) key informants were selected through purposive sampling technique and other ordinary respondents were selected by lottery method. Primary data sources are the source for this study. The ethnobotanical data were collected through group discussion, semi-structured interview, field observation, and market survey. The data were analyzed by using descriptive statistics, preference ranking, direct matrix ranking, and fidelity level. A total of 120 MPs species in 97 genera and 52 families were collected and documented. From those, 105 MPs species were used for the treatment of human diseases, 35 MPs species were used for treatment of livestock diseases. Fabaceae, Solanaceae, and Poaceae were the most widely utilized families. MPs were collected from wild 77 (64.2%) species, home garden 23 (19.2%) species, crop field 9 (7.5%), and in both the wild and home gardens 11 (9.2%) species. Herbs constitute the highest category with 54 species (45%), followed by shrubs with 42 species (35%), trees with 16 species (13.3%), and climbers with 8 species (6.7%). The local communities mostly use leaves 89 (39.4%), followed by roots 57 (25.2%) and seeds 39 (17.3%). Fresh plant materials were used more frequently 139(61.5%) followed by dried 66(29.2%) and fresh or dried 21(9.3%). The most widely used method of preparation were pounding 60 preparations (26.5%), followed by squeezing with 29 preparations (12.8%), and crushing with 27 preparations (11.9%). Preparations were administered mostly by oral 119 (52.7%), followed by dermal 72 (31.9%), and fumigation 14 (6.2%). There was a high preference for Ficus palmata to treat wound infection. Eucalyptus globulus was the most multipurpose use plant. In general, the study area is abundant in MPs, which play an important role in the treatment of various human and livestock diseases. Encouraging traditional healers by providing training, professional supporting, and integrating their work with modern healthcare system were recommended.

Keywords: Disease, Ethnobotany, Ethnoveterinary, Medicinal plant, Traditional healer

1. INTRODUCTION

1.1. Background of the study

Ethnobotany is the study of the relationship between plants and humans: the "ethno" study of people and the "Botany" study of plants (Martin, 2004). Ethnobotany is the study of interactions and relationships between plants and humans in time and space (Ijaz *et al*., 2016). The definition of ethnobotany can be summed up in four words: humans, plants, interaction, and use (Ijaz *et al*., 2017). Aumeerudy introduced the modern concept of ethnobotany in 1996. Ethnobotany has its roots in botany (Rahman *et al*., 2019). In fact, medicine and botany have always had strong and close connections as most modern medicines come from plant sources. A new science deals with the various principles that govern such relationships between man and nature (Micozzi, 2014). Ethnobotanical studies encompass all aspects of man's interactions with plants, including their medicinal, religious, indigenous, cultural beliefs, and uses (Rahman *et al*., 2019). Ethnobotany is a knowledge base field exploring the link between plants and folk (Sharma *et al*., 2020).

Traditional medicine refers to medical procedures, theories, methods, and viewpoints that use manual techniques, exercises, spiritual therapies, and medications; derived from plants, animals, and minerals either alone or in combination to treat, identify, and avoid disease or maintain health (WHO, 2006). It is the sum total of knowledge, skills, and practices based on theories, beliefs, and experiences indigenous to various cultures, whether explicable or not, used in health maintenance and the prevention, diagnosis, improvement, or treatment of physical and mental illnesses (WHO, 2008).

Plants have served diverse purposes for people since the beginning of civilization. They have been utilized as food sources, medicines for both humans and livestock, as well as materials for crafting, constructing, fuel, paints, and even poisons (Gerique, 2006). According to Dery *et al*. (1999), historical records reveal that medicinal plants were utilized by various civilizations as early as 5000 to 4000 BC in China, and by Syrians, Babylonians, Hebrews, and Egyptians around 1600 BC as cited by Mohammed Adefa and Berhanu Abraha (2011). According to WHO

(2002), the majority of the world population (70-90%) use plant remedies for their primary health care system as cited by Onyambu *et al*. (2019).

In Ethiopia, where around 80% of the population uses plant-based traditional medicine based on IK as their main primary health care system, traditional medicinal practices are widespread (Melaku Masresha, 2019).

Like other districts of Ethiopia, Estie district has a lack of documenting medicinal plants and efforts. Even though, it is known that district has relatively better plant resources and associated traditional knowledge resources are expected to be significant. The current trend in plant use indicates that the environment, like other parts of the country, is struggling with resource depletion and the loss of IK (Berhanu Shewangizaw, 2023). In order to preserve and use these therapeutic plants sustainably, the careful ethnobotanical study is crucial. MPs have been employed as traditional medicine in many Ethiopia regions to cure a variety of human illnesses. People who live in these places particularly in Estie district are familiar with using several species of medicinal plants.

1.2. Statement of the problem

Both emerging and developed nations are showing an increase in the demand for medicinal plants, and the majority of their material trade still comes from plants that have been taken from the wild (Handa, 2022). Increased usage of complementary and alternative medicine in many developed nations suggests that factors other than tradition and cost are at work (Lam *et al*., 2022). Due to its lower cost when compared to contemporary medical treatments, traditional medicine derived from plants is becoming more common in underdeveloped nations (Haris *et al*., 2023). However, due to deforestation for agricultural development, firewood and charcoal production, environmental degradation, modernity, and climate change, which could ultimately undercut the primary healthcare alternatives, the medicinal plants and the accompanying knowledge are at grave risk (Maja and Ayano, 2021). Therefore, ethnobotanical research and subsequent conservation efforts are required to protect therapeutic plants and the knowledge that goes with them from further extinction. This requires documentation of the MPs and their associated IK before it is too late for their sustainable use.

Traditional plant knowledge is being lost without being scientifically documented (Martin, 2014). As a result, the study area was chosen because there is no documented report on

ethnobotanical information of traditional medicinal plants used by the local community; the marketability of medicinal plants in Estie District is unclear, which necessitates further investigation. The study aims to fill this gap by documenting indigenous knowledge about medicinal plants.

1.3. Objectives of the study

1.3.1. General objective

The general objective of this study was to investigate and document the traditional medicinal plants used in Estie district to treat both human and livestock diseases.

1.3.2. Specific objectives

The specific objectives of this thesis were to:

- ✓ identify important medicinal plant species used to treat human and livestock diseases in the study area
- ✓ identify medicinal plant parts used to treat human and livestock diseases in the study area;
- ✓ describe the method of preparation, ways of application, dosage of prepared remedies, and routes of administration used by the local people in the study area;

1.4. Research questions

- ✓ What are the important MPs used to treat human and livestock diseases in the study area?
- ✓ Which parts of plants are used to treat human and livestock health problems in the study area?
- ✓ How to describe the method of preparation, ways of application, dosage of prepared remedies, and routes of administration used by the local people in the study area;

1.5. Significance of the study

This study was carried to document traditional medicinal practices derived from medicinal plants by the traditional healers and indigenous people of Estie district, transfer IK to future generations

in documented form, facilitate teaching and learning, and identify the dose, preparation, routes, and treatment of ethnobotanical MPs in the study area.

1.6. Scope of the study

The study was conducted in Estie district on the ethnobotanical study of traditional MPs used to treat human and livestock diseases. Therefore, the study concentrates on the identification and documentation of different plant species used to treat different human and livestock diseases in the study area. The study covers only six (6) sample kebeles in Estie district. As a result, the study was limited to identifying the plant species, documenting the IK of the people about MPs, and to describing the methods of preparation as well as ways of application of these MPs in the study district.

1.7. Limitation of the study

The limitation of this study was that it did not identify the phytochemical investigation and antibacterial activities in Estie district.

2. REVIEW OF LITERATURE

2.1. Origin and development of ethnobotanical study

According to Balick (1996) John Hershberger proposed the term ethnobotany for the first time in 1895 as cited by Alemitu Adane (2018), however this term has been given different interpretations and definitions depending on the interest of workers involved in the study (Cotton, 1996). Ethnobotany is a multidisciplinary science defined as the interaction between plants and people. It is also defined as local people's interaction with their natural environment: how they classify, manage, and use the plants in their immediate surroundings (Martin, 2014).

All studies on the interactions between plants and traditional people are included in ethnobotany. One of the connections between people and plants is IK of traditional medicine (Mekonen Woldetsadik, 2018). As a result, humans rely on plants for both nutrition and the creation of medicines. Ethnobotany is the study of how plants have been or are currently utilized, controlled, and perceived in human civilizations. This covers how they are used in food, medicine, rituals, social life, and other ways (Riestity and Herliani, 2022). In order to understand how local people have historically used plants for diverse purposes and how they incorporate plants into their cultural history and religion, ethnobotanical research is necessary (Prakofjewa *et al*., 2022).

As stated by Martin (2010) to achieve more detailed and reliable information of plants and plant use, ethnobotanical study needs involvement of specialists from various disciplines, such as plant taxonomists, plant ecologists, anthropologists, linguists, economic botanists, pharmacologists and others. With such interdisciplinary and multidisciplinary approaches, Ethnobotany is aimed at gathering and documenting indigenous botanical knowledge, cultural practice, use and management of botanical resources and discovers benefits from plants.

Ethnobotany describes the requirements, uses, and management of the local community's plant resources. The preservation of ethnobotanical knowledge as a component of live cultural practices and knowledge between communities and the environment is crucial for the preservation of biodiversity (Haris *et al*., 2023). Ethnobotany is also to save foreign exchange. Moreover, the development of MPs in primary health care not only were save the foreign exchange but also were aid in conserving our national heritage (Muhidin Tahir *et al*., 2023). By acting as a foundation for the creation of novelties in drugs, MPs play a crucial part in the growth and advancement of research studies (Ndhlovu *et al*., 2023). Application of ethnobotany can

strengthen the preservation of cultural diversity, increase the sustainability of the use of plant resources, and result in the creation of new plant-based products. Additionally, the use of ethnobotany can contribute to rural development by finding and promoting locally beneficial plant resources, encouraging effective conservation practices in natural management and conservation, and exploring for biodiversity (e.g. selecting plants for drug developments) (Ogwu and Osawaru, 2022).

2.2. Indigenous knowledge

Indigenous knowledge (IK) is the local information that is specific to a particular culture or civilization. It serves as the foundation for local decision-making in rural communities' agriculture, health care, food preparation, education, management, and a variety of other activities (Sharma and Pradhan, 2023). IK is the body of information developed over a long period of time via careful observation, trial and error, and experience (Yeneayehu Fenetahun and Girma Eshetu, 2017). This knowledge is cumulative and dynamic, having been developed over generations of individuals who live close to nature. IK evolves and transforms over time and space as resources and cultures change. As a result, such information also incorporates tried-and-true methods that emerged from how people interact with their surroundings (Mulsow *et al*., 2019). The use of plants as medicine by humans is one of the IK. When prehistoric man began to choose his food from local plants, he must have saved some of those that he discovered helped treat certain maladies or that he believed would prevent disease (Morris, 2010).

Indigenous people have a unique understanding of their local environment, which includes knowledge of specific plants utilized for food, medicine, building materials, and other purposes (Yeneayehu Fenetahun and Girma Eshetu, 2017). Research indicates that the indigenous human knowledge of MPs is disappearing at a startling rate (Yebirzaf Yeshiwas *et al*., 2009). Rapid land degradation, including faster forest destruction, people's availability to modern medicine, exposure to modern society, and acculturation are the key factors in the disappearance of IK (Mersha Ashagre *et al*., 2016; Yoseph Maru *et al*., 2020; Ashenafi Osman *et al*., 2020). IK is a comprehensive body of knowledge, principles, and practices that evolves over time and space. As a result, this knowledge also incorporates tried-and-true methods that are developed via human contact with the environment (Badege Bishaw *et al*., 2013). IK is a body of knowledge that has been collected by a population over generations of close touch with the natural world. It

is cumulative and dynamic (Fikadu Gebeyehu, 2020). It expands on human history and changes in social, economic, environmental, spiritual, and political spheres. Individual community members' levels and types of traditional knowledge vary depending on their gender, age, social standing, occupation, and intellectual prowess (Tamothran *et al*., 2017). Consequently, systematic IK application is crucial for sustainable resource usage and development (Yeneayehu Fentahun and Girma Eshetu, 2017).

Indigenous knowledge (IK) is becoming more widely discussed in the context of sustainable development and biodiversity preservation (Mathewos Agize *et al* 2013). By requiring signatories to "respect, preserve and maintain knowledge, innovations and practices of indigenous and local people embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity," the Convention on Biological Diversity has contributed to this process (Mondal *et al*., 2022). (IK), particularly in the developing world, has gained recognition in recent decades as having a significant impact on natural resource management systems (Belay Beyene *et al*., 2016).

IK on remedies in many countries including Ethiopia passed from one generation to the other generation verbally with great secrecy (Mohammed Adam, 2020). IK or ethnomedical knowledge is subject to distortion due to such crude and secretive transfer, and most of the time, some of the tradition is lost at each point of transfer (Mersha Ashagre, 2016). Therefore, there is a need for systematic documentation and record-keeping of such useful knowledge through ethnobotanical research, recording and using IK, raising community awareness of the value of IK, assisting communities in recording and documenting their local practices by providing computers, video equipment, etc. In addition, making IK accessible to disseminate IK back to the community through newsletters, videos, books, and other media (Yeneayehu Fenetahun and Girma Eshetu, 2017).

2.3. Traditional medicinal plants

According to the World Health Organization (WHO), Working with medical professionals is particularly helpful in establishing and incorporating pertinent strategies into the planning and budgeting framework for health care provision in the majority of developing countries and indigenous communities. Traditional medicine is preferred over contemporary medicine for a number of reasons, accessibility, therapeutic effectiveness, and affordable health care services as

cited by (Mekonen Woldetsadik, 2018). The traditional healthcare system's recognition suffers from a lack of precision and standardization. The absence of precise dosing in traditional medicine is another drawback that might result in toxicity (Eyayaw Birile, 2020). The measurements used to calculate dosage are not standardized; depend on the patient's age and physical characteristics, the sociocultural justification for the illness, the diagnosis, and the herbalist's level of experience (Ermias Lulekal *et al*., 2013).

The use of MPs in human health care is significant and popularized worldwide due to great contribution by traditional practitioners (Fikadu Gebeyehu, 2020). Utilizing resources that are readily available locally, numerous indigenous local cultures have created a variety of traditional systems for the relief of health issues (Fozia Mohammed, 2021).

In developing countries up to 80% of populations depended on plants for their primary healthcare Yebirzaf Yeshiwas *et al*., (2009) and the value of MPs to human livelihoods is essentially infinite (Zeleke Assefa, 2019). MPs have source for the invention of novel drugs Zelalem Getnet *et al*., (2016) and 25% of modern drugs contain one or more active principles of plant origin Calixto (2019) and According to Ohigashi (2008) top 25 best-selling medicines in the world originated from plant materials as cited by (Zeleke Assefa, 2019). Plant based drugs provide outstanding contribution to modern therapeutics (Ahmed Hassen *et al*., 2022).

When it comes to supporting their health, earning a living, and securing their way of life, traditional MPs play a typical role in the lives of many people (Birhanu Adibaru and Samuel Chane**,** 2021). Almost all life on Earth benefits from plants and MPs in particular. One of the most important roles of plants is their phytomedicinal role, or the advantages of MPs. Numerous authors, including Berhan Amsalu (2020), Debela Daba and Biniyam Asfaw (2020), Getachew Alebie *et al*., (2017), Marshet Gijan and Gemedo Dalle (2019), and Yebirzaf Yeshiwas *et al*., (2009), have noted the disadvantages of conventional medicine. One problem with the old healthcare system's recognition is its lack of precision and standardization. Another drawback of traditional medicine is the lack of precise dosing, which may cause toxicity (Getnet Chekole *et al*., 2015). The measurements used to determine the dosages are not standardized, depend on the age and physical appearance of the patient, the sociocultural explanation of the illness, the diagnosis, and the experience of the individual herbalist (Mersha Ashagre and Ermias Lulekal, 2021). Indigenous peoples' traditional medical procedures were primarily based on private practice, or private agreements between consenting parties, and traditional knowledge has

typically been passed down orally through folklore (Mersha Ashagre *et al*., 2016). The secret information retained by traditional healers is relatively less susceptible to distortion but less accessible to the public (Mekonen Woldetsadik, 2019). However, the knowledge is dynamic as the practitioners make every effort to widen their scope through the reciprocal exchange of limited information with each other (Yeneayehu Fenetahun and Girma Eshetu, 2017).

2.4. Traditional medicinal plants in public health care system in Ethiopia

The benefits of MPs have contributed to modern medicine by serving as ingredients for medications or by playing a key role in their discovery, with some medications having a botanical origin and being derived from plants (Yebirzaf Yeshiwas *et al*., 2009). Plants in general and MPs in particular are significant, fundamental, and most useful to almost all life on Earth (Yeneayehu Fenetahun and Girma Eshetu, 2017). About 80% of human population and over 90% livestock in Ethiopia rely on traditional medicine (Mersha Ashagre *et al*., 2016). Thus, today in Ethiopia there is a large magnitude of use and interest in MPs due to socio- cultural acceptability, accessibility, affordability and biomedical benefits of the traditional MPs. In other words, in all regions of the country traditional medicine has high acceptability since it is an integral part of the local culture and hence, people often rely on their efficient and less costly alternative health care (Fikadu Gebeyehu, 2020). Many people's life depends on MPs for their health, livelihood, and ability to pay their bills. Plants have been essential and the most significant sources of both medicinal and Since ancient times, people and livestock have been prepared traditionally (Gadisa Demie *et al*., 2018).

Plants have long been used as a source of traditional medicine in Ethiopia to treat various ailments and human sufferings (Reta Regassa *et al*., 2017). Traditional medicine has become an integral part of Ethiopian culture as a result of its long history of practice and existence (Tezera Jemere *et al*., 2020). According to Dawit Abebe (2001), there is a large magnitude of use and interest in MPs in Ethiopia due to acceptability, accessibility and biomedical benefits as cited by Mersha Ashagre *et al*., (2016). In this country, the long history of use of MPs is reflected in various medico- religious manuscripts produced on parchments and believed to have originated several centuries ago (Berhanu Shewangizaw, 2023).

MPs play typical role in the lives of many people in terms of health support, financial income and lively hood security (Zerihun Doda, 2017). Since the beginning of time, plants have been essential and the most significant sources of traditional preparations for both preventive and therapeutic care for humans and livestock (Mersha Ashagre, and Ermias Lulekal, 2021). Due to their ability to photosynthesis, plants serve as the foundation of the biological food chain, generating the essential element for life oxygen and regulating the gases in our surroundings (Tivy, 2018). Additionally, plants recycle vital nutrients, create healthy soil, and safeguard water catchment areas. Through the process of transpiration, they help to manage rainfall by maintaining biological and climatic balances. In addition, each of these advantages of plants is associated, either directly or indirectly, with health care (Elbasiouny *et al*., 2022).

2.5. Plants in ethnoveterinary medicine in Ethiopia

Ethnoveterinary medicine, which is the term for traditional knowledge and practices in animal health care, includes herbal medicines, traditional surgical and manipulation procedures, traditional immunization, and magic-related religious activities and beliefs. It also includes management approaches (Menzir Awoke and Adeladlew Tesfaye, 2020). Traditional medications are offered by ethnoveterinary medicine; they are frequently more affordable than conventional therapies and are accessible locally (Menzir Awoke and Adeladlew Tesfaye, 2020). Owners of livestock can prepare and use homemade medicines for little cost. Traditional MPs are currently the only option for many livestock owners in rural areas where there are comparatively few veterinarians and shortages of other facilities to address various maladies (Teka Feyera *et al*., 2017).

When and where stock raisers have no alternative options for providing animal health care, whether in rural or peri-urban regions, ethnoveterinary treatment might be helpful. Despite being of utmost importance as a system for animal health care, traditional veterinary procedures in Africa and Ethiopia were not well-recorded (Fisahaye Abraha, 2016). Therefore, raising public understanding of ethnoveterinary medicine, particularly of the helpful herbs used to cure livestock, is crucial for effective livestock management. Additionally, for the purpose of planning and putting into practice successful livestock production, it is crucial to properly document and comprehend farmers' knowledge, attitudes, and practices regarding the

occurrence, cause, treatment, prevention, and control of various ailments (Mersha Ashagre, and Ermias Lulekal, 2021).

Livestock production is crucial to the livelihood and economics of the majority of the population in Ethiopia, as it is in other developing nations. Animal-provided traction power is almost entirely necessary for crop production (Fredu Nega *et al*., 2012). In many severe areas, livestock is the only means of life. It also serves as a catalyst for food security and sustainable development in underdeveloped nations like Ethiopia (Ndemo Okoyo, 2018).

Even though the profit from raising livestock is strongly tied to upholding animal health standards, Ethiopia has one of the weakest veterinary medical systems in the world. Among cattle owners, there is widespread understanding of methods for treating common maladies (Belay Beyene *et al.,* 2016). Others, on the other hand, are only known to a small number of native professional healers who have over the course of a year acquired the discipline. Farmers and herders who raise livestock have each evolved unique strategies for maintaining the health and productivity of their livestock (Assemu Tesfa, and Shigdaf Mekuriaw, 2014). They use traditional home medicines, surgical procedures, and manipulative approaches to cure and prevent animal diseases. These traditional local ideas and techniques for caring for animals collectively make up ethnoveterinary medicine (Menzir Awoke and Adeladlew Asnakew, 2020). Ethnoveterinary medical practice and skills, like other types of local technical knowledge, are developed through time by empirical observation, primarily through trial and error and occasionally through purposeful or even desperate experimentation and innovation (Tizazu Worku, 2018). Therefore, raising public awareness of ethnoveterinary medicine and emphasizing the value of plants used to cure cattle is crucial for effective livestock management (Melese Mengistu *et al*., 2017).

Designing and implementing successful livestock production also requires accurate documentation and an awareness of farmers' knowledge, attitudes, and practices on the occurrence, cause, treatment, prevention, and control of various diseases (Hailay Abrha *et al*., 2016).

In Ethiopia, the bulk of the population's livelihood and economy are significantly influenced by the production of cattle. In terms of the number of cattle, Ethiopia is one of the top African nations (Mekonen Wolditsadik, 2018). Ethiopia has a large population of livestock, but it has one of the lowest per capita incomes in the world. A portion of the low yield can be attributed to the

livestock's poor health. The economic effectiveness of livestock production in Africa is being negatively impacted by the ever-declining availability of animal health services and the emergence of numerous epizootic diseases (Chala Tadesse, 2017).

2.6. Sources of medicinal plants

MPs harvested from wild vegetation and home garden and the local people of the study area are closely dependent on MPs harvested from the wild forests (Mihretu Berie, 2021). Wild habitats (natural ecosystems) like forests, grasslands, wetland, field margins, garden fences, as weeds, and many other microhabitats are where MPs are found and harvested when necessary. Everyone who wishes to practice traditional medicine for their family is welcome to use these free resources (Menzir Awoke and Adeladlew Tesfaye, 2020). MPs also found in home gardens, and farming sites (Netsanet Gonfa *et al*., 2020).

2.7. Threats to traditional medicinal plants in Ethiopia

Traditional medicine in Africa, especially Ethiopia, has experienced sustainability challenges (Tariku Laelago *et al*., 2016). The main causes of this issue are the extinction of MPs species, ecosystems, and IK (Dejene Mengistu *et al*., 2022). The vast majority of Ethiopians' MPs come from natural settings, which suggests that a high rate of taxa with associated local knowledge and loss of widely distributed MPs species is occurring (Mersha Ashagre, and Ermias Lulekal, 2021). The loss of IK, the extinction of medical plant species, and the devastation of MPs habitats are the main causes of this issue (Getnet Chekole, 2017).

Threats to MPs can come from both man-made and natural causes (Mohammed Yimam *et al*., 2022). Human-caused risks to MPs include a rapid rise in population, the need for fuel, urbanization, wood production, overharvesting, destructive harvesting, invasive species, commercialization, honey cutting, degradation, agricultural expansion, and habitat devastation (Terefe Argaw, 2021). Habitat loss, urbanization, agricultural expansion, investment, road development, and deforestation are the main risks to MPs. These factors are causing MPs to decline and lose their habitats. A suitable strategy for addressing the issues related to the extinction of MPs and their habitats as well as for cataloguing MPs could be community- and research-based conservation mechanisms (Admasu Moges and Yohannes Moges, 2019).

3. MATERIALS AND METHODS

3.1. Description of the study area

The study was carried out in Ethiopia's Estie District, South Gondar Zone, and Amhara Region. It is bounded on the south by the Abay River, which separates it from the East Gojjam zone, on the west by Dera, on the northwest by Fogera, on the north by Farta, on the northeast by Lay Gayint, and on the east by Simada. It is located around 100 km north of Bahir Dar and about 676 km northwest of Addis Abeba. There are 6 urban kebeles and 41 rural kebeles in it. This district has an altitude range of 1261-4114 m and is situated between the latitudes of 11°10'N and 11°50'N as well as the longitudes of 37°40'E and 38°20'E (Figure 1).

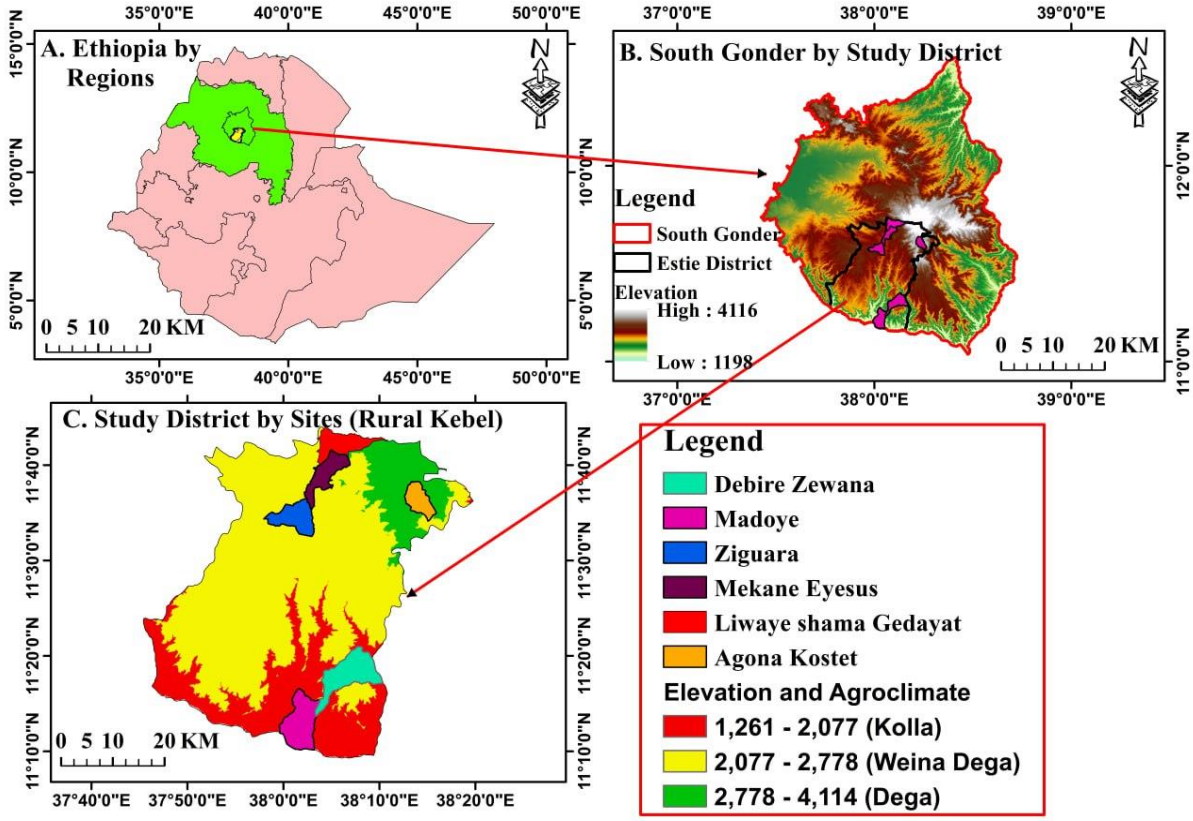

Figure 1: Map of the study area

3.2. Climate and ecology of the district

The district's agro ecology is divided into three climatic zones: high land (44.01% dega), moderate height (50.8% Woina dega), and low land (5.08% kola). The three cropping seasons in the district are kiremit (summer, the primary crop season): June, July, and August; bega (winter with a short rainy season): December, January, and February; and meher (autumn): September, October, and November (EWARDO, 2015).

3.3. Topography and soil

Estie district areas are characterized by a variety of geomorphologic features. Of which 39% is wotageba (undulating), 35% is plain, 6% is mountainous, 15% is valley, and 5% is marshy. According to EWARDO (2015), the district's soil types were: 30% red soil, 10% black soil, and 60% brown soil.

3.4. Population

The district had a total population of 267,478 people, 136,158 men, and 131,320 women. The district's predominant ethnic group is Amhara, and Amharic is the primary language of both the district and its administrative zone. Almost 88% of the population identified as Orthodox Christians, whereas 12% identified as Muslims (EWAO, 2015).

3.5. Land use patterns of Estie District and Agriculture

The total surface area of the district is 137,889.5 square kilometers, which is subdivided into 41 rural and 6 urban kebeles. The altitude of the district ranges from 1261 m to 4114 m.a.s.l. According to a survey of the land in this district, 51693.1 hectares are for cultivation, 19751.08 hectares are for grazing, 15367 hectares are for the forest, 13100 hectares are for bush land, 4520 hectares are covered with water; 13269.5 hectares are for construction, 1800 hectares are for non-use, and others 137.5 hectares (EWAO, 2015).

It is known that 93% of the population of the district lives in rural areas, and 7% lives in sub-urban areas. 78% of the farmers are managed by combined agriculture, 10% by farming (agriculture only), 3% by handicrafts, and 8% by trade (EWAO, 2015).

Agro-ecologically, Estie District is suitable for the cultivation of different annual and perennial plants. The major food crops grown in the district are teff (*Eragrostis tef*), wheat (*Tritrcum aestivum*), barley (*Hordeum vulgare* L.), pea (*Pisum sativum* L.*)*, bean (*Vicia faba* L.), maize (*Zea mays*), finger millet (*Eleusine coracana*), chickpea (*Cicer arientinum)*, potato (*Solanum tuberosum)*, guaya (*Lathyrus sativus* L.), nug (*Guizotia abyssinica*), and others (Table 1). Irrigation is also practiced in the district, and some cash crops, including vegetables and fruit crops, are grown (Table 1).

Table 1: Major food crops grown in Estie District

Crop category	Scientific name	English name	Amharic Name
Cereals	*Eragrostis tef (*Zucc)	Tef	Teff
	Tritrcum aestivum L.	Wheat	Sinde
	Hordeum vulgare L.	Barely	Yemigib Gebs
	Hordeum vulgare L.	Barley	Yebira gebs
	Avena sativa L.	Oats	Aja
	Zea mays L.	Maize	Bekolo
	Pennisetum glaucum L.	Millet	Mashla
	Eleusine coracana L.	Finger millet	Dagusa
Vegetable	*Brassica oleracea* L.	Cabbage	Tikil gomen
	Allium sativum	Garlic	Nech shinkurt
	Capsicum annuum L.	Chili	Berbere
	Allium cepa L.	Shallot	Key shinkurt
	Lycopersicon esculentum Mill.	Tomato	Timatim
Fruit	*Musa acuminata* Colla	Banana	Muz
	Mangifera indica L.	Mango	Mango
	Persea americana Mill.	Avocado	Avocado
	Citrus sinensis L.	Orange	Birtucan
	Carica papaya L.	Papaya	Papaya
	Malus domestica Borkh.	Apple	Apple
	Citrus lemon L.	Lemon	Lomi
Pulses	*Pisum sativum L.*	Pea	Ater

Table 1: Major food crops grown in Estie District (Continued)

	Vicia faba	Bean	Bakela
	Lathyrus sativus L.	Grass Pea	Guaya
	Lens culinaris Medikus	Lentil	Misr
	Cicer aestivum L.	Chickpea	Shimbra
Oil seed	*Linum usitatissimum L.*	Lin seed	Telba
	Guizotia abyssinica (L.f.) Cass.	Niger seed	Nug
	Ricinus communis L	Gulo	Gulo (chakma)
	Brassica carinata A. Br.	Kale seed	Gomen zer
	Arachis L.	Nut	Lewz
	Carthamus tinctorius L.	Sunflower	Suf
	Sesamum indicum L.	Sesame	Selit
Root crop and	*Solanum tuberosum* L.	Potato	Dinch
Stem crops	*Daucus carota* L.	Carrot	Carrot
	Ipomoea batatas L.	Sweet potato	Sikuar dinch

Source: (EWARDO, 2015)

3.6. Sampling techniques and sample size

Key informants were selected by purposive sampling from the study kebeles based on the information gathered from the local people, while other general respondents were randomly (lottery method) selected. Ethnobotanical data were collected from January to March 2023 on trips made to the six sites. Madoye and Debire Zewana (from Kola), Ziguara and Mekane Eyesus (from Woina Dega), and Lewaye Ashama Gedayat and Agona Kositet (from Dega) were purposefully chosen based on agro-ecological zone, the availability of traditional medicine, practitioners and traditional medicine use history.

A total of 120 informants aged 20 and above were chosen for the study. Among them, 80 were men and 40 were women. Out of the informants, 24 were key informants, while the remaining 96 were general informants. The selection of the key informants was done purposively, with four key informants chosen from each research kebele. Among the key informants, 18 were men and 6 were women. The sample size was determined using the equation:

$$N = \frac{Z2 * P\,(1 - P)}{C2}$$

where 'n' represents the sample size, 'z' is the standard normal value at a 95% confidence level (z=1.96), 'p' is the assumed proportion of households practicing traditional medicine (0.5), and 'c' is the marginal error (0.5) (Karema et al., 2019). it was assumed that 50% of households (p=0.5) with a 5% marginal error (c=0.05) and 95% confidence level. However, to ensure representativeness, one-third of the calculated sample size based on these assumptions was taken for the study, considering the homogeneity of the subject population in terms of culture, language, religion, and settlement. The selection of the 24 key informants was done purposefully with the assistance of local administrators, elders, and community members, following the suggestion by Martin (1995). Key informants are individuals from the community who are knowledgeable about the culture and are willing to share their insights. The other 96 informants were randomly selected using the lottery method from the local population of the study area to gain a general understanding of medicinal plant knowledge among the people (Martin, 1995).

3.7. Ethical considerations

It makes sense that certain studies, such as ethnobotanical research on MPs, were conducted with agreement and in an ethical and diplomatic way. To conduct the complete research in a safe setting and to lower the risk, getting the necessary clearance from all relevant agencies is essential. Prior approval from Bahir Dar University was obtained for this investigation. After outlining the study's goals, methods, results, and advantages, each local participant was asked for their agreement. Additionally, their right to privacy was respected throughout data gathering, and the privacy of any information or secrets they provided was protected.

3.8. Data source and methods of data collection

Primary data sources were the sources for this study. Interviews, group discussion with informants, and field observation were obtained by primary data sources. Data collection methods included semi-structured interviews, group discussions, and escorted field walks with key informants for field observations. The local names of the plants they use to treat illnesses, the conditions they treat, the parts of the plants they utilize, the preparation methods for the remedies, the application methods, and the dangers to MPs were all covered in the individual

interviews with each respondent. To check the accuracy of the data, each informant was interviewed two to three times (triangulation) over the course of the study. Responses that contradict one another are not taken into consideration. After that, key informants took part in group talks, and a field excursion was planned with them so they could observe plants in person.

3.8.1. Semi-structured interview

Semi-structured interviews were developed (Appendix 1) and utilized as recommended by Martin (1995) and Cotton (1996). The semi-structured interview gave the investigator the flexibility to ask as many questions as were required. Initial drafts of the questionnaire's items were written in English based on a review of relevant literature. They were then translated into the local tongue after that. The informants were questioned (Figure 2) in their own language (Amharic) about the many types of MPs, growth patterns, parts used, and preparation techniques, conditions of preparations, administration routes, diseases treated, and management alternatives (Figure 2).

Figure 2: Interview with informants

3.8.2. Group discussion

Discussion was based on a list of questions that had been written in English and translated into Amharic beforehand. At predetermined times in each location, knowledgeable locals and volunteer traditional healers discussed the understanding and use of important medicinal herbs. The debate allowed all informants to express themselves freely and without interruption. All crucial facts were included, including plant species used to treat different ailments, regional names, plant parts used, diseases treated, preparation process, degree of management, and administration information for medications (Figure 3).

Figure 3: Group discussion with informants

3.8.3. Field observation

Field observations on research sites, including market surveys, were conducted with the assistance of a local guide and interpreter. Important issues such as the vernacular name of the plant, habit, habitat of the plant, the parts used, the preparation methods and modes of administration, conditions of preparation, and major threats were covered throughout the observation.

3.8.4. Market survey

Market survey was taken in three markets within Estie district, Agona, Estie, and Lewaye markets to observe and collect data on the marketability and trade of MPs (Figure 4). Therefore, a market survey was conducted to gather ethnobotanical information, distinguish and record the type of herbal drugs sold in the market, and determine the multipurpose role of some MPs. Semi-structured interviews were conducted with drug sellers, producers, and consumers to assess the other aspects of plant materials based on a semi-structured checklist of topics (Appendix 1).

Figure 4: Some of the MPs sold at the market (Taken by Tirualem Adane)

3.9. Specimen collection and identification

We gathered medicinal herbs from both cultivated and natural environments. The names, customs, and related flora were gathered from the local area. The taxonomic keys, Flora of Ethiopia and Eritrea, and Natural Database for Africa (NDA) version 2.0 were used to identify the plant specimens both in the field and afterwards at the University of Bahir Dar. Some of these MPs images were collected for further identification (Appendix 5).

3.10. Data analysis

3.10.1. Descriptive statistics

To create bar graphs and pie charts and establish the percentage and frequency of the data on MPs, IBM SPSS statistics 20 tools and Microsoft Excel 2010 were used. Martin (1995) was examine the gathered ethnobotanical data using survey and analytical techniques for ethnobotanical methods that are recommended. The most pertinent data about MPs acquired and provided by local individuals with regard to medicinal value, applications, preparation techniques, routes of administration, dosage, parts used, habit, and habitat of plants, utilizing the proper software and descriptive statistical methods. Accordingly, ethnobotanical ranking and scoring methods such as preference ranking, direct matrix ranking, and fidelity level techniques were employed to test the consistency of responses.

3.10.2. Preference ranking

A preference ranking was conducted following Martin (1995) for the eight most important MPs used in treating wounds (Table 4), as traditional healers treat it usually. Eight informants were selected to identify the best preferred MPs species for treatment of wounds. Each informant was provided with eight MPs reported to cure this disease with leaves of MPs used being paper tagged name and asked to assign the highest value (8) for the most preferred species, against this illness and the lowest value (1) for the least preferred plant and in accordance of their order for the remaining ones. Each species' value was totaled, and the rank of each species was determined based on the total score. This aided in determining the ranking of the most effective MPs used by the community to treat the disease.

3.10.3. Direct matrix ranking

A direct matrix ranking exercise was done for eight MPs according to the information gathered from informants on the multipurpose use categories of the plants. This is done in order to the compare multipurpose use of a given species and to infer the multiple significant of the species as compared to other species, as recommended by Martin (1995). As a result, eight multipurpose species were chosen from the total MPs, and seven use-categories (furniture, construction, charcoal, medicine, fence, firewood, and agricultural tools) were listed for each species' use value to be assigned by eight key informants. Each key informants were assigned use values (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used and 0 = not used). Accordingly, each key informant's usage values were summed up and ranked.

3.10.4. Fidelity level

The following equation was also used to compute the fidelity level (FL), which is the proportion of informants who indicate to have used a certain plant for the same primary purpose (Alexiades, 1996). The MPs that had the highest FL values could be an indication of their good healing potential and that they are commonly used. It was designed to quantify the importance of the species for a particular purpose. The majority of commonly used MPs have a high level of fidelity. The FL index was calculated for 20 MPs used for treating five human diseases (tonsillitis, headache, wound, cough, and evil eye) with four species each.

❖ $\mathrm{FL}\% = \frac{NP}{N} \times 100$

Where N is the number of informants who use the plants as medicine to treat any given ailment, and Np is the number of informants who claim the usage of a plant species to treat a specific condition.

4. RESULTS AND DISCUSSION

4.1. Diversity of medicinal plants in the study area

A total of 120 species of MPs in 97 genera and 52 families were collected and documented in the study area that are used for the treatment of human and livestock health problems. From 120 species of MPs, 105 MPs species were used for the treatment of human health problems, and 35 MPs species were used for the treatment of livestock health problems. The result indicates the local people of the study area have high knowledge of MPs to treat human health problems than knowledge of MPs treating livestock ailments.

Other research reported by Amare Bitew *et al*. (2022) in Sedie Muja District, South Gondar Zone, reported 89 MPs s collected in the study area. Out of which 60 plant species (67.42%) have been reported to treat exclusively human diseases, 19 species (21.35%) have reported to treat both livestock and human diseases, and 10 species (11.23%) have be reported to treat only livestock diseases. Similarly, in the research reported by Netsanet Gonfa *et al.* (2020) in Gera district, 63 MPs species used to treat human and livestock ailments reported. Out of which 56 (88.9%) species were used for the treatment of human ailments, 15 (23.8%) species were used for the treatment of livestock ailments, and the remaining 8 (12.7%) species were used for the treatment of both human and livestock ailments.

4.2. Composition of medicinal plants in the study area

The species composition of the study area was analyzed, and the family Fabaceae appears to contain the highest number of species, with eight species. This could be due to the various ways its species are utilized in treating different diseases, as well as the diversity of the family in the study area. Following closely behind Fabaceae, the Poaceae and Solanaceae families were both identified to have seven species each, while the Asteraceae family had six species, and the Lamiaceae family had five. The families Apiaceae, Acanthaceae, Brassicaceae, Cucurbitaceae, Euphorbiaceae, and Polygonaceae each had four species identified, while Rosaceae and Moraceae had three species each. The remaining 39 families in the study area were characterized with one or two species each (Table 2).

This finding is in line with the findings reported by Banchiamlak Nigussie and Young-Dong (2019), Netsanet Gonfa *et al.* (2020), and Mihretu Berie (2021). However, according to the research reported by Alemitu Adane (2018) Asteraceae were the most distributed leading family. According to research conducted by Birhanu Adibaru and Samuel Chane (2021), Yimer Assen *et al*. (2021) Solanaceae has been found the most distributed leading family.

Table 2: Number of family, genera, and species of MPs in the study area

No.	Family	No. of plant species	% of plant species	No. of Genera	% of Genera
1	Fabaceae	8	7.9	8	8.2
2	Poaceae	7	6.9	8	8.2
3	Solanaceae	7	6.9	6	6.2
4	Asteraceae	6	5.9	6	6.2
5	Lamiaceae	5	4.9	5	5.2
6	Brassicaceae	4	3.9	3	3.1
7	Cucurbitaceae	4	3.9	4	4.1
8	Euphorbiaceae	4	3.9	3	3.1
9	Polygonaceae	4	3.9	2	2.1
10	Apiaceae	4	3.9	4	4.1
11	Acanthaceae	4	3.9	4	4.1
12	Rosaceae	3	2.9	3	3.1
13	Moraceae	3	2.9	2	2.1
14	Menispermaceae	1	1.0	1	1
15	Others 38 families	38	37.3	38	39.2
Total	52	102	100	97	100

4.2.1. Composition of MPs used to treat human health problems

In this study conducted in Estie district, it was found that a total of 105 species of MPs were collected. These plants were used for treating various human health problems. Upon identification, it was revealed that these 105 species belonged to 85 genera and 50 families. The

family Fabaceae had the highest number of species, with six different plants falling under this category. This was followed by Solanaceae, which had five species, while Lamiaceae, Euphorbiaceae, Poaceae, Polygonaceae, Cucurbitaceae, Brassicaceae, Apiaceae, and Acanthaceae each had four species. Asteraceae had only two species, while the remaining 39 families were represented by just one species (Table 3).

Table 3: Number of family, genera and species of MPs used to treat human ailments in the study area

No.	Family	No. of plant species	% of plant species	No. of Genera	% of Genera
1	Fabaceae	6	7.1	6	7.1
2	Lamiaceae	4	4.8	5	5.9
3	Poaceae	4	4.8	5	5.9
4	Solanaceae	5	5.9	5	5.9
5	Polygonaceae	4	4.8	3	3.5
6	Cucurbitaceae	4	4.8	4	4.7
7	Brassicaceae	4	4.8	3	3.5
8	Apiaceae	4	4.8	4	4.7
9	Acanthaceae	4	4.8	4	4.7
10	Asteraceae	2	2.4	3	3.5
11	Euphorbiaceae	4	4.8	4	4.7
12	39 other families	39	46.4	39	45.9
Total	50	84	100	85	100

This result agrees with the work of Amare Bitew *et al*. (2022), Derebe Alemneh (2021), Mihretu Berie (2021), and Mohammed Yimam *et al*. (2022), showed the dominance of the family Fabaceae in treating of human diseases. However, Netsanet Gonfa *et al*. (2020) reported the power of the Asteraceae family for the treatment of human diseases.

4.2.2. Composition of MPs used to treat livestock health problems

In a study area, it was found that 35 MPs were used to treat livestock health problems. These plants belonged to 33 different genera and 24 families. Among the 35 MPs, it was discovered that they were used to treat 19 different livestock ailments. The analysis revealed that the people

in the study area relied on traditional remedies to treat their livestock. Asteraceae and Acanthaceae were the dominant families represented by four and three species, respectively. Fabaceae, Euphorbiaceae, Poaceae, Rosaceae, and Solanaceae were the families with two species, while the remaining 17 families were represented by a single species each (Table 4). These findings aligned with a previous study conducted by Mihretu Berie (2021). However, according to the research conducted by Netsanet Gonfa *et al.* (2020), and Mohammed Yimam *et al*. (2022) Euphorbiaceae were the most leading family. The diversity of MPs used for livestock in the study area highlighted the significance of traditional remedies.

Table 4: Number of family, genera, and species of MPs used to treat livestock ailments in the study area

No.	Family	No. of plant species	% of plant species	No. of Genera	% of Genera
1	Asteraceae	4	11.8	4	12.12
2	Acanthaceae	3	8.8	3	9.1
3	Fabaceae	2	5.9	2	6.1
4	Euphorbiaceae	2	5.9	2	6.1
5	Poaceae	2	5.9	2	6.1
6	Rosaceae	2	5.9	1	3.03
7	Solanaceae	2	5.9	2	6.1
8	17 other families	17	49.3	17	51.51
Total	24	34	100	33	100

4.3. Sources of medicinal plants species in Estie district

The residents of Estie District have been collecting and preparing MPs that are found in different habitats. The majority of MPs, around 77 (64.2%) species were collected from natural vegetation in the wild. Additionally, around 23 (19.2%) species were obtained from home gardens, and 9 (7.5%) species were obtained from crop fields. Moreover, around 11(9.2%) species were obtained from vegetation in both the wild and home gardens. The results indicate that the local people in this study area primarily depend on MPs that are harvested from wild forests. Although the potential to cultivate these plants around their home gardens and crop fields exists, their ability to do so is generally low. This suggests that the local people need to be more aware of the

benefits of cultivating MPs in their homes and crop fields to benefit from them in the future. Collectively, the study underscores the importance of conserving wild forests, as they are a vital source of MPs for the local population.

Similarly, in Sedie Muja District, out of 89 MPs recorded, 53 (59.55%) were collected from wild vegetation, while only 29 (32.58%) species were harvested from the home garden, and 7 (7.87%) were harvested from both wild and home gardens (Amare Bitew *et al*. (2022). In other parts of Ethiopia, the majority of MPs were harvested from wild vegetation (Ermias Lulekal *et al*., 2014; Molla Alemu, 2019; Netsanet Gonfa *et al.*, 2020; and Mihretu Berie, 2021).

4.3.1. Sources of MPs used to treat human health problems

Estie district residents collect and prepare MPs from different habitats. From a total of 105 species, about 67 (63.8%) species were harvested from wild vegetation, 21 (20%) species were harvested from home gardens, 9 (8.6%) species were harvested from both wild and home gardens, and 8 (7.6%) species were gathered from crop fields. This study was in line with (Chala Mohammed *et al*., 2016; and Tilahun Tolossa, 2018).

4.3.2. Sources of MPs used to treat livestock health problems

From a total of 35-plant species, 25 (71.4%) species were collected from wild habitats, 6 (17.1%) species were collected from home garden habitats, and 4 (11.4%) species were collected from both wild and home garden habitats. This finding is in line with the results of Chala Mohammed *et al*. (2016), Tilahun Tolossa (2018), and Netsanet Gonfa *et al.* (2020) in Melkabello District, Berbere District, and Gera district, respectively.

4.4. Growth habits of medicinal plants in Estie District

From the total MPs recorded in the study area, for treatment of both human and livestock ailments, showed that herbs constitute the highest category with 54 species (45%), followed by shrubs with 42 species (35%), trees with 16 species (13.3%), and climbers with 8 species (6.7%) (Figure 5). The dominance of herbs is due to their easy availability to local people and their abundance in the area.

According to Eyayaw Birile (2020), the growth form analysis of MPs used to treat human and livestock ailments showed that herbs were the dominant growth form 31 (46.97%) followed by trees 20 (30.30%), shrubs 13 (19.70%), and climbers 2 (3.03%). Similar findings were also

reported in earlier works in Ethiopia, in which herbs are the dominant growth form of MPs (Adimasu Mekonen, 2018; Molla Alemu, 2019; Amare Bitew *et al*. (2022); and Zewdie Kassa *et al*., 2020).

In contrast to this, according to research done by Addissie Belay (2018), Birhanu Adibaru and Samuel Chane (2021**),** and Mihretu Berie (2021), they have reported that shrubs constitute the largest proportion of MPs in their research in Dejen district of east Gojjam, Dera district of south Gondar, and Sokoru district of Jimma Zone, respectively.

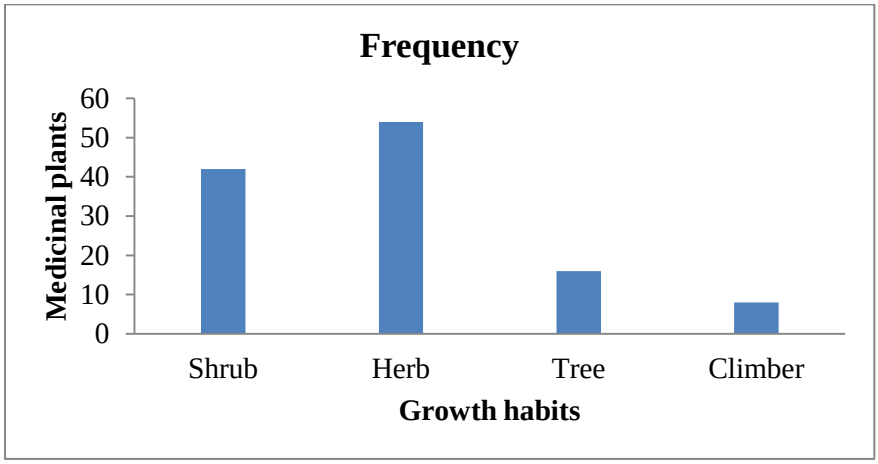

Figure 5: Growth habits of MPs

4.4.1. Growth habits of MPs used to treat human ailments in the study area

The growth forms of MPs used for treating human ailments were analyzed, and it was discovered that herbs made up the majority with 49 (46.7%) species. The next most common category was shrubs with 38 (36.2%) species, followed by trees with 11 (10.5%), and climbers with 7 (6.7%). Other findings in Ethiopia, including Molla Alemu (2019), Netsanet Gonfa *et al.* (2020), and Derebe Alemneh (2021) have reported similar findings indicating that the use of herbs is the most commonly used growth habit. However, Getu Alemayehu *et al.* (2015), Mersha Ashagre *et al.* (2016), and Tilahun Tolossa, and Moa Megersa (2018), found that shrubs were the commonly used growth habit, which is in contrast to the aforementioned reports.

4.4.2. Growth habits of MPs used to treat livestock diseases in the study area

The examination of the growth patterns of MPs utilized for curing livestock health issues unveiled that herbs are the most extensive group among the 13 (37.1%) documented species of livestock MPs with the following categories of shrubs, trees, and climbers having 12 (34.3%), 8 (22.9%), and 2 (5.7%) species, respectively. Yihenew Simegniew *et al*. (2017) and Yalelet Worku *et al*. (2018) reported a similar study in Enarj Enawga district and in South Wollo zone, respectively. However, Mikiyas Abebe (2022), who reported findings from the Mojana Wodera district, and Mohammed Yimam (2022), from Artuma Fursi district, found that shrubs were the most commonly used plants for treating livestock ailments. On the other hand, studies reported by Ermias Lulekal *et al*. (2014), suggest that trees make up the most substantial group of growth forms used in the treatment of livestock ailments.

4.5. Parts of medicinal plants used

During the study, respondents reported the use of various parts of MPS for medicines. Leaves were indicated as the most commonly used plant part for medicinal purposes by local communities, accounting for 89 (39.4%) species, followed by roots at 57 (25.2%), and seeds at 39 (17.3%). Other plant parts such as stems at 12 (5.3%), bulbs at 7 (3.1%), fruits at 6 (2.7%) and others 16 (7.2%) (Figure 6) were also identified as being used to prepare traditional medicine. While the preparation of remedies using roots, shoots, barks, whole plants, stems, and bulbs had a further effect on the survival of the parent plant, leaves had little impact on it.

Previous reports in Ethiopia have also indicated that leaves were the most commonly used plant part, followed by roots, to treat various health issues (Addissie Belay, 2018; Adimasu Mekonen, 2018; Amare Bitew *et al*. (2022); Eyayaw Birile, 2020; and Zewdie Kassa *et al*., 2020).

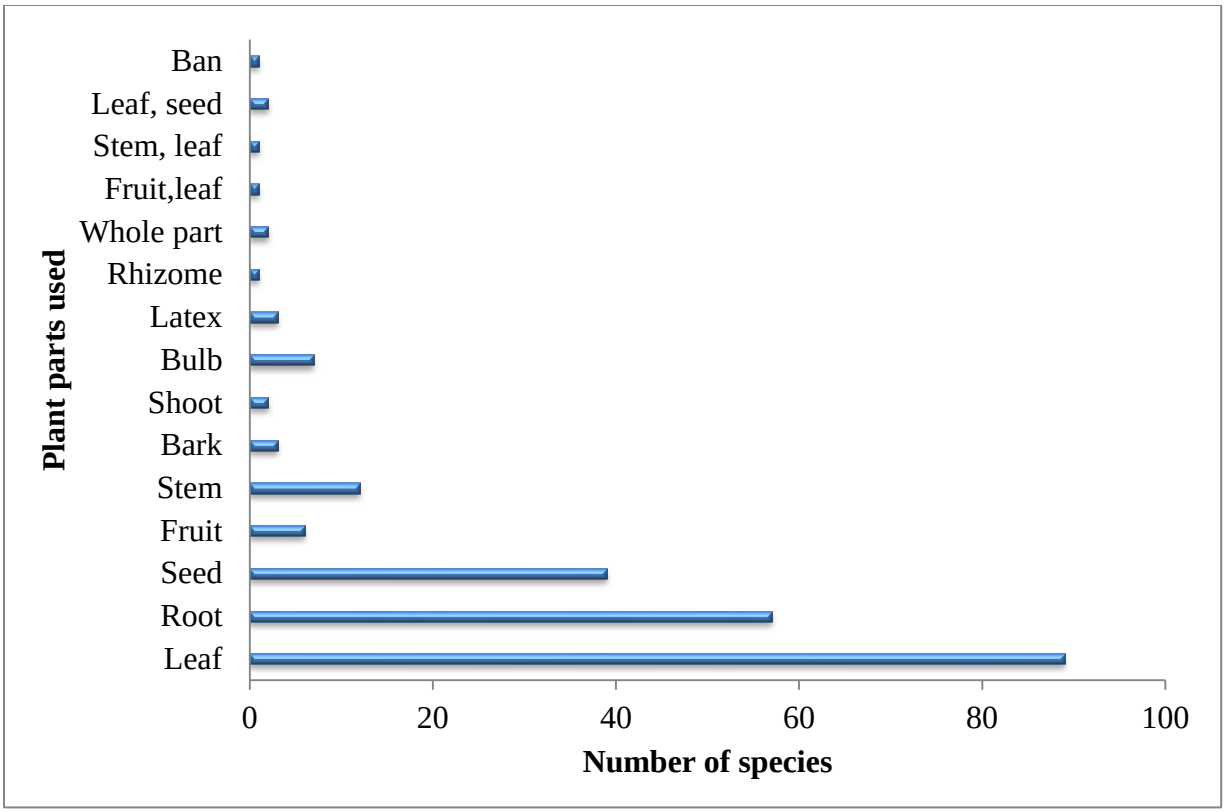

Figure 6: Plant parts used to treat human and livestock ailments

4.5.1. Plant parts of medicinal plants used to treat human ailments

The usage of various plant parts for medicinal purposes was observed among people in the study area. Leaves 71 (38.2%) were found to be the most commonly used part, followed by roots 47 (25.3%) and seeds 35 (18.8%), as depicted in Figure 14**.** Additionally, stem (10.4%), bulb and fruit 7 (3.8%), latex 3 (1.6%), and other parts were also utilized in preparing traditional medicine. These results are consistent with previous research conducted in different parts of Ethiopia by (Getu Alemayehu *et al.,* 2015; Reta Regassa *et al*., 2017; Netsanet Gonfa *et al.*, 2020; Derebe Alemneh, 2021; and Mohammed Yimam *et al*., 2022). However, Tilahun Tolossa and Moa Megersa (2018) medicinal preparations mainly involve the use of roots.

4.5.2. Plant parts of medicinal plants used to treat livestock ailments

People in the study area used different parts of the plant for medicinal purposes. The findings revealed that leaves 19(46.3%) were the most commonly used plant parts followed by roots 11 (26.8%) and seeds 5 (12.2%) and others (Figure 15).

Previous reports in Ethiopia have also shown that leaves were the most commonly used and followed by roots to treat livestock health problems (Chala Mohammed *et al*., 2016; Netsanet Gonfa *et al.*, 2020; and Asaye Asfaw *et al*., 2021).

4.6. Conditions of plant remedy preparations in Estie District

According to the informants, fresh plant materials were utilized more often 139(61.5%) conditions than dried materials 66 (29.2%) conditions, and a combination of fresh or dried materials 21 (9.3%) conditions were used to prepare remedies (figure 16). This suggests that the locals consider fresh materials to be more potent as they do not lose bioactive components. The locals also believe that dried materials tend to decay during the drying and storage process. Similarly, in the Simada district, Desta Wuletaw (2020) reported a higher frequency of using fresh plant materials 125 (57.3%) compared to dried materials 80 (36.7%), and a small portion 13 (6%) used a combination of fresh or dried materials for remedial purposes. This finding aligns with the results reported by (Zewdie Kassa *et al*. 2020).

4.6.1. Conditions of plant remedy preparations used for the treatment of human ailments

Local individuals utilized primarily fresh materials to create remedies for human illnesses, with 61.3% (114 out of 186) of preparations in fresh form, 30.6% (57 out of 186) in dried form, and 8.1% (15 out of 186) in both dried and fresh forms. This outcome is comparable to a study conducted by Netsanet Gonfa *et al.* (2020) in other parts of Ethiopia.

4.6.2. Conditions of plant remedy preparations used for the treatment of livestock ailments

The result of the study indicated that MPs used to treat livestock health problems preparations were 25 (61%) of the preparations were prepared as fresh herbal medicine followed by dry 10 (24.4%) and fresh/dried 6 (14.6%) forms of preparation. Fresh plant parts were ranked first. The result is in agreement with the finding conducted in different parts of Ethiopia, which reported that the remedies in the fresh form were considered more powerful than dried forms (Ermias Lulekal *et al*., 2014; Gebremedhin Romha *et al*., 2015; Yalelet Worku *et al*., 2018; and Asaye Asfaw *et al*., 2021).

4.7. Modes of remedy preparation

The study area had documented a total of 120 plant species. Due to the fact that one plant species can be used to treat multiple diseases and have various remedial preparations, the people in the study area utilized various traditional medicine preparation methods for ailment treatments. These methods included pounding, which accounted for 60 (26.5%) preparations of the 226 preparations, squeezing with 29 (12.8%) preparations, crushing with 27 (11.9%) preparations, and other modes (Figure 7). The locals believed pounding was the most effective method of extracting potential compounds from the plants, and it increased the medicine's healing power by enhancing physiological reactions.

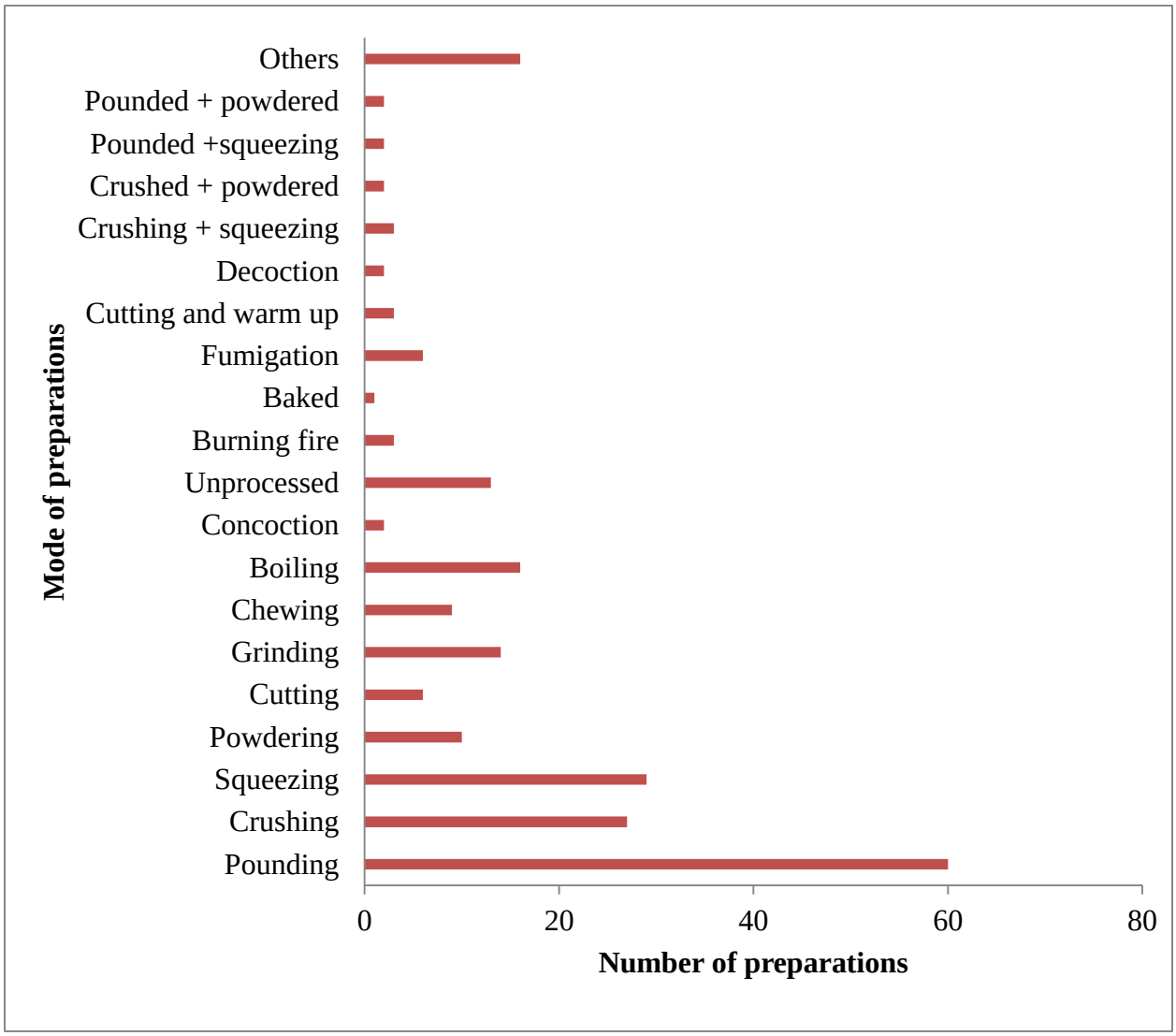

Figure 7: Modes of MPs preparations

Amare Bitew *et al*. (2022) report revealed that the most common mode of preparation in Sedie Muja district was crushing with 44 (22.8%) preparations, followed by crushing and squeezing with 22 (11.39%) preparations and pounding and powdering or unprocessed preparations with 18 (9.33%). Crushing were also the most common mode of preparation by (Yimer Assen *et al*., 2021; and Birhanu Adibaru and Samuel Chane, 2021).

4.7.1. Modes of remedy preparation used for the treatment of human diseases

According to the information gathered from the informants the preparations for remedies differ depending on the type of disease being treated the location of the ailment and the plant parts utilized. They used various methods to prepare the medicinal plant parts for 186 preparations with pounding being the most common method accounting for 37(39.9%) preparations, followed by squeezing with 25 (13.4%) preparations, crushing with 18 (9.7%) preparations, and others. The local people believed that pounding is the most effective method for extracting potential compounds from the plant and increasing the curative power of the medicine leading to a faster physiological reaction.

In Dera district, Mihretu Berie (2021) found that pounding was the most frequently employed method for preparing remedies, making up 92 (35.38%) of all preparations, followed by squeezing at 58 (23.3%) and crushing at 29 (11%). And also in line with the result of (Derebe Alemneh, 2021; and Mohammed Yimam *et al*., 2022). However, Netsanet Gonfa *et al.* (2020), study found that crushing were the largest proportion of remedies preparation for treating human diseases.

4.10.2 Modes of remedy preparation used for the treatment of livestock diseases

Pounding was the most popular mode of remedy preparation, accounting for 18 (43.9%) of preparations, followed by crushing at 8 (19.5%), and squeezing at 3 (7.3%). The specific method of remedy preparation varied based on the livestock ailment, complexity, and plant part used. Pounding and crushing were frequently used due to their ability to extract the plant's full potential content and effectiveness in treating ailments.

According to Mihretu Berie (2021) pounding was the most common remedy preparation mode for treating livestock ailments. However, Netsanet Gonfa *et al.* (2020) study found that crushing and pounding were the largest proportion of remedies for treating livestock diseases.

4.8. Dosage and route of administration

Preparations were administered mostly by oral 119 (52.7%), followed by dermal 72 (31.9%), fumigation 14 (6.2%), nasal 9 (4%), ocular 5 (2.2%), spraying 3 (1.3%), ear 1 (20.4%), and others 3 (1.3%), based on the type of disease for human and livestock ailments (Figure 8).

Dosages were estimated using lids, spoons, handfuls (for powder preparations), cups, coffee cups (sini), tassa (can), yewuha birchiko (for liquid mixtures to be administered), numbers, or sometimes, handfuls (for leaves, seeds, and fruits) and atik (for roots, stems, or barks). In most cases, the measurements were rough and lacked precision, and the dosage given to the patient had no strict specification.

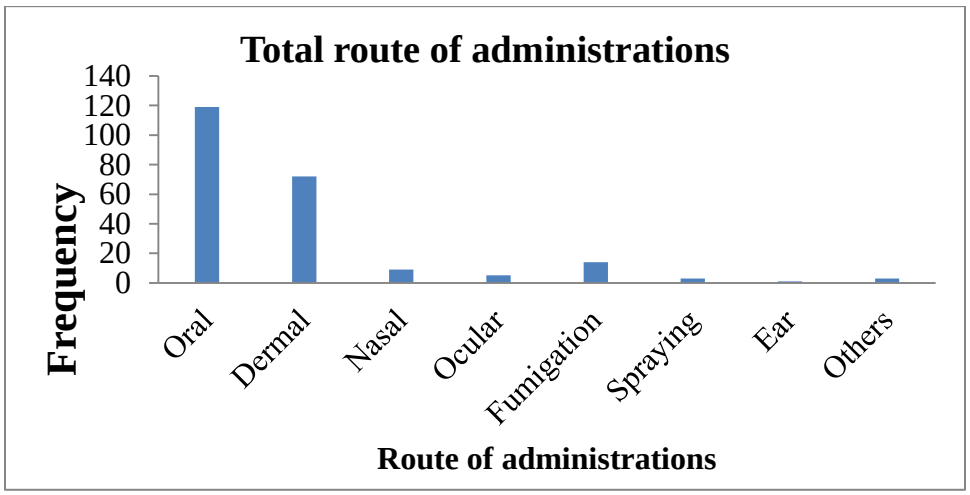

Figure 8: Route of administration

The result is like the findings of Banchiamlak Nigussie and Young-Dong (2019) in Hawassa Zuria District, Muhidin Tahir *et al*. (2023) in Asagirt District, and Zewdie Kassa *et al*. (2020) in Sheka district. Similarly, Ermias Lulekal *et al*., (2014), and other reports have also discussed the lack of precision and standardization as one drawback to recognizing of the traditional healthcare system. These methods of application (oral and dermal) of remedies allow and enhance the physiological reactions of remedies with the pathogens that increase the healing power of the medication.

4.8.1. Dosage and routes of administration of remedies for human ailments

The routes of administration for human ailments include oral, dermal, nasal, fumigation, ocular, and others. From the reported routes of administration, the highest use was through oral 92 (49.5%), dermal 65 (34.9%), fumigation 13 (7%), and others. The finding agrees with the findings conducted in another parts of Ethiopia by Netsanet Gonfa *et al.* (2020), and Derebe Alemneh (2021), oral and dermal route was the most widely used mode of remedy administration used to treat human health problems.

4.8.2. Dosage and routes of administration of remedies for livestock ailments

There are three major routes of application (oral, dermal, and ocular) of plant remedies commonly adopted for 41 preparations by indigenous people of the study area in the treatment of livestock diseases. 26 preparations (63.4%) were administered orally, while 7 preparations (17.1%) followed dermal, 3 preparations (7.3%) followed ocular, and 5 preparations followed others, based on the type of disease for livestock ailments as illustrated in (Figure 9). Netsanet Gonfa *et al.* (2020) have found that they administer most preparations via the oral route in treating livestock in their studies.

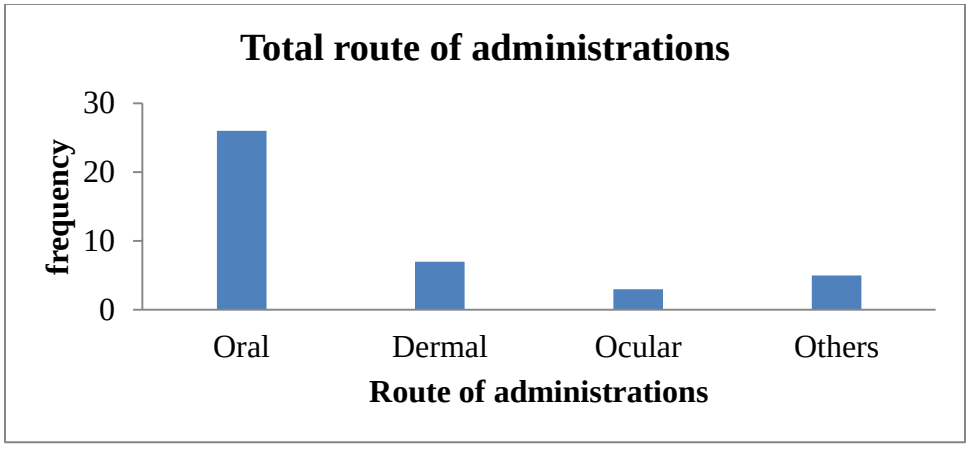

Figure 9: Modes of administrations used to treat livestock health problems

4.9. Applications of plant remedies

4.9.1. Applications of plant remedies for human ailments

People in the study area apply different methods of remedy applications based on the type of diseases treated. Among these methods, drinking to be the most widely application accounted for 36% followed by creaming (9.1%), fumigation (9.5%), eating (7%), tied (5.9%), and others (Figure 10). This finding was in line with Zewdie Kassa *et al*. (2020).

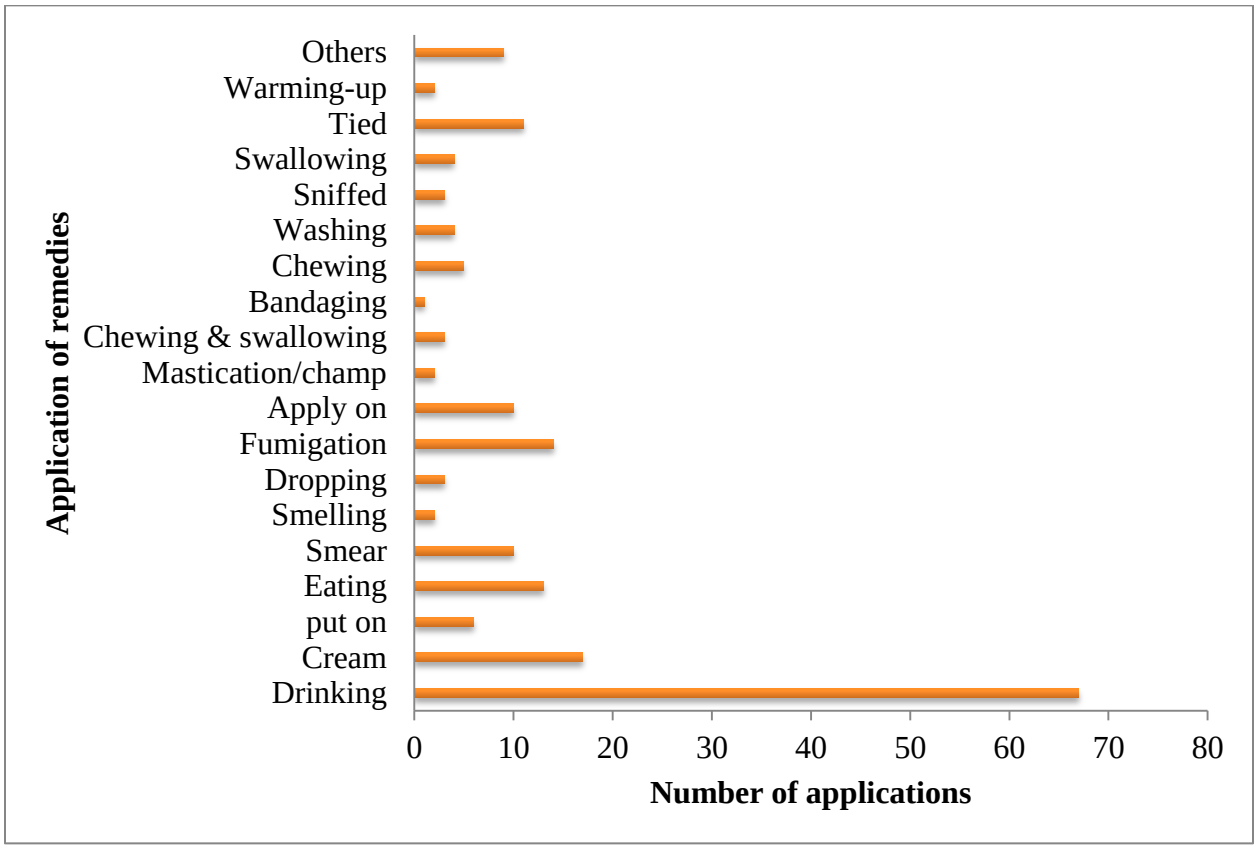

Figure 10: Application of prepared remedies for the treatment of human diseases

4.9.2. Applications of plant remedies for livestock ailments

People in the study area apply different methods of remedy applications based on the type of diseases treated for livestock health problems. Among these methods, drinking to be the most widely application accounted for 63.4% followed by spraying (17.1%), and others (Figure 11). Similarly, Mihretu Berie (2021), and Netsanet Gonfa *et al.* (2020) reported drinking was the most commonly used application used to treat livestock health problems.

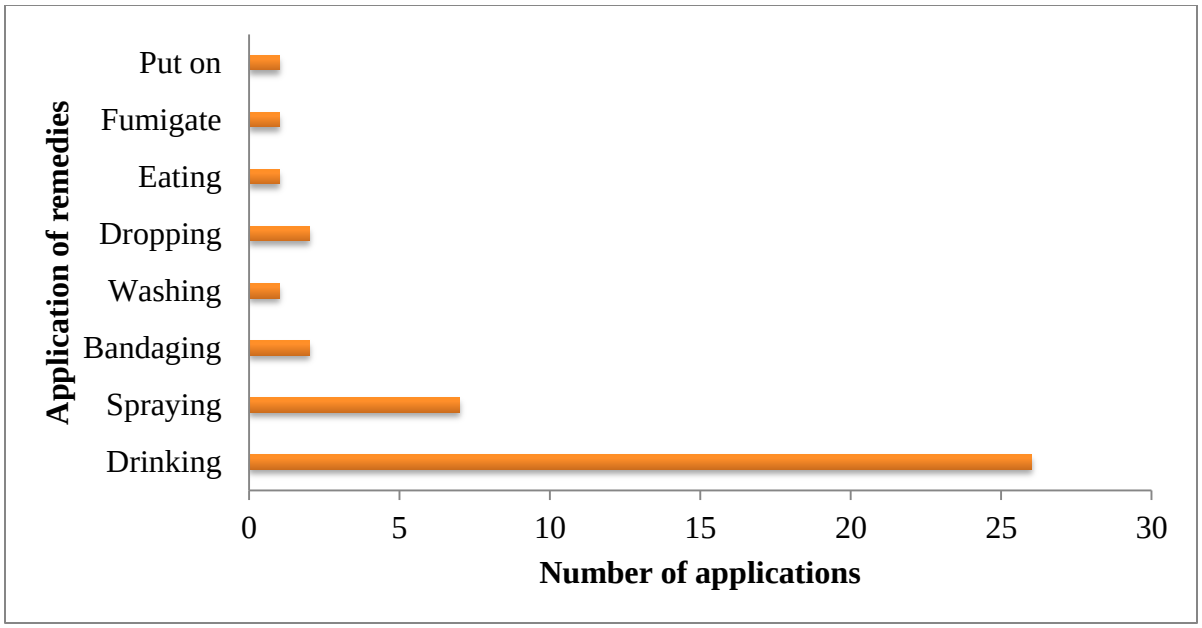

Figure 11: Applications of livestock remedies

4.10. Solvents and additives of plant remedies

4.10.1. Solvents and additives of plant remedies for human ailments

It took some remedies with different additives and solvents. The most frequently used solvents and additives by the community were water 73 (69.5%) followed by honey 9 (8.6%), butter, and sugar 6 (5.7%) and others (Figure 12). These additives have importance in the reduction of pain, getting a better taste, reducing adverse effects such as vomiting and diarrhea, minimizing discomfort, and enhancing the efficacy and healing conditions, as explained by informants. During preparing traditional medicine from plants, the methods of preparation used by traditional healers involved mixing with solvents like water and milk in liquid preparations. Most of the preparations of traditional MPs involve the use of solvents, and the solvent used is water. They used butter and honey in solid preparations. In certain cases, they included excrements or materials from animals in such preparations. Additives like sugar, honey, tea, and coffee were used in most of the remedy preparations to make them taste during taking the medicine. This is to reduce the bitterness of the medicine and encourage the patient to take it (Mihretu Berie, 2021). Amare Bitew *et al*. (2022), who conducted a similar study in Sedie Muja District, reported that water, butter, honey, Injera, bread, salt, coffee, egg, and sugar were some of the solvents and additive substances that were used to prepare remedies.

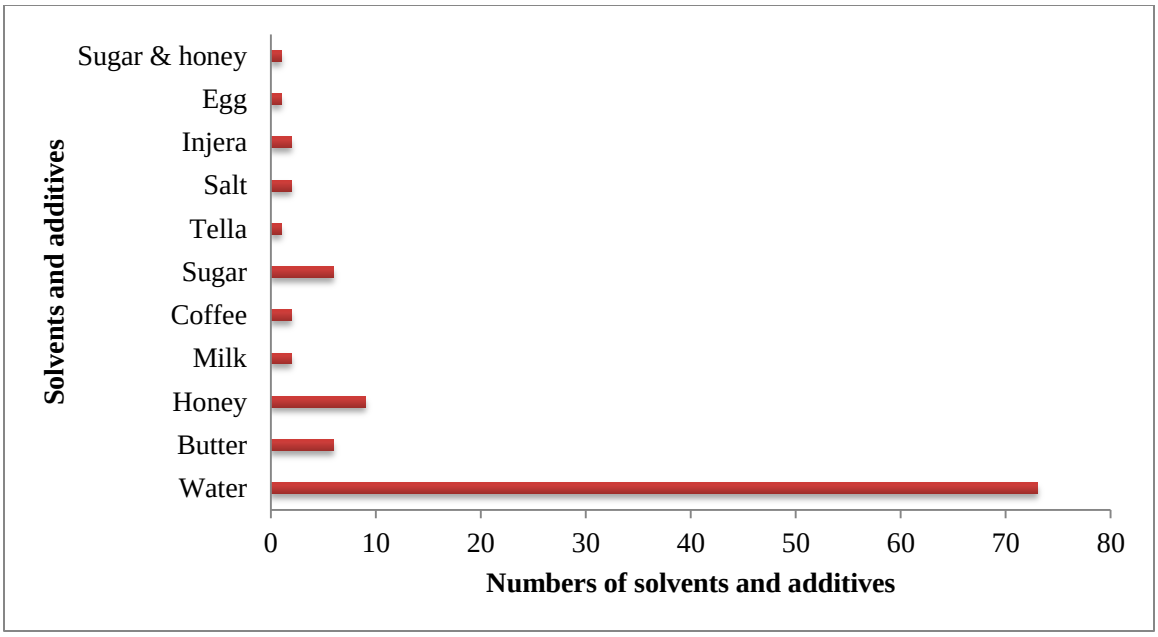

Figure 12: Additives and solvents used in medicinal preparation

4.10.2. Solvents and additives of plant remedies for livestock ailments

In this study, the medicinal remedies were prepared with additives and solvents. The most frequently used solvents and additives by the community were water 31 (88.6%) followed by salt 2(5.7%), honey and milk 1 (2.9%) (Figure 13).

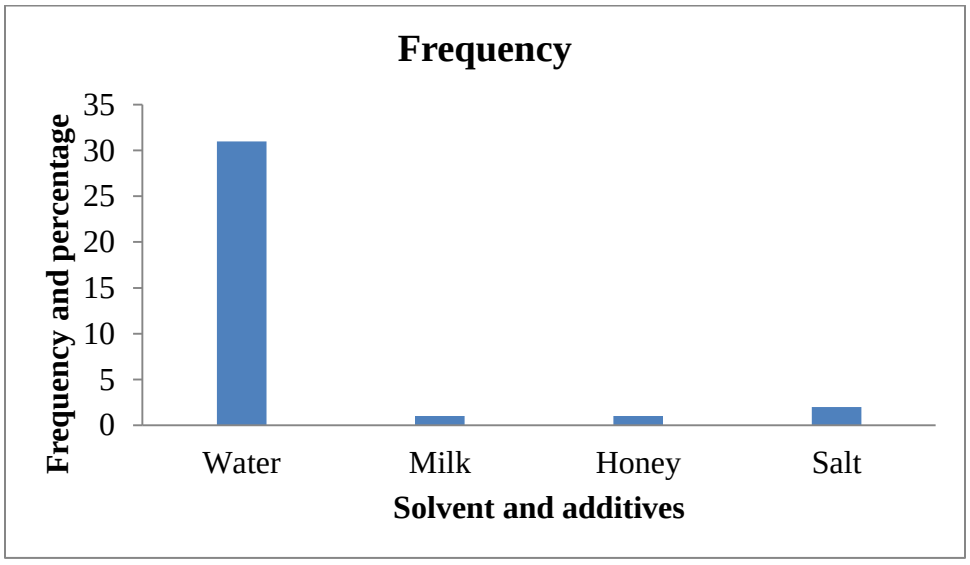

Figure 13: Additives and solvents used in plant remedy preparation

4.11. Diseases reported in Estie District

4.11.1. Major human diseases and plant species used

In the study area, a total of 60 human diseases were treated with 102 plant species and 186 preparations a single species was found capable of treating one or multiple diseases. While a combination of plant species or a single plant could treat a single ailment healer in the study area used various diagnosis methods such as visual examination, interviews, and touch to determine the severity of the disease.

The study revealed that wound infection, evil eye, and stomachache were the most prevalent human health problems in the area. The largest number of plant species 16 (8.6%) were used to treat wound infection, while evil eye and stomachache were treated with 13 (7.0%) species each, common cold, tonsillitis, and wart were treated with 8 (4.3%) species each, diarrhea, cough, and headache with 7 (3.8%) species each, hypertension and evil spirit with 6 (3.2%) species each. Additionally febrile illness was treated with 5 (2.7%) species, while malaria, toothache, antrax, and fire wound were treated with 4 (2.2%) species each, and the rest were listed in table 5.

Amare Bitew *et al*. (2022) reported that in Sedie Muja district had 50 human diseases treated by 79 plant species with headache, stomach problems, wound, evil eye, febrile illness, eye diseases, common cold, and skin rash being the most commonly treated human health problems. According to Desta Wuletaw (2020) in Simada district had 43 human diseases treated by 58 plant species while stomachache were the most commonly treated human health problems.

Table 5: Major human diseases and number of plant species

No.	Disease treated	Local Name (Amharic)	No. of medicinal plant	Percentage
1	Abortion	Wurja	2	1.1
2	Amazment	Yeayn megerem	1	.5
3	Amoebiasis	Ameba	1	.5
4	Antrax	Kurba	4	2.2
5	Ascaris	Wosfat	3	1.6
6	Common cold	Gunfan	8	4.3
7	Cough	Sal	7	3.8
8	Dandruff	Forefore	3	1.6
9	Dessication	Dirket	1	.5

Continued

10	Diarrhea	Tekmat	7	3.8
11	Ear disease	Yejero himem	1	.5
12	Eczema	Chife	3	1.6
13	Evil spirit	Wugit	6	3.2
14	Evil eye	Buda	13	7.0
15	External tongue	Tirf milas	2	1.1
16	Eye disease	Yeayn himem	3	1.6
17	Face fungus	Yefit kusil	1	.5
18	Febrile illness	Yesewnet tikusat	5	2.7
19	Fever	Tikusat	1	.5
20	Fire wound	Be esat mekatel	4	2.2
21	Gastritis	Cheguara himem	3	1.6
22	Gout	Rih	1	.5
23	Headache	Years hymen	7	3.8
24	Hemorrhoid	Yeahya kintarot	2	1.1
25	Hepatitis	Gubet beshita	2	1.1
26	Hypertension	Yedem gifit	6	3.2
27	Intestinal parasite	Tigegna tilatil	1	.5
28	Itch	Ekek	1	.5
29	Jaundice	Yewof beshita	1	.5
30	Kidney disease	Kulalite beshita	1	.5
31	Kuakucha	Kuakucha	1	.5
32	Leishimaniasis	Kunchir	1	.5
33	Lifie	Lifie	2	1.1
34	Liver disease	Gubet beshita	1	.5
35	Lung cancer	Yesamba cancer	1	.5
36	Malaria	Woba	4	2.2
37	Mumps	Jero degf	2	1.1
38	Nightmare	Kizhet	1	.5

Continued

39	Pimple	Bigur	1	.5
40	Pneumonia	Samba michi	2	1.1
41	Pumping of children	Yehitsanat hod megozer	1	.5
42	Rabies	Yewusha likift	1	.5
43	Retained placenta	Ye engdie lig alemewred	1	.5
44	Rheumatic/arthritis	Yemegetatemia beshita	2	1.1
45	Ring worm	Aguagot	1	.5
46	Scabbing	Yenefsat nikisha	2	1.1
47	Serakian	Serakian	1	.5
48	Snake bite	Ye ebab nikisha	2	1.1
49	Spider poison	Yeshererit shint	1	.5
50	Stomach	Yehod himem	13	7.0
51	Swelling	Bugunji	1	.5
52	Swelling	Bugunj	1	.5
53	Syphilis	Kitign	1	.5
54	Tape warm	Kosso	3	1.6
55	Tetanus	Mengaga kolf	1	.5
56	Thug	Ejeseb	1	.5
57	Tonsillitis	Entil mewred	8	4.3
58	Toothache	Yetirse himem	4	2.2
59	Wart	Kintarot	8	4.3
60	Wound	Kusil	16	8.6
Total	60		186	100.0

4.11.2. Major livestock diseases and plant species used

In Estie district, a study identified 19 livestock ailments and 34 plant species used in traditional medicine. Traditional medicine practitioners through observing the animals and interviewing their owners about major symptoms diagnose livestock health problems. The study found that

stave is treated by 7 (17.1%) species, leech by 5 (12.2%) species, pumping by 4 (9.8%) species, diarrhea and wounds by 3 (7.3%) species, and others (Table 6).

Table 6: Major Livestock diseases and number of MPs species in the study area

No.	Disease treated	Local Name	No. of medicinal plant	Percentage
1	Abortion	Wurja	2	4.9
2	Anthrax	Abasenga	1	2.4
3	Blackleg	Worchoge	1	2.4
4	Bloat	Ebtet	2	4.9
5	Bone dislocate on	Sibrat	1	2.4
6	Cattle aye pain	Ayn himem	2	4.9
7	Diarrhea	Tekmat	3	7.3
8	Donkey cough	Yeahya kuro	1	2.4
9	Eye disease	Yeayn beshita	2	4.9
10	Hen disease	Yedoro beshita	1	2.4
11	Insect bite	Yenefsat nikisha	1	2.4
12	Ladle	Chilfa	1	2.4
13	Leech	Alekt	5	12.2
14	Nightmare	Kizhet	1	2.4
15	Pumping	Nifat	4	9.8
16	Rabies	Yewusha likift	2	4.9
17	Shiny cattle	Abrk	1	2.4
18	Stave	Yebetir	7	17.1
19	Wound	Kusil	3	7.3
	Total		41	100.0

In Sedie Muja district, a study by Amare Bitew *et al*. (2022) reported that 17 livestock diseases treated by 29 plant species. Wound and eye diseases were the most common, treated by 6 (15.8%) species, followed by diarrhea treated by 4 (10.5%) species, and bloating by 3 (7.9%) species. Similarly, in Debre Tabor Town, Friehiwot Tamrat (2021) found that 18 livestock diseases were treated by 10 plant species. The main and most widespread diseases in the study

area were bloating (treated with 7 species), leech (treated with 4 species), anthrax, bone fracture, external parasite, and diarrhea (treated with 2 species each).

4.12. Marketability of medicinal plants

The results obtained from the market evaluation of three local markets, Monday (Estie town), Wednesday (Lewaye), and Saturday (Agona) markets, showed that most of the MPs are not widely traded for medicinal purposes, but mostly for other different uses (Table 7). *Ferula asafoetida, Echinops kebericho, Otostegia integrifolia, and Silene macrosolen* were found on markets being sold and purchased for medicinal purposes. The remaining medicinal plants listed as marketable species were mainly sold in bulk for their non-medicinal uses. This finding was in line with the finding of Ermias Lulekal *et al*. (2014) in Ankober District.

Table 7: Marketable MPs

No.	Scientific name	Family name	Local name	Use value
1	*Allium cepa*	Amaryllidaceae	Key shinkurt	Food, spice
2	*Allium sativum*	Alliaceae	Nechi shinkurt	Spice, food
3	*Avena sativa*	Poaceae	Ajja	Food
4	*Brassica napus*	Brassicaceae	Gomenzer	Oil seed, medicine
5	*Brassica nigra*	Brassicaceae	Senafch	Spice
6	*Capsicum annuum*	Solanaceae	Karia	Food
7	*Cicer arietinum*	Fabaceae	Shimbira	Food
8	*Citrus limon*	Rutaceae	Lomi	Food
9	*Coffea arabica*	Rubiaceae	Bunna	Drinking
10	*Coriandrum sativum*	Apiaceae	Dinbilal	Spice
11	*Cucurbita pepo*	Cucurbitaceae	Dubba	Food
12	*Cyperus fischerianus*	Cyperaceae	Giramita	For making house material like winnowing
13	*Echinops kebericho*	Asteraceae	Kebericho	Medicinal
14	*Eleusine floccifolia*	Poaceae	Akirma	Making house material
15	*Eragrostis teff*	Poaceae	Key teff	Food
16	*Ferula asafoetida*	Umbelliferae	Altite	Medicinal

Continued

17	*Guizotia abyssinica*	Asteraceae	Nug	Oil seed, food, medicine
18	*Hordeum vulgare*	Poaceae	Gebs	Food
19	*Impatiens tinctoria*	Balsaminaceae	Ensosla	Decorating purpose
20	*Lepidium sativum*	Brassicaceae	Fetto	Medicinal
21	*Linum usitatissimum*	Linaceae	Telba	Food, oil seed
22	*Lupinus albus*	Fabaceae	Gibito	Food
23	*Myrtus communis*	Myrtaceae	Ades	Spice
24	*Ocimum basilicium*	Lamiaceae	Zikakibie	Spice
25	*Olea europaea*	Oleaceae	Woyra	For fumigation
26	*Oryza sativa*	Poaceae	Ruse	Food
27	*Otostegia integrifolia*	Lamiaceae	Tinjut	Devil removal
28	*Physalis Peruviana*	Solanaceae	Timatim	Food
29	*Phytolaca dodecandra*	Phytolaccaeceae	Endod	Washing cloth
30	*Rhamnus prinoides*	Rhamnaceae	Gesho	Used as a condiments
31	*Ricinus communis*	Euphorbiaceae	Gullo	Oil seed
32	*Ruta chalepensis*	Rutaceae	Tenadam	Spice, medicine
33	*Schinus molle*	Anacardiaceae	Kundo berbere	Spice
34	*Silene macrosolen*	Caryophllaceae	Wegerit	Medicinal
35	*Thymus schimperi*	Lamiaceae	Tosign	Spice, medicine
36	*Trigonella foenum-graecum* L.	Fabaceae	Abish	Spice
37	*Vicia faba*	Fabaceae	Bakella	Food
38	*Zingiber officinale*	Zingiberaceae	Zinjibbil	Spice, medicinal

4.13. Ranking of medicinal plants

4.13.1. Preference ranking of human MPs

There are various plant species recommended for the same health issue in the study area, and individuals tend to favor one over the others. To determine the preference ranking of eight MPs used for healing wound infections, eight key informants were selected and asked to compare the efficacy of the given MPs. The informants were instructed to rank the plants based on their effectiveness, with the most effective plant being given the highest rank (8) and the least effective plant being given the lowest rank (1). *Ficus palmata* was ranked first and scored 60, indicating that it is the most effective in treating wound infections, followed by *Ricinus communis*. *Datura stramonium* was ranked as the least effective medicinal plant (as seen in table 8).

In a study conducted by Mihretu Berie (2021) in Dera District, *Ficus palmata* was revealed to be the most preferred medicinal plant for treating wounds, followed by *Kalanchoe petitiana*. *Clerodendrum myricoides* was ranked last and considered to be the least effective.

Table 8: Preference ranking of eight MPs used to treat human wound infection

List of MPs	List of respondents								Total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8		
Verbascum sinaiticum	6	5	4	3	5	6	7	4	40	4
Ficus palmata	8	7	7	8	6	8	8	8	60	1
Rumex nervosus	1	1	1	5	3	3	4	3	21	7
Datura stramonium	2	3	5	1	1	2	2	2	18	8
Ricinus communis	7	6	8	7	7	8	7	7	57	2
Stephania abyssinica	4	2	4	2	2	5	3	5	27	6
Coffea arabica	5	4	3	4	6	4	5	6	37	5
Juniperus procera	3	8	6	6	5	6	6	7	51	3

NB, R=Respondents

4.13.2. Preference ranking of livestock MPs

In the study area, local people reported that stave was the most common livestock health problem. Six MPs were reported as effective in treating the stave problem. Eight key informants ranked these six plants based on their perception of the degree of effectiveness. The preference ranking for MPs to treat stave revealed that *Echinops echinatus* was the most preferred one, scored 43, followed by *Verbascum sinaiticum*, and the least preferred was *Lepidium sativum*, scored 11 (Table 9).

Table 9: Preference ranking of six MPs s used to treat livestock stave

List of MPs	List of key informants								Total	Rank
	K1	K2	K3	K4	K5	K6	K7	K8		
Lepidium sativum	2	1	1	2	1	2	1	1	11	6th
Echinops echinatus	6	5	6	6	5	6	5	4	43	1st
Rumex nepalensis	3	3	4	5	3	3	3	2	26	4th
Urtica simensis	1	2	3	2	2	1	2	3	16	5th
plocarpha rueppellii	4	4	2	4	4	4	4	6	32	3rd
Verbascum sinaiticum	5	6	5	3	6	5	6	5	41	2nd

NB, K= key informants

Research conducted by Friehiwot Tamrat (2020) in Debre Tabor town reported that *Otostegia integrifolia* had the highest potency to treat stomachache followed by *Rumex nepalensis* and *Lepidium sativum.*

4.14. Direct matrix ranking for multiple uses of MPs

The analysis of the direct matrix ranking exercise on eight multipurpose MPs for treating human and livestock ailments allowed evaluating the relative importance. The result showed that *Eucalyptus globulus, Juniperus procera,* and *Croton macrostachyus* were ranked first, second, and third, respectively. *Ficus palmata* and *Rosa abyssinica* were MPs that were less used for those stated use categories (Table 10). *Eucalyptus globulus* had ranked first, and there is no fear for its reduction; consequently, people in the study area grow this plant in their home gardens. The direct matrix analysis indicated that MPs were broadly collected for furniture, construction, charcoal, fences, firewood, and agricultural tool purposes rather than for their medicinal use.

Amare Bitew *et al*. (2022) in Sedie Muja district reported that *Olea europaea* sub sp. was most multipurpose plant.

Table 10: Direct matrix ranking of MPs with different uses

Species	Use categories								
	F	Co	Ch	Fe	Me	Fw	Ag	Total	Rank
Acacia Abyssinica	5	4	4	5	3	2	4	27	5th
Ficus vasta	4	3	3	3	2	1	2	18	6th
Croton macrostachyus	5	5	4	4	4	3	5	30	3rd
Eucalyptus globulus	5	5	5	5	3	5	5	33	1st
Juniperus procera	5	5	4	4	4	5	4	31	2nd
Olea europaea	4	5	4	3	4	4	5	29	4th
Ficus palmata	0	0	1	5	4	2	0	12	8th
Rosa abyssinica	1	1	2	4	3	4	1	16	7th

F=Furniture, Co=Construction, Ch=Charcoal, Me=Medicine Fe=Fence, Fw=Firewood, Ag=Agricultural tool

4.15. Fidelity level

The fidelity level (FL) was calculated for the most commonly and frequently used MPs reported by informants and to identify the most important species obtained from the study. The fidelity level of MPs for frequently reported diseases was calculated. The results showed that 95% of *Ocimum urticifolium* for headache healing, 89% of *Ricinus communis* for wound healing, 98% of *Allium sativum* for healing of the evil eye, 64% of *Coffea arabica for cough healing, and 78% of Rhamnus prinoides* for healing of tonsillitis were reported by 74%, 53%, 79%, and 90% of informants, respectively (Table 11). This result indicated that MPs with a high fidelity level had good healing potential and were commonly used.

Allium sativum and *Croton macrostachyus* were reported by many informants to treat evil eye and stomachache respectively (Amare Bitew *et al*., 2022).

Table 11: Fidelity level of traditional MPs for the most frequently reported diseases

Diseases treated	MPs species	N	Np	FL=NP/N	FL%	% of informants
Headache	*Ocimum urticifolium*	89	85	0.95	95	74
	Zehneria scabra	112	98	0.87	87	93
	Eucalyptus globulus	67	54	0.8	80	56
	Ferula asafoetida	40	29	0.72	72	33
Wound	*Ricinus communis*	64	57	0.89	89	53
	Jasminum officinale	72	61	0.84	84	60
	Inula confertiflora	89	76	0.85	85	74
	Citrus limon	102	78	0.76	76	85
Evil eye	*Allium sativum*	95	94	0.98	98	79
	Acanthus sennii	34	28	0.82	82	28
	Sida schimperiana	115	103	0.89	89	96
	Ruta chalepensis	110	97	0.88	88	92
Cough	*Juniperus procera*	53	31	0.58	58	44
	Coriandrum sativum	82	40	0.48	48	68
	Coffea arabica	95	61	0.64	64	79
	Rosa abyssinica	41	15	0.36	36	34
Tonsillitis	*Rhamnus prinoides*	108	85	0.78	78	90
	Zingiber officinale	91	68	0.74	74	76
	Maytenus senegalensis	39	21	0.53	53	33

Key, FL%= NP/N*100%

FL is Fidelity Level, N is the number of informants who use the plants as medicine to treat any given ailment, and Np is the number of informants who claim the usage of a plant species to treat a specific condition.

4.16. Socio demographic characteristics of respondents

The distribution of respondents with respect to age class showed that most informants were found in the age group between 65 and 80. This indicates an increase in age among respondents who have knowledge that is more traditional because of many years of experience about plants

than other age classes, while young one lack the attention to comprehend the medicinal benefits of plants. This study was in line with study conducted by (Mohammed Yimam *et al*., 2022). The majority were males (66.7%) more knowledgeable than females (33.3%) which could be related to the country's traditional information transmission via the male line. Based on educational status among the total informants the highest number of informants was obtained, 65 (54.2%) were illiterate but traditionally knowledgeable farmers, followed by 48 (40%) educated and church education (*Mergeta, Kes, Debtera, and Diakon*) 7 (5.8%). This indicates the modern education has a greater impact on the loss of knowledge of traditional medicinal plants. When individuals receive modern education, they tend to assign less significance to conventional medicinal knowledge and consider its potential adverse effects. The occupational status of informants was as follows: 49 (40.8%) were farmers, 30 (25%) were housewife, 20 (16.7%) were teachers, and others. This may be expected as farmers daily life is around garden and forest area this may help them to know more medicinal plants (Table 12).

Table 12: Socio demographic characteristics of the participants in the study area

Variable	Categories	Frequency	Percentage
Sex	Male	80	66.7
	Female	40	33.3
	Total	120	100.0
Age	20-35	19	15.8
	36-50	24	20.0
	51-65	34	28.3
	>65	43	35.8
	Total	120	100.0
Educational status	Illiterate	65	54.2
	Educated	48	40.0
	Church education	7	5.8
	Total	120	100.0
Occupational status	Farmer	49	40.8
	Housewife	30	25.0
	Teacher	20	16.7
	Merchant	11	9.2
	Student	8	6.7
	Mergeta	1	0.8
	Veterinary Doctor	1	0.8
	Total	120	100.0

4.17. Acquisition and transfer of indigenous MPs knowledge

According to the data gathered, most of the traditional IK transfer on MPs, conventional concepts of illness, and methods of diagnosis among traditional healers in the Estie district were through oral tales to a family line from parents (62.3%), followed by observation (19.2%), and religious books (10%). The others (8.5%) contribute a little knowledge of the MPs transfer to the next generation; in addition, some informants acquired their knowledge secretly through systematic follow up and observation of practitioners at the time of MPs collection and preparation.

4.18. Indigenous knowledge of the local people on land, vegetation, and soil classification

The results of the current study revealed that the inhabitants of the study area traditionally classified the landforms, vegetation, and soil according to their long years of accumulated IK. This indicates that people in the study area have deep knowledge of classifying the locally available resources in addition to knowing MPs and their uses.

The local people of the district have a system of grouping soils based on color and moisture content as Keyate (red), Nechate (white), Bunama (brown), and Walika (waterlogged). The local people also experience botanical and ecological knowledge like grouping vegetation based on its structure, height, and other conditions such as Kutikuato (shrub), Medama (grassland), and Chaka (forest). They also have a system of grouping landscapes based on their position or structure as Wotageba, Medama, Terarama, Shelekoama, and Regregama, which mean undulating, plain, mountainous, valley, and marshy, respectively.

Similarly, in research conducted by Mohammed Adefa and Berhanu Abraha (2011), the local people of Tehuledere District have knowledge of grouping vegetation based on its structure, height, and other conditions. For example, "Qutkuato" is a name given to plants having a shrubby growth form, and it means a bush area. The local people have their own knowledge of ecological classification based on climatic conditions such as kolla, woyna dega, dega, and wurch, which mean high-temperature, medium-temperature, low-temperature, and very low-temperature areas, respectively. The local people have a system of grouping soils based on color, substrate, and moisture content as Key (red), Tikur (black), and Walka (waterlogged).

5. CONCLUSION

The result of ethnobotanical survey of medicinal plants in Estie district depicted the prevalent of traditional medicinal plants knowledge and practices in the district. However, there is no traditional medicinal practitioners' association in the district. The indigenous people predominantly use medicinal plants and some animals derived remedies for maintaining their primary healthcare. The majority of the local people used to acquire medicinal knowledge from their parents and partners in their locality.

A total of 120 medicinal plants used for treating human and livestock disease are documented despite of all the Kebeles of the district are not explored. The existence and utilization of such high diversity of plant species for medicinal purpose attributes to the reliance of local people on traditional medicine for their central healthcare system even nowadays. The majority plant species recorded in the district are found to be used in other parts of the country, even some plant species being used for treating the same ailment that could show their potential efficacy.

The majority of species are herbs followed by shrubs and trees, while and a very few species have climber growth forms. Leaves followed by roots are the dominant plant parts used for preparation of most remedies. On the other hand, the great numbers of preparations are set from pounding in the study area. The larger proportions of remedies are administered for internal ailments through oral route, while some external infections are treated commonly using dermal (topical) route. The dosages of most remedies are not commonly fixed, but some remedies are quantified by palm, cup can and etc on the basis of age and types of life to treat. Additive and solvents substances like water, honey, salt, butter, sugar and butter are common which could reduction of pain, getting a better taste, reducing adverse effects such as vomiting and diarrhea, minimizing discomfort, and enhancing the efficacy and healing conditions which could occur as part of the side effects of remedies.

6. RECOMMENDATION

To fully utilize the potential of medicinal plants efficiently, training on how the healers cultivate MPs in their home gardens to conserve, how they integrate their work with modern healthcare systems, and how they transfer their knowledge to the young generation is recommended.

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8. APPENDICES

Appendix 1: Questionnaires in English and Amharic version

Format for collecting ethnobotanical information

(Checklist of semi-structured interviews question for collecting ethnobotanical data**)**

Date _____

Dear respondents,

The main purpose of this questionnaire is to gather information or data on traditional MPs used in Estie district to treat both human and livestock diseases for the partial fulfillment of master's degree in Botany. Dear respondents, you are expected to provide genuine, accurate and balanced information with respect medicinal plant species, plant parts, method of preparations, ways of applications, and route of administrations of MPs . Your genuine information is highly valuable and it determines the success of this study. Therefore, the researcher is very much grateful for the sacrifice you pay to this end and the information gathered will be highly confidential and will be only for the purpose of this research. Participation in this study is fully voluntary. The participants will have the right to refuse the participation or to answer any questions that they feel uncomfortable. They can also withdraw at any time in the process. The decision not to participate or withdraw will not label them for any loss of benefits which they otherwise are entitled.

Contact address:

If there are any questions or enquiries any time about the study, please contact: Mobile Phone: 0946973928 or Email address: tirualemadane12@gmail.com

Thank you in advance!

I. General Information on respondents:

1. Area of Residence (village) _____Name _____Sex_____Age ____
2. Source of income: Farming_____Trading local items_____Others_____
3. Level of education: Educated_____Illiterate _____ Others_____

II. Ethnobotanical Data

1. Mention the major human health problems in your locality?
2. What are the major livestock diseases in your area?

3. Mention Medical plants that are used to treat for human and/or livestock diseases; local name; habit; disease treated; parts used; mode of preparation with dosage used; route of administration; ingredients add & other uses of medicinal plants.

Key: Habit (herb, shrub, tree, and climber); parts used (bark, leaf, root, fruit, flower, seed, stem, bulb, whole plant…..); Route (dermal, nasal, oral…)

Local Name of Plants	Habit	Use			Parts of plants used	Disease treated	Mode of preparation	Route	Ingredients added	Other uses of medicinal plants
		Human	Livestock	Both						

4. How do you acquire knowledge of traditional medicine?
5. Does each medicinal plant have any use other than medicine?
6. How local people prevent and control a given disease in your areas?
7. List the type of traditional MPs used to treat human and livestock ailments.

7.1. Which MPs are used to treat human disease only?

7.2. Which MPs are used to treat livestock ailments only?

7.3. Which MPs are used to treat both human and livestock ailments?

8. How is the knowledge of MPs use transferred from generation to generation in the community?
9. Where do the MPs grow?

9.1. In the wild

9.2. In the gardens

9.3. Both in the wild and home garden

10. Tell the traditional way of classifying vegetation, soil, and landscapes in your area:

10.1. vegetation

10.2. Landscape

10.3. soil

11. Dosage: Does it vary among age groups, sex? If you say yes, why? If not, why not?

12. How do the local people measure the dosage?
13. Is there any solvent and additives during rout of administration of MPs?
14. Is medicinal plant easily accessible in your area?
15. Mention the MPs that have multipurpose other than medicine in your locality?
16. Which medicinal plant is dominant in your area?
17. Are the medicinal plants marketable?

ቀን_____

ውድ ምላሽ ሰጭዎች

የዚህ ጥናት ዋና አላማ በእስቴ ወረዳ ውስጥ የሰው እና የእንስሳት በሽታዎችን ለማከም ጥቅም ላይ የሚቅሉ የባህላዊ መድኃኒት ተክሎች መረጃንዎችን ለመሰብሰብና ለመመዝገብ ከፍተኛ አስተዋጽኦ ይኖረዋል፡፡ ከዚህም በተጨማሪ ጥናቱ ለአጥኝው በእጽዋት ሳይንስ የማስተርስ ዲግሪ መመረቂያ ጽሁፍ ማሟያ የሚውል ይሆናል።

ውድ ምላሽ ሰጭዎች፣ ከመድኃኒት እጽዋት ዝርያዎች፣ ከእጽዋት ክፍሎች፣ ከዝግጅት ዘዴዎች፣ ከመተግበሪያዎች እና ከመድኃኒት እጽዋት አስተዳደር መንገዶች ጋር እውነተኛ፣ ትክክለኛ እና ሚዛናዊ መረጃን መስጠት ይጠበቅብዎታል፡፡ የእርስዎ እውነተኛ መረጃ በጣም ጠቃሚ ነው እናም የዚህን ጥናት ስኬት ይወስናል፡፡ ስለሆነም ተመራማሪው ለዚህ አላማ ለከፈሉት መስዋእትነት በጣም አመስጋኝ ነው፡፡ የተሰበሰበው መረጃ በጣም ሚስጥራዊ እና ለዚህ ምርምር ዓላማ ብቻ ይሆናል፡፡ በዚህ ጥናት ውስጥ መሳተፍ ሙሉ በሙሉ በፈቃደኝነት ነው፡፡ ተሳታፊዎቹ በጥናቱ ላይ አለመሳተፍም ሆነ መሳተፍ ከጀመሩ ማቋረጥ ወይም የሚጠየቁት ጥያቄ የማይስማማቸው ከሆነ አለመመለስ ይችላሉ፡፡ ስለዚህ ይህን በማድረጋቸው ምንም የሚደርስባቸው ችግር የለም፡፡ መልስ መመለስ የማይፈልጉት ጥያቄ ሲኖር በማንኛውም ሰዓት ያለመመለስ መብታቸው የተጠበቀ ነው፡፡

አድራሻ

ስለጥናቱም ሆነ ስለማንኛዉም ነገር ግልጽ ያልሆነ ካለ ችግሩን ለመፍታት ፈቃደኞች ነን፡፡ ስለሆነም ማንኛውንም ጥያቄ ካላችሁ የሚከተለው አድራሻ በመጠቀም መጠየቅ ይችላሉ፡፡ የጥናቱ ባለቤት አድራሻ ጥሩአለም አዳነ, ስልክ ቁጥር 0946973928, ኢ-ሜይል፡ tirualemadane12@gmail.com

ይህንን መጠይቅ ለመሙላት ላሳዩት በጎ ፈቃደኝነት በጣም አመሰግናለሁ።

I. <u>የመልስ ሰጪዎች አጠቃላይ መረጃ</u>

1. የመኖሪያ አካባቢ (መንደር)_____ስም_____ ጾታ_____ዕድሜ_____
2. **የገቢ ምንጭ፡** እርሻ_____የአካባቢው ዕቃዎችን መገበያየት_____ሌሎችም_____
3. **የትምህርት ደረጃ፡** የተማረ/ች _____ ማንበብ እና መጻፍ የማይችል _____ሌሎች_____

II. <u>ተያያዥ የማህበረሰብ እውቀት መረጃዎች</u>

1. በአካባቢዎ ውስጥ ያሉትን ዋና ዋና የሰው ጤና ችግሮች ጥቀስ/ሽ?
2. በአካባቢዎ ውስጥ ዋና ዋና የእንስሳት በሽታዎች ምንድ ናቸው?
3. ለሰው ወይም ለእንስሳት በሽታዎች ለማከም የሚያገለግሉ የሕክምና እፅዋትን ይጥቀሱ፤ የአካባቢ ስም፤ ልማድ፤ የሚያድኑት በሽታ ጥቅም ላይ የዋሉ የእፅዋቱ ክፍሎች፤ የመድሃኒቱ አዘገጃጀት እና አወሳሰድ፤ የአስተዳደር መንገድ፤የሚጨመሩ ንጥረ ነገሮች እና ሌሎች የመድኃኒት እጽዋት አጠቃቀም

ቁልፍ፥ ልማድ (ቁጥቋጦ፣ ዛፍ፣ ተክል)፤ ክፍሎች (ቅርፊት፣ ቅጠል፣ ሥሮች፣ ፍራፍሬ፣አበባ፣ ዘር፣ ግንድ፣ አጠቃላይ የተክሉን ክፍል)፤የአወሳሰድ መንገድ (በመቀባት፣ በአፍንጫ፣ በአፍ)

የእጽዋቱ አካባቢያዊ ስም	የእፅዋቱ ልምድ	የመድኃኒትነት ጥቅም		እፅዋት ክፍሎች	የበሽታው አይነት	አዘገጃጀት	የአወሳሰድ መንገድ	የተጨመሩ ንጥረ ነገሮች	ሌሎች የእጽዋቱ ጥቅሞች
		ለሰው	ለከብቶች						

4. ስለ ባህላዊ መድሃኒት እውቀት እንዴት ያገኛሉ?
5. እያንዳንዱ የመድኃኒት ተክል ከመድኃኒት በስተቀር ሌላ ጥቅም አለው?
6. በአከባቢዎ ውስጥ አንድ የተወሰነ በሽታ እንዴት ይከላከላል እና ይቆጣጠራሉ?
7. የሰውን እና የከብት እርባታዎችን ለማከም የሚያገለግሉ ባህላዊ የመድኃኒት እፅዋትን ይዘርዝሩ?
   7.1. የሰውን በሽታ ብቻ ለማከም የሚያገለግሉ የትኞቹ የመድኃኒት እፅዋት ናቸው?
   7.2. የእንስሳትን ህመም ብቻ ለማከም የሚያገለግሉ የትኞቹ የመድኃኒት እፅዋት ናቸው?
   7.3. የሰውን እና የእንስሳትን ህመም ለማከም የሚያገለግሉ የትኞቹ የመድኃኒት እፅዋት ናቸው?
8. የእጽዋት መድኃኒት እውቀት በህብረተሰቡ ውስጥ ከትውልድ እስከ ትውልድ የተላለፈ እንዴት ነው?
9. የመድኃኒት እጽዋት የት ያድጋል?
   9.1. በዱር ውስጥ ምን ምን ናቸዉ?
   9.2. በአትክልት ስፍራዎች ውስጥ ምን ምን ናቸዉ?
   9.3. ሁለቱም በዱር እና በቤት ውስጥ የአትክልት ስፍራ?
10. በአከባቢዎ ውስጥ ባህላዊ የመሬት ገጽታ ምደባ መንገድ ይግለጹ
    10.1. ደን
    10.2. የመሬት ገጽታ
    10.3. አፈር
11. የመድሃኒቱ አወሳሰድ መጠን፥ በዕድሜ እና በጾታ መካከል ይለያያል፤ አዎን ከሆነ ለምን፤ ካልሆነ ለምን አይሆንም?
12. የአከባቢው ሰዎች የመድኃኒት መጠኑን እንዴት ይለካሉ?
13. የመድኃኒት እፅዋትን በሚወሰድበት ጊዜ ፈሳሽ እና/ሌሎች ተጨማሪዎች ነገሮች አሉ? ይጥቀሱ
14. የመድኃኒት ተክል በአከባቢዎ በቀላሉ ተደራሽ ነውን?
15. በአከባቢዎ ውስጥ ካለው መድሃኒት ውጭ ሌሎች የሚያዉቁትን የመድኃኒት እፅዋት ይጠቁሙ?
16. በአከባቢዎ ውስጥ የትኛው የመድኃኒት ተክል በብዛት ይገኛል?
17. የመድኃኒት ዕፅዋት ለገበያ የሚውሉ ናቸው?

Appendix 2: List of Informants participated in the Study Area

Name	Sex	Age	E/status	Kebelle	Occupation
Kes Getnet Tadesse *	M	70	CE	M/Eyesus	Farmer
Dassash Dessalegn *	F	52	IL	M/Eyesus	H/Wife
Demrie Nega *	M	66	ED	M/Eyesus	Farmer
Endalew Marye	M	36	ED	M/Eyesus	Merchant
Birrie Binega	M	37	ED	M/Eyesus	Farmer
Gasha Mesfin	M	52	ED	M/Eyesus	Merchant
Yhun Mesfin	M	54	IL	M/Eyesus	Farmer
Shashe Destaw	F	67	IL	M/Eyesus	H/Wife
Tsedie Ashagrie	F	72	IL	M/Eyesus	H/Wife
Ehtnesh Shumet	F	69	IL	M/Eyesus	H/Wife
Wubet Destaw	F	67	IL	M/Eyesus	H/Wife
Aderajew Sema	M	36	ED	M/Eyesus	Student
Yetsedaw Setargie *	M	67	ED	M/Eyesus	Farmer
Worku Ferde	M	66	IL	M/Eyesus	Farmer
Abraraw Alemu	M	25	ED	M/Eyesus	Student
Zena Alemu	M	22	ED	M/Eyesus	Student
Belay Tigabu	M	26	ED	M/Eyesus	Merchant
Belachew Erkie	M	37	IL	M/Eyesus	Teacher
Ermias Abagena	M	30	ED	M/Eyesus	Teacher
Timesil Getnet	F	30	ED	M/Eyesus	Teacher
Fikadie Nigatie	M	68	IL	A/Kositet	Farmer
Anbeye Gebeyehu	M	67	IL	A/Kositet	Farmer
Yeshalem Lakew	F	52	IL	A/Kositet	H/Wife
Emamye Abebe	F	21	IL	A/Kositet	Student
Mastewal Lakew *	F	36	ED	A/Kositet	Merchant
Emaway Biset	F	31	ED	A/Kositet	H/Wife
Kes Kiflie Dessie	M	67	CE	A/Kositet	Farmer
Askal Aragie	F	36	ED	A/Kositet	H/Wife
Tarekegn Mengistie	M	37	ED	L/A/Gedayat	Teacher

Continued

Yekitie Alemu	F	55	IL	A/Kositet	H/Wife
Tsega Bizuayehu	M	66	IL	A/Kositet	Farmer
D/n Firiesibhat Damtie*	M	53	CE	A/Kositet	Farmer
Tsegaye Tarekegn*	M	51	IL	A/Kositet	Farming
Getanew Worku	M	32	ED	A/Kositet	Merchant
Temare Endeshaw	M	51	ED	A/Kositet	Merchant
Ayalew Kelkay *	M	69	CE	A/Kositet	Farmer
Erkie Kebede	M	68	ED	A/Kositet	Farmer
Tarekegn Filate	M	68	IL	A/Kositet	Farmer
Tadie Filate	M	51	IL	A/Kositet	Farmer
Kibie Tarekegn	F	23	ED	A/Kositet	Student
Shambel Tarekegn	M	36	ED	A/Kositet	Merchant
Alene Abeje	M	69	ED	L/A/Gedayat	Farmer
Tesfie Adane*	M	67	IL	L/A/Gedayat	Farmer
Kes Adamu*	M	66	CE	L/A/Gedayat	Farmer
Asefa Birkie	M	52	ED	L/A/Gedayat	Teacher
Getnet Mazengia*	M	70	IL	L/A/Gedayat	Farmer
Wondm Tigab	M	51	ED	L/A/Gedayat	Merchant
Tarkie Gelie	M	52	IL	L/A/Gedayat	Merchant
Alem Agegn	F	51	IL	L/A/Gedayat	H/Wife
Kes Baye Negash	M	52	CE	L/A/Gedayat	Farmer
Addis Yismaw	M	36	ED	L/A/Gedayat	Student
Tesfa Abaynew	F	36	ED	L/A/Gedayat	Teacher
Amsal Teklachew	F	37	ED	L/A/Gedayat	Teacher
Adugnaw Alanie	M	36	ED	L/A/Gedayat	Veternary
Aragie Belay	M	70	IL	L/A/Gedayat	Farmer
Atalay Gelaw	M	67	IL	L/A/Gedayat	Farmer
Maregie Haylie *	F	71	IL	L/A/Gedayat	H/Wife
Gebeye Awoke	F	69	IL	L/A/Gedayat	H/Wife
Bizuayehu Dessie	F	20	ED	L/A/Gedayat	Student
Wudie Abeje	F	55	ED	L/A/Gedayat	H/Wife

Continued

Mergeta Hulgizie Nurlgn*	M	80	ED	Ziguara	Mergeta
Alemnesh Yehuala *	F	70	IL	Ziguara	H/Wife
Awoke Wondye	M	76	IL	Ziguara	Farmer
Tsega Admasie	F	70	IL	Ziguara	H/Wife
Gedef Yhunie*	M	51	IL	Ziguara	Farmer
Melkamie Molla	F	53	ED	Ziguara	H/Wife
Ybeltal tilahun	M	37	ED	Ziguara	Teacher
Wasihun worku	M	31	ED	Ziguara	Teacher
Kindu Amsalu	M	30	ED	Ziguara	Teacher
Almaz Akele	F	31	ED	Ziguara	Teacher
Workalem setegn	F	27	ED	Ziguara	Teacher
Firdywok Birhanie	M	38	ED	Ziguara	Teacher
Gizie Yhunie	M	36	IL	Ziguara	Merchant
Gebeye Tiruneh	M	54	ED	Ziguara	Farmer
Geta Tarekegn	M	55	IL	Ziguara	Farmer
Shiferaw Aynalem	M	66	IL	Ziguara	Farmer
Mengist Abera *	M	80	IL	Ziguara	Farmer
Amlakie Wubet	M	37	ED	Ziguara	Teacher
Adebabay Adane	M	51	ED	Ziguara	Teacher
Firdywok Sisay	M	23	ED	Ziguara	Student
Tilaye Adamu	M	51	ED	Madoye	Farmer
Lake Kefale	M	55	ED	Madoye	Merchant
Melkie Belay	M	51	IL	Madoye	Farmer
Kegne Asefa	M	53	IL	Madoye	Farmer
Kindye Gedam	M	38	ED	Madoye	Teacher
Desalegn Ymam	M	69	IL	Madoye	Farmer
Kes Kindalem *	M	70	CE	Madoye	Farmer
Misgie Melak *	M	54	IL	Madoye	Farmer
Shega Kefale	M	67	IL	Madoye	Farmer
Alem Ewunetie	F	67	IL	Madoye	H/Wife
Endesh Terefe*	F	68	IL	Madoye	H/Wife
Alemye Alelgn	F	51	IL	Madoye	H/Wife
Birhane Demlie	F	42	IL	Madoye	H/Wife

Continued

Wondie Walle	M	69	IL	Madoye	Farmer
Getie Asrade	M	57	IL	Madoye	Farmer
Zeleke Belay *	M	70	IL	D/Zewana	Farmer
Gizachew Kassa	M	70	IL	D/Zewana	Farmer
Wondmagegn Angash	M	71	IL	D/Zewana	Farmer
Adugnaw Alemayew	M	60	IL	D/Zewana	Farmer
Ashagrie Dires*	M	80	IL	D/Zewana	Farmer
Birhanu Molla	M	80	IL	D/Zewana	Farmer
Kassaw Tarekegn*	M	65	IL	D/Zewana	Farmer
Aychew Tilahun*	M	70	IL	D/Zewana	Farmer
Abebaw Moges	M	58	IL	D/Zewana	Farmer
Dessie Baylie	M	56	IL	D/Zewana	Farmer
Amare Molla	M	43	ED	D/Zewana	Teacher
Masrie Ayalew	M	32	ED	D/Zewana	Teacher
Sendek Diress	M	33	ED	D/Zewana	Teacher
Fenta Akalu	F	33	IL	D/Zewana	H/Wife
Workie Ymer	F	32	IL	D/Zewana	H/Wife
Neter Goshe	F	75	IL	D/Zewana	H/Wife
Belaynesh Asmare	F	55	IL	D/Zewana	H/Wife
Ejigitu Molla*	F	70	IL	D/Zewana	H/Wife
Ager Taye	F	60	IL	D/Zewana	H/Wife
Tirubir Taye	F	50	IL	D/Zewana	H/Wife
Aynshet Simegn	F	35	ED	Madoye	Teacher
Enysh Zelalem	F	44	IL	Madoye	H/Wife
Asmamaw Aychew	M	70	IL	Madoye	Farmer
Madie Enyew	F	52	IL	Madoye	H/Wife
Zerfie Ayalew	F	66	IL	Madoye	H/Wife

Key: IL=illiterate, Ed=educated, CE= church education, M/Eyesus= Mekane Eyesus, A/Kositet = Agona Kositet, D/Zewana= Debire Zewana, L/A/Gedayat and *=key informant

Appendix 3: List of medicinal plants

MPs used for human (#), livestock (*), and both human and livestock (#*) diseases, scientific name, family, local name, habit, habitat, parts used, disease treated, mode of preparation, and route of administration and additives

No	Scientific Name	Family Name	Local name	Disease they Treat	PU, Mode of Preparation	RA	Ad	Ha	Hab
1	*Verbascum sinaiticum* Benth	Scrophulariaceae	Kotetina	Cough#	**Root,** crush the roots and boil with honey then drink every day	O	Ho	S	Wd
				Lifi# (wound)	**Leaf**, pounding the leaf and tie on the wound	D	-		
				Evil eye#	**Root,** pounded fresh root and sniffed	Na			
				Diarrhea*	**R**oot, Crush the root and drink	O	-		
				Stomachache#	**Root**, Mix it with *Cucumis ficifolius* A. Rich and squeeze it and drink it with good milk	O	Mi		
				Stave*	**Root**, Crush the root and drink it.	O	-		
2	*Rumex abyssinicus* Jacq.	Polygonaceae	Mekmeko	kuakucha#	**Root**, The root is washed, dried then powdering and applied every three days	D	-	H	Wd
				Rih#	**Root**, Dry then crush and drink with honey	O	Ho		
3	*Olea europaea L.* subsp. Cuspidata	Oleaceae	Woyra	lify#	**Stem**, Cut the wood in seven places and tie it with a copper ring	D		T	Wd
				Evil eye#	**Leaf,** Fresh or dried leaves are fumigated nasally	N			
				Toothache#	**Leaf**, Dismantle the leaf and hold between teeth	Te	-		

4	*Phytolaca dodecandra* L'Herit	Phytolaccaeceae	Endod	Tape worm[#]	**Fruit**, Dry, Grinding the fruit and drink a little	O		S	Bo
				Thug[#]	**Root**, Pounding the root and drink a little with teacup	O			
				Abortion[#]	**Fruit**, grind and drink	O			
5	*Ficus palmata* Forssk.	Moraceae	Beles	Wound[#]	**Seed,** Juice, smear on the wound	D		T	Wd
				Stomachache[#]	**Seed**, Eating the seed	O			
6	*Euphorbia abyssinica* Gmel.	Euphorbiaceae	Qulqual	Malaria[#]	**Root,** Root baked with teff and then eating	O	-	H	Wd
				Wound[#]	**Stem**, Bleed the plant and creaming on the affected part	D	-		
				Donkey cough*	**Stem,** fumigate the stem	Fu			
7	*Artemisia abyssinica* Sch. Bip. ex A. Rich.	Asteraceae	Chiqugn	Common cold[#]	**Leaf**, cutting the leaf and then smelling	Na		H	Wd
				Evil eye [#]	**Leaf**, smelling the leaf	Na			
8	*plocarpha rueppellii*	Asteraceae	Getin	Stave *	**Root**, crushing and drenching	O		H	Wd
9	*Ferula asafoetida*	Umbelliferae	Altite	Headache[#]	**Leaf**, crushing the leaf and apply on the body	D	-	H	Bo
10	*Prunus persica (*L.)	Rosaceae	Kock	Pumping[*]	**Leaf**, Squeezing the leaf and then drenching	O	-	T	Hg
11	*Capsella bursa-pastoris* (L.) Medic	Brassicaceae	Yebegilat	Tonsillitis[#]	**Leaf**, Squeezing the leaf, mix with sugar and then drinking	O	Su	H	Wd
12	*Zehneria scabra* Linn. f. Sond.	Cucurbitaceae	Haregresa	Headache[#]	**Leaf**, Boiling the leaf and fumigate	Fu	-	Cl	Wd
				Febrile illness[#]	**Stem &leaf**, boiled the fresh stem and leaf, inhale the steam or squeezed the fresh leaf and apply creaming the body	D			

				Common cold[#]	**Leaf**, Squeezed and drunk isolated juice	O			
13	*Justicia schimperiana* Hochst. ex Nees) T. Anders.	Acanthaceae	Simiza	Hen disease[*]	**Leaf**, Squeezing the leaf and drenching	O		S	Bo
				Anthrax[#]	**Leaf**, Squeezed the fresh leaf and drunk the juice	O			
				Diarrhea[#]	**Leaf**, pounded the fresh leaf, homogenized with water and drunk	O			
				Hepatitis[#]	**Leaf**, squeezed and drunk the juice	O			
				Dandruff[#]	**Leaf**, squeezed the fresh leaf and apply creaming	D			
				Stomachache*	**Leaf**, squeezing the leaf and then drenching	O			
				Amazment[#]	**Root**, pounding and then fumigation	Fu			
14	*Hagenia abyssinica* (Bruce) J. F. Gmel	Rosaceae	Koso	Wart[#]	**Stem**, Cutting the stem and warm-up with fire and then warming on the wart	D		T	Wd
				Ring worm[#]	**Fruit**, grind the fruit and swallow it with honey	O	Ho		
15	*Stephania abyssinica* (Dillo and A.Rich.)	Menispermaceae	Shimtirtira	Pumping[*]	**Leaf**, Squeezing the leaf and then drenching	O		Cl	Wd
				Wart[#]	**Fruit**, Pound fresh fruit of Stephania *abyssinica* and squeeze its juice then smear the affected part	D	-		
				Rabies[#]	**Leaf**, Crush fresh leaf and root of *Stephania abyssinica* together and mix with water and honey, leave for 24hr then drunk one glass per day for 7 days	O	Ho		
16	*Rumex nepalensis* Spreng.	Polygonaceae	Yebere milas	Stomachache[#]	**Root**, cutting the root and then champ or mastication	O		H	Wd
17	*Hypericum*	Hypericaceae	Ameja	Stomachache[#]	**Root**, cutting the root and then champ or mastication	O		S	Wd

	quartinianum A. Rich.								
18	*Allium sativum* L.	Alliaceae	Nechi shinkurt	Cough[#]	**Bulb**, boiling the bulb and then drinking	O	-	H	Hg
				Malaria[#]	**Bulb**, Pounding bulb fresh of Allium sativum and mixed with *Cicer arietinum* in water (concoction).The n take with 1 -2 cup of tea	O	-		
				Febrile illness[#]	**Bulb**, Bulb pounded fresh bulb with the leaf of *Ruta chalepensis* (concoction) and eaten	O	-		
				Evil eye[#]	**Bulb**, pounding the bulb and tie on the neck	D			
				Common cold[#]	**Bulb**, boil the bulb and drinking	O			
19	*Oxytenanthera abyssinica*	Poaceae	Kerkeha	Black legg*	**Ban**, Shooting while warming up with seven melts	D		T	Bo
20	*Zingiber officinale* Roscoe.	Zingiberaceae	Zinjibbil	Stomachache[#]	**Root**, Chewing and taking the juice	O	-	H	Hg
				Common cold[#]	**Root**, pound and boil the root with sugar and honey and then drunk	O	Su, Ho		
				Tonsillitis[#]	**Root/rhizome**, Fresh root/ rhizome will be crushed together with *Solanum incanum* flower (concoction) and drunk.	O	-		
21	*Rubia cordifolia*	Rubiaceae	Mencherer	Cough[#]	**Root**, pounding and drinking with water	O		S	Wd
22	*Guizotia abyssinica* (L.f.) Cass.	Asteraceae	Nug	Dessication [#]	**Seed**; Grinding the seed and solute with water and then drinking	O		H	Hg
23	*Hypoestes forskaolii*	Acanthaceae	Telenzhi	Fire wound[#]	**Leaf**, drying and grinding the leaf and then smear on the fire wound	D		H	Wd

				eye pain *	**Leaf**, Pound and spry on the eye	Oc			
				Eczema#	**Leaf**, Pounded the fresh leaf and tied on the infected part	D			
24	*Echinops kebericho* Mesfin.	Asteraceae	Kebericho	Evil eye#	**Root**, fumigating the root	Fu		S	Wd
				Headache#	**Root**, smoking the root	Fu			
25	*Carissa spinarum* L.	Apocynaceae	Agam	Nightmare/Delirium*	**Root**, Soaking the root with water and then spraying in the house	Sp		S	Wd
				Evil eye#	**Roots**: Crush the roots and smoke or tie on the neck	Fu	-		
				Snake bite#	**Shoot**, Fresh shoot buds from several plants are given for chewing	O	-		
				Diarrhea *	**Root**, Dried root crushed with dried powder of *Brassica nigra* add salt (concoction) and making as solution drunk cattle.	O	Dried root crushed with dried powder of *Brassica nigra* add salt (concoction) and making as solution drunk cattle.		
26	*Rhamnus prinoides* L'Herit.	Rhamnaceae	Gesho	tonsillitis #	**Shoot**, Crushed and squeezed shoots or tip part from 12 d/f plants of the same species and added few droplets to raise the epiglottis	O		S	Hg
				pumping*	**Leaf**, mix with malt and crushing then drenching with water	O			
				Diarrhea #	**Leaf**, its leaf decoction taken orally	O			

				Face fungus[#]	**Leaf,** Squeezed the juice and apply creaming on the affected part	D			
27	*Euclea racemosa* Murr.	Ebenaceae	Dediho	Extra tongue[#]	**Root**, Pounding the dry root and then smear	D		S	Wd
				Diarrhea [#]	**Leaf**, squeezing the leaf and mix with water, and then drinking	O			
28	*Otostegia integrifolia* Benth.	Lamiaceae	Tinjut	Antrax[#]	Leaf, Pounded or Squeezed the leaf and drunk the isolated juice	O		S	Bo
				Stomachache[#]	**Leaf**, chewing the leaf	O			
				common cold, devil[#]	**Leaf**, smoking the dry leaf and fumigate the smoke	Fu			
29	*Thymus schimperi* Ron.	Lamiaceae	Tosign	Hypertension[#]	**Leaf**, Boiling and drinking with tea	O	Su	H	Wd
30	*Ruta chalepensis* L.	Rutaceae	Tenadam	Stomachache[#]	**Leaf**, Fresh leaf will be crushed mixed with coffee (concoction) and drunk.	O	Co	H	Hg
				Pumping [*]	Leaf, pounding the leaf and mix with water and then drenching.	O			
				Evil eye[#]	**Fruit**, Pounding dried fruit of *Ruta chalepensis* plant and adding with *Allium sativum* (concoction) to be sniffed using a spoon	N	-		
31	*Kalanchoe petitiana* A. Rich.	Crassulaceae	Andawula	Tonsillitis[#]	**Leaf**, Squeezing the leaf and drink the juice	O		H	Bo
				Wart [#]	**Leaf**, heating the fresh leaf and put on the affected part	D			
32	*Sida schimperiana*	Malvaceae	Chifrig	Evil eye[#]	**Stem**, Chewing the steam	O		S	Wd

	Hochst. ex A. Rich			Syphilis[#]	**Roots**, Crush the roots and mix with honey and swallow	O	Ho		
33	*Urtica simensis* Steudel	Urticaceae	Samma	Stave[*]	**Root**, Pounding the root and drenching with water	O		H	Wd
				Wart [#]	**Leaf**, boil the leaf and wash with water	D			
				Hemorrhoid[#]	**Root**, Crushing the fresh root and polish the wound	D	-		
34	*Brassica napus* L.	Brassicaceae	Gomenzer	Stomachache[#]	**Seed**, Grinding the seed and homogenized the powder with water and drunk the solution	O		H	Hg
				wound [#]	**Seed**, grinding and pasting the powder on wounded part	O			
35	*Solanum marginatum* L. f.	Solanaceae	Embuay	Eye disease*	**Seed**, spraying the seed on the eye	Oc		S	Wd
				Ladle*	**Seed**, drenching the seed with goat milk	O	Ml		
				Hypertension[#]	**Leaf**, eating the leaf alone	O			
36	*Jasminum officinale*	Oleaceae	Amiera	Wound [#]	**Leaf**, Squeezing the leaf and creaming on the wound	D		S	Hg
37	*Stephania abyssinica*	Menispermaceae	Nechi hareg	Pneumonia[#]	**Leaf**, boil the leaf and then fumigate it	Fu		Cl	Wd
				Head ache [#]	**Leaf,** boil and fumigation	Fu			
38	*Cynoglossum coeruleum* Steud. Ex A.DC	Boraginaceae	Shimgegit	Pneumonia[#]	**Leaf**, Squeezing the leaf and creaming on the affected skin	D		H	Bo
				Stave*	**Root**, pounded the root and drenching with nose and mouth	Na & O			
				Fire wound[#]	**Leaf**, pounding the dry leaf and then creaming on affected part	D			
39	*Millettia ferruginea*	Fabaceae	Birbira	Leech [*]	**Leaf**, Pounding the leaf and drenching with water	O		T	Wd

40	*Rumex nepalensis* Spreng	Polygonaceae	Wusha milas	Pain, Stave*	**Root**, Pounding the root and drink the juice	O		H	Wd
				Toothache#	**Root**, Holding the fresh root (un processed) in between teeth.	D			
				Wound#	**Leaf**, Its fresh leaves with root of *Malva Verticillata* (concoction) powdered and put on affected part.	D			
				Abortion#	**Root**, Fresh root pounded with water and squeezed: juice isolated and drink 1 -2 cup	O			
41	*Croton macrostachyus* Del.	Euphorbiacea e	Bisanna	Wound#	**Leaf**, Squeezing the leaf and creaming on the wound	D		T	Wd
				Dandruff #	**Leaf**, squeezing the leaf and creaming on dandruff	D			
				Rabies*	**Bark**, Dry bark is powdered and mixed with water 1 bottle is given orally	O			
42	*Vernonia amygdalina* Del.	Acanthaceae	Girawa	Wound #	**Leaf**, squeezing the leaf and smear on the wound.	D		S	Wd
				Hepatitis#	**Leaf**, Squeezed the fresh leaf and drunk the juice	D			
43	*Securidaca longepedunculata*	Polygonaceae	Temenay	Evil eye #	**Root**, cutting and tie the root on neck	D		S	Wd
44	*Prunus africana*	Rosaceae	Tikur enchet	Leech *	**Stem**, boiling and drenching	O		T	Wd
45	*Calpurnia aurea* (Ait.) Benth.	Fabaceae	Ziqita	Insect bite	**Leaf**, washing the skin with the leaf	D		S	Wd
				Diarrhea#	**Leaf**, The leaf of *Calpurnia aurea* is squeezed and then drunk before food	O			
46	*Debregeasia saeneb*	Urticaceae	shunshuna	Evil eye #	**Root,** cut the root and tied on the neck	D	-	S	Wd
47	*Myrica salicifolia*	Myricaceae	Shinet	Leech*	**Bark**, boil the bark and drenching	O		T	Wd

48	*Cyperus fischerianus*	Cyperaceae	Giramita	Mumps[#]	**Stem**, spin and tied on the neck	D		H	Hg
49	*Eucalyptus globulus* Labill.	Myrtaceae	Nech Bahirzaf	Headache [#]	**Leaf**, Boil the leaf and fumigate it.	Fu		T	Bo
				Common cold[#]	**Leaf**, Fresh leaf boiled being mixed with *O. sauve* and *Z. scabra* (decoction) and then fumigated nasally	Na	-		
50	*Cicer arietinum* L.	Fabaceae	Shimbira	Wart [#]	**Seed**, boil the seed and wash with the boiled water	D		H	Cr
				Fever[#]	**Seed**, Chewing the dry seed and swallowed the juice	O			
				Ascaris[#]	**Seed**, Boiling the dry seed and drunk the decoction.	O			
51	*Echinops echinatus* Roxb.	Asteraceae	Ye Ahiya eshoh	Stave*	**Root**, Pounding the root and drenching with water	O		H	Wd
52	*Malva verticillata L.*	Malvaceae	Lut	Skinny cattle*	**Root**, Pounding the root and drenching	O	-	H	Wd
				Spider Poison [#]	**Root**, Pound fresh root of *Otostegia integrifolla* and mix with butter then creamed on the affected part	D	Bu		
				Retained Placenta[#]	**Root**, Remove the bark of root of *Rumex nepalensis* then insert in the reproductive organ of women and leave it 3-5 minute	Ins	-		
53	*Aloe Macrocarpa*	Aloaceae	Wonderet	Dandruff [#]	**Latex**, smear the juice on the body	D		S	Wd
				Wart[#]	**Latex**, smear on the wart	D			
				Hemorrhoid[#]	**Latex**, The fresh latex is applied on the affected part				
54	*Capsicum annum* L.	Solanaceae	Berbere	Malaria[#]	**Leaf**, Squeezing the leaf and drink	O		H	Hg
55	*Datura stramonium* L.	Solanaceae	Astenagir	Wound[#]	**Leaf**, Squeezed the leaf and apply creaming on the affected part	D		H	Wd

				Toothache [#]	**Seed**, smoke the seed and fumigate	Fu			
56	*Ricinus communis* L.	Euphorbiacea e	Gullo	Wound [#]	**Leaf**, Pounding the dry leaf and creaming with butter on the wound	D	Bu	S	Wd
				Wart[#]	**Seed**, warm-up the wart with the seed	D			
				Fire wound[#]	**Leaf**, Pounding the dry leaf and then creaming with butter	D	Bu		
				Amoebiasis[#]	**Seed**, Dried seed is given for chewing during stomachache	O			
57	*Stephania abyssinica* DilloEn and A.Rich)	Menispermac eae	Ayit hareg	Wound [#]	**Seed**, pound the seed and smear on the wound.	D		Cl	Wd
				Antrax[#]	**Root**, pounding the root and drink	O			
58	*Panicum coloratum* L.	Poaceae	Yekok sar	Tonsillitis[#]	**Leaf**, Squeezing the leaf and creaming	D		H	Wd
59	*Dodonea angustifolia* L f.	Sapindaceae	Kitkita	Bone dislocate on*	**Leaf**, Dismantle the leaf and tied on the broken part	D		S	Wd
				Diarrhea[#]	**Leaf**, pounded the leaf, homogenized with water and drunk the solution.	O			
60	*Avena sativa* L.	Poaceae	Ajja	Broken body[#]	**Seed**, Grinding the seed and cook and then drink	O		H	Cr
61	*Oryza sativa* L.	Poaceae	Ruse	Hypertension[#]	**Seed**, boil the seed and eat.	O		H	Cr
62	*Lupinus albus* L.	Fabaceae	Gibito	Hypertension [#]	**Seed**, soak and eat the seed	O		H	Cr
63	*Nicotiana tabacum* L	Solanaceae	Tinbaho	eye pain*	**Leaf,** Pounding the leaf and spray on the eye	Sp		S	Wd
				Leech*	**Leaf,** pounding the leaf and drenching with mouth and nose	O& na			

64	*Rosa abyssinica*	Rosaceae	kega	Cough#	**Bulbs,** Bulbs are grounded with water, filtered and taken orally	O	-	S	Wd
				Evil spirit #	**Bulb**, Crushed and roasted for fumigation	Fu	-		
65	*Linum usitatissimumL.*	Linaceae	Telba	Eye disease #	**Seed**; Add few seeds of *Linum usitatissimum* in the eye at night then clean with clean close early in the morning	D		H	Cr
				Gastritis#	**Seed**, grinded the roasted seed mix the powder with water and drunk.	O			
				Stomachache#	**Seed,** boil the seed then freeze and drink	O			
66	*Coffea arabica L.*	Rubiaceae	Bunna	Cough#	**Leaf**, boil the leaf and drink the water	O		S	Hg
				Wound#	**Seed**, Grind the roasted seed and put the powder on the wounded part.	D			
67	*Coriandrum sativum* L	Apiaceae	Dinbilal	Cough #	**Seed**, Boil the seed and drink	O		H	Hg
68	*Vicia faba L.*	Fabaceae	Bakella	swelling#	**Seed**, Mastication of the seed and tied on the neck	D		H	Cr
69	*Inula confertiflora* A. Rich	Asteraceae	Weyina gefet	Eye disease*	**Leaf**, soak the leaf and spraying	Oc		S	Wd
				Wound *	**Leaf**, Fresh leaves are crushed, squeezed and the juice is dropped on the wound	D			
70	*Ocimum urticifolium* Roth (Ocimum suave*).*	Lamiaceae	Damakessie	Common cold#	**Leaf**, Stroke and drink with sugar.	O	Su	S	Wd
				Febrile illness#	**Leaf**, Squeezing the fresh leaf and drunk the juice or creamed the body	O/ D			
				Headache#	**Stem**, Boiled and inhale the stem	Inh			

71	*Juniperus procera Hochst. ex Endl.*	Cupressaceae	Yehabesha tsid	Leech *	**Leaf**, Pounding the leaf and drenching with water	O	-	T	Bo
				Cough#	**Stem**, Crush dry stem of *Juniperus procera* and burn with fire then fumigate its smoke	Fu	-		
				Wound#	**Leaf**, Pound fresh leaf of *Juniperus procera* and mix with butter then tie on the wound	D	Bu		
72	*Brassica nigra* L.	Brassicaceae	Senafch	Intestinal parasite#	**Seed**, The seed is crushed, powdered, mixed with water eaten with injera every morning	O	Inj	H	Hg
73	*Acanthus sennii* Chiov.	Acanthaceae	Kosheshile	Evil eye#	**Root**, pound the root and tied on the neck	D		S	Wd
				Abortion *	**Root**, pounding the root and drenching with water	O			
				Ascaris#	**Root**, Grinded the dry root, homogenized the powder with water and drunk 1-2 cup	O			
74	*Diplolophium africanum* Turcz.	Apiaceae	Dogg	Serakian#	**Root**, Crush the roots and spray the house	Sp		S	Wd
75	*Lolium temuientum* L.	Poaceae	Enkrdad	Wound*	**Seed**, Crushed dry seed of *Lolium temuientum* and rubbed the pounder on the sore of the cattle	D	-	H	Wd
76	*Momordica foetida* Schumach.	Cucurbitaceae	Kur hareg	Evil spirit #	**Leaf**, pound the leaf and drink a little	O		Cli	Wd
				Wound#	**Leaf**, powdered the leaf and apply the wound	D			
77	*Silene macrosolen*	Caryophllaceae	Wegerit	Ascaris#	**Root**, grind the root and drink with tella.	O	Te	H	Wd
78	*Embelia schimperi*	Myrsinaceae	Enkoko	Tape warm #	**Seed**, Pounding the seed and drink with honey	O	Ho	S	Wd
79	*Physalis Peruviana* L.	Solanaceae	Timatim	Stomach	**Leaf**, Chew fresh leaf of *Solanum lycopersicum* and	O		H	Hg

				ache[#]	swallow its juice				
80	*Citrus limon* L.	Rutaceae	Lomi	Wound [#]	Juice, mix with egg and smear on the wound	D	Egg	S	Hg
81	*Caesalpina spinosa* (Molina) Kuntze	Fabaceae	Gemero	Evil eye[#]	**Root**, Pounding the fresh root mixed with *Ruta chalepensis* then drunk the solution or sniffed	O/ Na		S	Wd
82	*Lepidium sativum* L.	Brassicaceae	Fetto	Stave[*]	**Seed**, pound finely with *Brassica Carinata* and honey then drenching	O	Ho	H	Hg
				Febrile illness[#]	**Seed**, Dry seeds will be powdered mixed with bulb of *Allium sativum* (concoction) and salt, and eaten	O	Sa		
				Diarrhea[#]	**Seed**, Dry seeds are pounded, powdered, mixed with water, and the solution has to be taken orally	O			
				Diarrhea*	**Leaf and seed,** Seed of Lepidium sativum is powdered and mixed with bulb Allium sativum and given to cattle	O			
83	*Combertum terminilia* R. Br. ex G. Don.	Combertaceae	Abalo	Eczema [#]	**Seed**, pound finely and mix with honey, and smear.	D	Ho	S	Wd
84	*Citrullus colocynthis (L.) Schrad.*	Cucurbitaceae	Yemidr embuay	Stomachache[#]	**Root**, Pounded the fresh root, homogenized with water and drunk	O		H	Wd
				Swelling[#]	**Leaf**, Heated the leaf and put on	D			
				Evil eye[#]	**Root**, pounded the fresh root and sniffed	Na			

85	*Dorstenia barnimiana* Schwienf.	*Moraceae*	Workbemeda	Itch [#]	**Seed**, washing the skin with seed	D		H	Wd
				Jaundice [#]	**Root**, The powder of *Dorstenia barnimiana* root is drinking in milk or nut	O	Mi		
				Lung cancer[#]	**Root**, Drink the roof with tea	O	Su		
86	*Verbena officinalis* L	Verbenaceae	Atuch	Evil spirit[#]	Root, Grinding the root and mix with honey and then drinking	O	Ho	H	Wd
				Nightmare[#]	**Root**, tie the root around the neck	D			
				Stomach ache[#]	Root, Chewing and swallowing the root of this plant during the feeling of ache	O	-		
87	*Cucurbita pepo L.*	Cucurbitaceae	Dubba	Gout (rih) [#]	**Seed**, Pounding the seed and eat repeatedly	O	-	Cli	Hg
				Tape worm[#]	**Seeds**: Crush the seeds and eat with injera or bread	O	inj		
88			Yedeha mechagna	Pumping of children[#]	**Root**, pounding the root and drunk	O		Cli	Wd
89	*Euphorbia tirucalli* L.	Euphorbiacea e	Kinchib	Wart[#]	**Stem**, applied the milk on wart	D		T	Wd
90			Nib wodedd	Evil spirit[#]	Root, pounding the root and drink a little	O		H	Wd
91	*Solanecio gigas* (Vatke) C. Jeffrey	Asteraceae	Ashkoko gomen	Abortion *	**Leaf**, crushing the leaf and spraying with water	D		S	Wd
92	*Ximenia americana L.*	Olacaceae	Enkoy	Hypertension[#]	**Leaf**, eating	O		S	Wd
				Liver disease[#]	**Leaf**, Fresh leaf of *Ximenia Americana* crushed, powdered and mixed with water and then 2 to 3 cup of	O	-		

					filtrate is drunk for 3 days				
93	*Rumex nervosus* Vahl	Polygonaceae	Embuacho	Eye disease[#]	**Leaf**, The fresh leaf of Rumex nervosus is pounded squeezed and added 3-5 drops through eye	Oc	-	S	Wd
				Snake bite[#]	**Leaf**, The fresh leaf of Rumex nervosus is chewing and swallowing the solution during the time of bite.	O	-		
				Wound[#]	**Leaf**, Pounded the fresh leaf and creamed the wound	D			
				Febrile Illness[#]	**Leaf**, Pounded the fresh leaf, homogenized with water and drunk the solution	O			
				Bugunij[#]	**Stem**, heating the stem by fire and put on the infected part	D			
94	*Tostegia integrifolia* Benth.	Lamiaceae	Geram Tinjut	Antrax [#]	**Leaf**, pounding the leaf and drinking	O		S	Wd
95	*Hordeum vulgare* L.	Poaceae	Gebs	Gastritis[#]	**Seed**, eating without remove the awn (cover)	O		H	Cr
				leishimaniasis [#]	**Seed**, Powdering dry seed and Barely dough (Ligus) is prepared; bread is baked from this Ligus and applied on the wound as bandage with the hot inner soft part	D			
96	*Plantago lanceolata* L.	Plantaginaceae	Gorteb	Fire wound[#]	**Leaf**, pounding the leaf and apply on the wound	D		H	Wd
97	*Eragrostis teff* (Zucc.)	Poaceae	Key teff	External tongue[#]	**Seed**, Grind the seed and heating the duff and put on the external tongue	D		H	Cr
98	*Capsicum annuum* L.	Solanaceae	Karia	Malaria[#]	**Fruit**, Crushed fresh fruit of *Capsicum annuum*, mix with water, *allium sativum* and salt then eat with enjera for seven days	O	Sa	H	Hg

99	*Peucedanum mattirolii*	Apiaceae	Sire bizu	Head ache[#]	**Root**, Pounding the root and creamed	D		H	Bo
100	*Crinum ornatum* (Ait.) Bury	Amaryllidaceae	Yejib shinkurt	Ear disease[#]	**Root**, Fresh root is crushed, squeezed and then its liquid is dropped through ear	Ear		H	Wd
101	*Ocimum basilicium* L.	Lamiaceae	Zikakibie	Bloating*	**Leaf**, Ground fresh leaf of *Ocimum basilicium* with bulb of *Allium sativum* together and mix with salt and water then give to cattle	O	Sa	H	Hg
102	*Impatiens tinctoria* A. Rich	Balsaminaceae	Ensosla	Rheumatic/arthritis[#]	**Root**, Fresh root is crushed, and tied around the affected part	D	-	H	Hg
103	*Buddleja polystachya*	Scrophulariaceae	Anfar	Eye disease[#]	Leaf, Fresh leaf is crushed, mixed with little water and dropped on the eye	Oc	W	S	Wd
104	*Acacia Abyssinica*	Fabaceae	Girar	Tonsillitis[#]	**Root,** the root bark is chewed and swallowed	O		T	Wd
105	*Schinus molle* L.	Anacardiaceae	Kundo berbere	Tonsillitis[#]	**Seed**, The seed is pounded, powdered, mixed with honey and then drink	O	Ho	T	Hg
106	*Myrtus communis* L.	Myrtaceae	Ades	Scabies[#]	**Leaf**, Dry powder Leaf is mixed with butter and applied on the affected part	D	Bu	S	Hg
107	*Aloe pulcherrima* Gilbert & Sebsebe	Aloaceae	Sete-eret	Evil spirit[#]	**Root**, Roots are grounded together with seeds of allium sativum and leaves of *Ruta chalepensis*, powder burned on fire in the patient's house or fumigated	Fu		S	Wd
108	*Clutia Sp.*	Peraceae	Alashume	Common cold[#]	**Leaf**, Leaf is Squeezed then fumigated with nasal	Na	-	S	Wd

109	*Trigonella foenum*	Fabaceae	Abish	Gastritis[#]	**Seed**, The powdered mixed with sugar and soaked in water for few minutes then given orally	O	Su	H	Cr
110	*Maytenus senegalensis* (Lam.) Exell	Celastraceae	Atat	Kidney disease[#]	**Root**, The root with Croton macrostachyus is crushed, powdered, mixed with water and one 'sine' drunk every morning until recovery	O		S	Wd
				Tonsillitis[#]	Leaf, The leaf is squeezed and drunk	O			
111	*Ficus vasta* Forssk	Moraceae	Warka	Wound*	**Leaf**, Fresh leaf is crushed, squeezed and creamed the affected part	D	-	T	Wd
112	*Withania somnifera* (L.) Dunal	Solanaceae	Giziewa	Diarrhea[#]	Leaf, The fresh leaf is crushed, squeezed and mixed with water and drunk	O	W	S	Wd
113	*Calpurnia aurea* (Ait.) Benth.	Fabaceae	Digita	Rabies*	Leaf, fruit, seed, Fresh or dried leaf, fruit and seeds crushed, mixed with food and given to dogs	O		S	Wd
114	*Eleusine floccifolia*	Poaceae	Akirma	Mumps[#]	**Whole part**, Fresh plant juice is filtered and applied through the ear	D		H	Bo
115	*Plectranthus ornatus* Codd	Lamiaceae	Yezinjero Fes	Wound[#]	**Stem**, Fresh stem is crushed with water and applied	D		H	Wd
116	*Allium cepa* L.	Amaryllidaceae	Key shinkurt	Hypertension[#]	**Seed**, The fresh seed *Allium cepa* is crushed and immersed in little water for 1 day and then filtrated by clean cloth and drunk before food	O	-	H	Hg
				Bloat*	**Whole parts**, The fresh whole parts of *Allium cepa* is pounded, mixed with little water and then only the pure solution is drunk	O			

117	*ladiolus candidus*	Iradaceae	Milas golgule	Anthrax*	**Leaf**, The smashed leaf and root of Gladiolus candidus mixed with water and then one litter is given to cattle for three days	O	Wa	Cl	Wd
118	*Asparagus africanus* Lam.	Asparagaceae	Yesiet kiest	Tetanus[#]	**Fruit,leaf,** The fresh leaf and fruit of *Asparagus africanus* together with the leaf of *Cucumis ficifolius* ground, powdered, mixed with fresh butter (concoction) and creamed on affected part	D	Bu	H	Wd
				Eczemia[#]	Leaf, Fresh leaf Pounded being mixed with *J. abyssinicum, S. nigrum, K. petitiana* (concoction) and bandage on the wound	D	-		
119	*Podocarpus falcatus* (Thunb.) Mirb.	Podocarpaceae	Zegba	Scabbing[#]	**Bark**, Pounded the fresh stem bark, homogenized with water and drunk the solution	O		T	Wd
120	*Chaerophyllum bulbosum* L.	Apiaceae	Shimbakla	Toothache[#]	seed, pound the seed with the seed of *Lagenaria siceraria* then chewing	O		H	Wd

Habit (Ha), Herb (H), Shrub (S), Tree (T), and Climber (Cl). Habitat (Hab), Homegarden (Hg), Wild (Wd), Both (Bo). Route of administration (RA): Oral (O), Dermal (D), Nasal (N), Ocular (Oc), Ear (E), Anal (A), Inhale (Inh), Fumigate (Fu).Additive (Add): (Honey=Ho, Milk=Mi, Sugar=Su, Butter=Bu, Salt=Sa, Tella=Te).

Appendix 4**:** Images of some MPs with scientific name and corresponding local name recorded from the study area.

Kock, *Prunus persica*

Kosheshile, *Acanthus sennii*

Kega, *Rosa abyssinica*

Yehabesha tsid, *Juniperus procera*

Kotetina, *Verbascum sinaiticum*

Endod, *Phytolaca dodecandra*

Agam, *Carissa spinarum*

Girar, *Acacia abyssinica*

Shimbakla, *Chaerophyllum bulbosum*

Gomenzer, *Brassica napus*

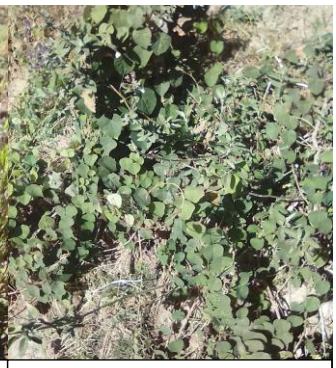
Gesho, *Rhamnus prinoides*

Gulo, *Ricinus communis*

Wonde-eret, *Aloe Macrocarpa*

Sete-eret, *Aloe pulcherrima*

Embuacho, *Rumex nervosus*



Ayit hareg, *Stephania abyssinica*

Shimbra, *Cicer aestivum*

Atat, *Maytenus senegalensis*

Tenadam, *Ruta chalepensis*

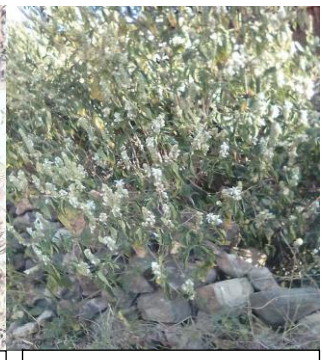
Dubba, Cucurbita pepo

Samma, *Urtica simensis*

Embuay, *Solanum marginatum*

Damakessie, *Ocimum urticifolium*

Bakella, *Vicia faba*

			
Nech bahrzaf, *Eucalyptus globulus*	Alashume, *Clutia Sp.*	Simiza, *Justicia schimperiana*	Yeahya eshoh, *Echinops echinatus*