2024-09

# Ethnobotanical Study of Traditional Medicinal Plants Used To Treat Human and Animal Diseases and Antibacterial Activity of Some Plants at Telemt District, North Gondar Zone of Amhara Region, Ethiopia

EMEBET, TEKA


**BAHR DAR UNIVERSITY**

**GRADUATE STUDIES OFFICE**

**COLLEGE OF SCIENCE**

**DEPARTMENT OF BIOLOGY**

# ETHNOBOTANICAL STUDY OF TRADITIONAL MEDICINAL PLANTS USED TO TREAT HUMAN AND ANIMAL DISEASES AND ANTIBACTERIAL ACTIVITY OF SOME PLANTS AT TELEMT DISTRICT, NORTH GONDAR ZONE OF AMHARA REGION, ETHIOPIA

**BY**

**EMEBET TEKA**

**SEPTEMBER, 2024**

**BAHR DAR, ETHIOPIA**

**BAHR DAR UNIVERSITY**

**GRADUATE STUDIES OFFICE**

**COLLEGE OF SCIENCE**

**DEPARTMENT OF BIOLOGY**

# ETHNOBOTANICAL STUDY OF TRADITIONAL MEDICINAL PLANTS USED TO TREAT HUMAN AND ANIMAL DISEASES AND ANTIBACTERIAL ACTIVITIES OF SOME PLANTS at TELEMT DISTRICT, NORTH GONDAR ZONE OF AMHARA REGION, ETHIOPIA

**THE THESIS SUBMITTED TO THE DEPARTMENT OF BIOLOGY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN BIOLOGY (BOTANICAL SCIENCE)**

**BY**

**EMEBET TEKA**

**ADVISOR GETAHUN YEMATA (PhD)**

**SEPTEMBER, 2024**

**BAHR DAR, ETHIOPIA**

## THESIS DECLARATION

This is to certify that the thesis entitled "Ethnobotanical Study of Medicinal Plants Used to Treat Human and Animal diseases and Antibacterial Activity of some Plants at Telemt District, North Gondar Zone, Amhara Region, Ethiopia" is submitted in partial fulfillment of the requirements for the degree of Master of Science in Biology (Botanical Science).

I hereby declare that the work presented in this thesis is my own. It has been carried out under the supervision of Dr. Getahun Yemata (PhD) at Bahir Dar University. I confirm this thesis has not been submitted for any other degree or qualification at any other institution.

All sources used in the preparation of this thesis have been acknowledged.

Name of Candidate: Emebet Teka Signature_____ Date_____

**BAHIR DAR UNIVERSITY**

**GRADUATE STUDY OFFICE**

**COLLEGE OF SCIENCE**

**DEPARTMENT OF BIOLOGY**

**Thesis approval sheet for defense for advisor**

As a thesis research advisor, I hereby certify that I have read and evaluated this thesis prepared, under my guidance, by Emebet Teka which is entitled "ETHNOBOTANICAL STUDY OF TRADITIONAL MEDICINAL PLANTS USED TO TREAT HUMAN AND ANIMAL DISEASES AND ANTIBACTERIAL ACTIVITY OF SOME PLANTS at TELEMT DISTRICT, NORTH GONDAR ZONE OF AMHARA REGION, ETHIOPIA".

I recommended the paper to be submitted for fulfilling the requirement of the degree of Masters in Botanical science.

Candidate Names: Emebet Teka Signature _____ Date_____

Advisor Name: Getahun Yemata (PhD) Signature _____ Date_____

**BAHIR DAR UNIVERSITY**

**GRADUATE STUDY OFFICE**

**COLLEGE OF SCIENCE**

**DEPARTMENT OF BIOLOGY**

Approval sheet of thesis for defense result for examiners

As members of the Board of Examiners for the MSc Thesis Defense Examination, we confirm that we have read, evaluated, and examined the thesis reported by Emebet Teka and the Examined candidate we, recommended the thesis to be accepted for fulfilling the Requirement of the degree of Masters in Botanical science.

Board of Examiners

| _____ | _____ | _____ |
|---|---|---|
| External examiner name | Signature | Date |
| _____ | _____ | _____ |
| Internal examiner name | Signature | Date |
| _____ | _____ | _____ |
| Chairperson name | Signature | Date |

# ACKNOWLEDGMENT

First and foremost, I thank the Almighty God for his unspeakable gift to this achievement. I would like to express my gratitude from the deepest of my heart to my advisor Dr Getahun Yemata (PhD) for his guidance, advice, and comments from the development of the proposal up to this thesis write-up.

I would like to thank Gambella Unversity for giving chance to learn a master's education. I would like to thank Bahir Dar Unversity for permitting the laboratory room with its equipment. I would like to thank all members of the local communities of Telemt District specifically to my informants who participated in the study for sharing their traditional knowledge with me with appreciated kindness and nice response. In addition, I thank the District Agricultural and Rural Development sector for their provision of supplementary data about the District.

I would like to pass my gratitude to my brother Maereg Teka and My husband Setegn Adugna for their assistance through data collection and all the work in this thesis.

# TABLE OF CONTENTS

**Content** **Page**

# LIST OF TABLES

**Table** **Page**

# LIST OF FIGURES

**Figure** **Page**

## LIST OF APPENDICES

**Appendixes** **Page**

## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| ANOVA | Analysis of Variance |
| CSA | Central Statistical Agency |
| FL | Fidelity Level |
| ICF | Informant Consensus Factor |
| IK | Indigenous knowledge |
| MPs | Medicinal plants |
| SE | Standard error |
| SPSS | Statistical Package for the Social Sciences |
| TDADO | Telemt District Agricultural Office data |
| TMPs | Traditional medicinal plants |
| WHO | World health organization |

# ABSTRACT

*Ethnobotany is the study of interaction between people and plants. Much of Ethiopia's population, primarily receives their medical treatment from the usage of traditional herbal medicines. But across the country, human activity has been the primary cause of the degradation of natural resources. The study aims to document the indigenous knowledge about medicinal plants and to evaluate the antibacterial activities of some plants in the Telemt District. The ethnobotanical data was collected through semi-structured interviews, focus group discussions, field observations , and a market survey. Ethnobotanical data was analyzed using descriptive statistics, informant consensus factor, fidelity level, preference ranking, and direct matrix ranking. A total of 198 informants (143 general informants selected randomly and 55 key informants selected purposively) were selected from 8 study kebeles. A total of 113 medicinal plant species belonging to 57 genera and 59 families were documented, with 77 species used for human ailments, 16 for livestock, and 20 for both. Most medicinal plants were found from a wild environment. Fabaceae had the highest number of traditional medicinal plants with eight species (7.08%). Shrub constitutes the largest number of medicinal plants with 46 species . The most frequently used plant parts were leaves, accounting for 75.23%. Herbal remedies are prepared mostly using fresh plant material (64.4%). Crushing was the major method of preparation accounts (35.6%), followed by grinding accounts (20.42%). The major route of administration was oral accounting for 109 (57.07%) of preparation. The major way of application was drinking (40.43%). Agricultural expansion was a major threat to medicinal plants. Environmental protection was the major activity used by local communities. Significant differences were observed in the antibacterial activity of three selected medicinal plants (Brucea antidysenterica, Verbascum sinaiticum, and Withania somnifera). The antibacterial activities of these plants were evaluated against four bacterial strains using the agar well diffusion method. Among the three plants, the leaf extract of B. antidysenterica exhibited the highest antibacterial activity against Klebsiella pneumoniae, measuring 21 ± 0.471 mm.*



**Keywords**: Antibacterial activity, Ethnobotany, Medicinal plants, Telemt

# 1. INTRODUCTION

## 1.1. Background of the study

Ethnobotany, the study of the relationship between plants and people, has long been recognized as an important field of research, particularly in understanding the traditional use of medicinal plants by local communities (Balick and Cox, 2020). The focus of ethnobotany encompasses the diverse ways in which plants are utilized, perceived, and integrated into human societies, including their application in areas such as building, tools, food, medicine, and cultural practices (Pandey and Tripathi, 2017).

According to WHO estimates, over 80% of the world's population now receives their primary healthcare and wellness from traditional healing practices and herbal medicines (WHO, 2002). The use of plant-derived resources for primary healthcare has been a longstanding tradition, up to 80% of the population in Africa relies on traditional medicine to address their healthcare needs (WHO, 2002).In Ethiopia, the utilization of traditional medicinal plants is widely practiced (Moa Megersa et al., 2013). About 90% of people in Ethiopia receive their primary medical care through traditional medicine (WHO, 2010) and More than 95% of traditional preparations are derived from plant sources (Dawit Abebe, 2001).

Ethiopia's remarkable geographical diversity has contributed to the formation of distinct habitats and vegetation zones, which combined with the country's cultural and linguistic, has led to the existence of high plant diversity, a vast array of traditional knowledge and practices related to the use of these plants (Mirtuse Giday *et al*., 2003). However, this traditional knowledge is often transmitted orally and in secrecy, leading to a lack of written documentation and records, which poses a significant threat to the preservation of this important heritage (Jansen, 1981).

Additionally, the growth of contemporary education causes knowledge loss due to the diminishing interest of the younger generation on indigenous knowledge (Mirtuse Giday *et al*., 2003), the migration of people from rural to urban areas and the migration of residents from drought-stricken areas to fertile areas cause deterioration of traditional practices (Dawit Abebe, 1986). Furthermore overharvesting of medicinal plants, deforestation, land degradation, overgrazing by large cattle populations, and poverty are major factors in the decline of medicinal

plants in Ethiopia (Kloos, 2023). One of the regions of Ethiopia where similar problems are observed is the Amhara Regional State, specifically in the Telemt district where the sustainability of medicinal plant resources and associated traditional knowledge are threatened.

Even though the area is known to have comparatively better plant resources, there is a lack of conservation efforts and projects to protect these valuable resources and the traditional knowledge that accompanies these resources.

This study aims to document the traditional knowledge about medicinal plants used by local people of the district for treating various diseases.

## 1.2. Statement of the problem

About 90% of people in Ethiopia receive their primary medical care through traditional medicine (WHO, 2010). However, It is commonly known that knowledge of traditional medicine is transmitted orally from generation to generation and that, in the process, important details regarding the use of plants, like the part used, how the drug is prepared, how it is administered, the diseases it treats, and so on, may be forgotten or lost (Moa Megersa *et al*., 2013).

Additionally, due to migration from rural to urban areas, industrialization, the spread of modern health care, the expansion of modern education, and the failure of specialized healers to pass on their knowledge to the next generation, the indigenous knowledge of using medicinal plants as remedies is disappearing (Wondwosen Teshome, 2006).

A similar problem is observed in one part of Ethiopia, Amhara Regional State, particularly in Telemt district. Traditional knowledge about the usage of plants is subjected to loss without any scientific documentation. So the study area was selected because there is no documented scientific information regarding traditional medicinal plants used by the local community. The lack of documentation not only threatens the preservation of indigenous knowledge but also hinders the exploration of natural solutions to pressing health issues, such as the global challenge of drug-resistant bacteria.

This study aims to fill this gap by documenting indigenous knowledge of medicinal plants and investigating the antibacterial properties of selected traditional plants in the Telemt District. By filling this knowledge gap, the research will contribute to both the preservation of indigenous

knowledge on medicinal plants and the potential discovery of new antimicrobial agents from locally sourced natural products.

## 1.3. Objectives of the study

### 1.3.2. General objective

- To investigate and document traditional medicinal plants and associated knowledge used by indigenous people for treating human and livestock ailments and testing the antibacterial activity of selected plants at the Telemt district.

### 1.3.2. Specific Objectives

- To identify and document medicinal plant species and associated knowledge used to treat human and livestock ailments at the Telemt district.
- To identify the plant parts used to treat different human and livestock ailments.
- To record methods of preparation, route of administration, and dosage of prepared remedies commonly used by the local people in the district.
- To identify the major threats to medicinal plants in the district.
- To examine the conservation measures used by the local people in the district.
- To evaluate the antibacterial activity of some plants having the highest informant consensus factor and fidelity level value on common disease-causing bacteria.

## 1.4. Research questions

- What are the medicinal plant species used by indigenous people of the study area to treat human ailments, livestock ailments, and both?
- Which part of the medicinal plants is useful to treat human and livestock ailments?
- What are the methods of preparation, route of administration, and dosage used?
- What are the major threatening factors affecting medicinal plants?

- How do the local people to manage and conserve these medicinal plant species through traditional practices?

- ❖ Which selected medicinal plants with high informant consensus factor and fidelity level value show antibacterial activity against some bacterial strains?

## 1.5. Significance of study

There has not been any ethnobotanical research on medicinal plants in the area until now. Therefore, the findings of this study help to preserve traditional knowledge by documenting the uses of local medicinal plants. This documentation not only safeguards indigenous knowledge but also enhances the understanding of local biodiversity, promoting the conservation of native plant species that may be vital for future medicinal applications.

Moreover, the documentation of traditional knowledge about medicinal plants serves as a source of information for future researchers hoping to conduct further studies for the development of modern drugs. By investigating the antibacterial activities of these plants, the research may contribute to the discovery of new antimicrobial agents, addressing the critical issue of antibiotic resistance.

## 1.6. Scope of the Study

This study was conducted in Telemt district, north Gonder Zone, Amhara Regional State, focusing specifically on the eight kebeles. The study focused on assessing ethnobotanical aspects of medicinal plants, including their uses, threats, and the related knowledge among local people of the Telemt district as well as the antibacterial activity of some medicinal plants.

## 1.7. Limitations of the study

This ethnobotanical study is subject to several limitations that may affect the comprehensiveness and applicability of its findings. Firstly, the study's scope is confined to the Telemt District, which may not represent the broader ethnobotanical practices found in other regions. The reliance on self-reported data from local healers and community members introduces the possibility of bias or inaccuracies in the information provided. Environmental factors and seasonal variations may affect plant availability and constraints in laboratory resources could influence the analysis of the plants' medicinal properties.

# 2. LITERATURE REVIEW

## 2.1 Origin and development of ethnobotany

Ethnobotany is a branch of ethnobiology that studies the mutual relationships between the human population and plants. Documenting and examining the application of indigenous knowledge, beliefs, and behaviors regarding plant resources is the main goal of this multidisciplinary, inter-disciplinary study (Cotton, 1996). Ethnobotany investigates the intricate interactions between cultures and plants, focusing on how plants are viewed, utilized, and managed in various social contexts (Hailemariam Bekalo *et al*., 2009).

It's hard to pinpoint the exact moment that ethnobotany entered contemporary science. Nonetheless, it dates back to the period when people first began consciously interacting with flora and fauna. Ethnobotanical work seems to have started with Christopher Columbus in 1492, at a time when he brought tobacco, maize, spices, and other useful plants to Europe from Cuba (Cotton, 1996) and when other immigrants from the new world documented food, medicine and other useful plants of the Aztec, Maya and Inca peoples. From the beginning, the recording of traditional knowledge regarding the therapeutic use of plants has produced numerous significant modern drugs (Dery, 1999).

The term Ethnobotany was the first time coined by Harshberger in 1895 (Jain, 2019). The term Ethnobotany comes from two Greek words: Ethnos and Botane. Ethnos means 'people', and Botane means 'herb', so it would be considered as 'the study of people and herbs' or 'the study of people and plants (tree, shrubs, and herbs). According to Fisseha Mesfin *et al*. (2009), ethnobotany is the scientific study of plants as they are used in indigenous cultures for a variety of purposes, including food, medicine, rituals, building, household utensils, musical instruments, cosmetics, firewood, dyeing, clothing, shelter, textiles, tools, currency, and social life. Ethnobotany is a multidisciplinary field that spans nearly all natural scientific disciplines. Its goal is to uncover people's hidden knowledge of plant resources, which could serve as the cornerstone for society's multifaceted growth (Aryal, 2009). Among the relationships of humans with plants, indigenous knowledge of traditional medicine is one. Thus, people depend on plants not only for food but also preparation of remedies.

The ethnobotanical study, according to Nolan and Turner (2011), records the knowledge of people's cultural interactions with plants and identifies how the local population has traditionally utilized plants for a variety of purposes and how they incorporate plants into their religious and cultural traditions. Therefore, the goal of ethnobotany is to conserve important traditional knowledge for future generations as well as for other communities.

The discipline of ethnobotany is expanding quickly and drawing researchers with a wide range of interests and backgrounds (Pandey and Tripathi, 2017). According to Hamilton (2003), ethnobotany has been increasingly analytical, quantitative, cross-disciplinary, and multi-institution in recent times. It is still mostly used to assess the potential value of different plants because it is connected to economic botany. Cotton (1996) pointed out that one possible use of ethnobotanical research in the pharmaceutical industry during the past ten years has been the identification of novel medications based on traditional medicinal plants. For these kinds of inquiries, ethnobotanical studies are excellent information sources.

## 2.2 Indigenous knowledge

Indigenous knowledge (IK) is the body of knowledge, norms, standards, abilities, and mental models that are specific to a particular culture or community and are employed by the local population (Warren, 1991). Due to their close and direct reliance on natural resources, the local population developed a body of indigenous knowledge that has helped them survive and adapt to their surroundings. Local knowledge is specific to a certain culture or society and serves as the foundation for a wide range of activities, including education, environmental conservation, food preparation, health care, and agriculture (Thomas, 1995).

Community members' traditional knowledge varies in amount and quality depending on their age, gender, occupation, social status, and level of intellect. From a scientific perspective, traditional knowledge is primarily viewed as a resource, consisting of a collection of knowledge and abilities acquired through traditions that are relevant to people's everyday lives (Abebe,2001).

In several countries like Ethiopia, traditional medical knowledge is verbally and extremely secretively transmitted from one generation to the next (GideyYirga, 2010). Such crude and covert transfer might damage indigenous knowledge or ethnomedical knowledge, and most of

the time some of the tradition is lost at each site of transfer (Mersha Ashagre *et al*., 2016). As a result, it's important to conduct systematic record-keeping and documentation of this valuable knowledge through ethnobotanical research, record and utilize indigenous knowledge, increase community awareness of the value of indigenous knowledge, support communities in recording and documenting their local practices by providing computers, video equipment, and other tools, and make indigenous knowledge available so that it can be returned to the community through books, videos, newsletters, and other media (Yeneayehu Fenetahun and Girma Eshetu, 2017). There is less distortion of ethnomedical knowledge when such a systematic technique of recording and documentation is used.

## 2.3 Traditional medicinal plants

According to WHO (2013), traditional medicine is the all of knowledge and techniques that can be formally explained or applied to the prevention and treatment of physical, mental, or social imbalances, with only the reliance on firsthand observation and practical experience passed down orally from generation to generation. For many years, various ethnic and social groups have utilized traditional medicinal plants for the treatment, prevention, and curing of human and cattle ailments.

In particular, the majority of people living in rural areas use traditional herbal medicine as their main source of healthcare (Balcha Abera, 2014). Fassil Kibebew (2001) estimates that, except for Western nations, between 75 and 90 percent of the world's rural population uses traditional medicine as their only source of healthcare.

Ethiopia, like every other country in the world, has long relied on traditional medicine derived from plants to treat a variety of illnesses and reduce human suffering (Asfaw Debela *et al*., 1999; Kebede Deribe *et al*., 2006). Traditional medicine has been a part of Ethiopian society for a very long time because of its extensive use and history (Migissa Kaba, 1996; Pankhurst, 1966).

Ethiopia's traditional medicine is widely used by both urban and rural populations, which can be linked to its cultural acceptability, effectiveness against specific ailments, accessibility in terms of location, and cost-effectiveness when compared to modern treatment (Haimanot Reta, 2010).

Novel drug inventions can be attributed to medicinal plants (Balunas and Kinghorn, 2005).

According to Medhin, Zewdau *et al*. (2001), 25% of contemporary drugs contain one or more active principles derived from plants, and the majority of the world's top 25 best-selling medications are derived from plant materials (Ohigashi, 2008). Plant-based pharmaceuticals have made a significant contribution to contemporary medicine (Perumal Samy and Gopalakrishnakone, 2010). The indigenous expertise of using medicinal plants as folk medicines is being lost in Ethiopia due to migration from rural to urban regions, industrialization, the fast loss of natural habitats, and lifestyle changes, yet there has been little creation of therapeutic products in the country.

## 2.4. Role of medicinal plants in human healthcare and ethnoveterinary medicine in Ethiopia

### 2.4.1 Plants for a Human Healthcare System

Due in large part to the contributions made by traditional healers, the use of medicinal plants in human health care has become more widespread globally (Shakya, 2016; Payyappallimana, 2010). Up to 80% of the population in Africa relies on traditional medicine to address their healthcare needs (WHO, 2002) and medicinal plants have an almost unlimited value to human livelihoods (Hamilton, 2004). Ethiopia, like other underdeveloped nations, has a long history of using plants for medical purposes. About 90% of people in Ethiopia receive their primary medical care through traditional medicine (WHO, 2010) and More than 95% of traditional preparations are derived from plant sources (Dawit Abebe, 2001). But as time goes on, the traditional knowledge gradually disappears for reasons mostly related to deforestation and environmental degradation, which also resulted in the extinction of various species, including therapeutic plants (Desalegn Desissa, and Binggeli, 2000).

In Ethiopia, medicinal plants were essential to the treatment of many ailments (Fekadu Fullas, 2007). According to reports, traditional medicines are primarily used by people who live in rural areas and do not have access to modern medical care because of a lack of doctors, modern medications, and health professionals, as well as the high cost of these treatments and an uneven distribution of healthcare facilities, the majority of which are located in towns, with few or none located in rural areas (Jansen, 1981).

Plants are a major source of prototype compounds that the pharmaceutical industry may use to build more conventional medications (Fekadu Fullas, 2001). Even though only a small portion of the world's plant species have been studied scientifically to date, humankind has already benefited much from this (Farns worth, 1985). Systematic scientific research is essential to understand the function that products derived from plants play in the health of humans and cattle (WHO, 1998).

### 2.4.2 Plants in ethnoveterinary medicine

According to Tafesse Meshing and Mekonnen Lemma (2001), ethnoveterinary medicine refers to traditional knowledge and methods for caring for animals, including traditional surgical and manipulative techniques, traditional immunization, magic-religious practices and beliefs, management techniques, and the use of herbal remedies to prevent and treat a variety of disease problems faced by livestock holders.

Animal illness continues to be a major factor in low livestock performance in Ethiopia and the majority of developing nations, which widens the gap between the supply and demand for livestock products (Teshale Sori *et al*., 2004).In Ethiopia, raising livestock directly supports a large number of people in addition to helping to produce crops (Tafese Mesfine and Mekonen Lema, 2001). Even if there are a lot of cattle, illness contributes to their decline. To get around this issue, a lot of individuals mostly treat their livestock's illnesses with traditional medicines. This is because there aren't enough veterinarian medications available, and the majority of them are quite expensive, making them unaffordable for Ethiopian farmers and pastoralists (Mirutse Giday and Gobena Ameni, 2003).

Ethiopian livestock farmers create their methods for maintaining the health and productivity of their animals utilizing resources that are readily available in the area, primarily plants, as a result of these and related variables. Ethnoveterinary medicine is comprised of these traditional, regional ideas and methods related to the health care of animals. Various traditional veterinary procedures remained unreported in Ethiopia and Africa despite their enduring value as a livestock health care system (Dawit Abebe and Ahadu Ayehu, 1993). The dissemination of knowledge about ethnoveterinary medicine, with a focus on practical plants utilized for livestock treatment, is critical to the management of cattle.

Additionally, planning and executing successful livestock production requires accurate documentation and comprehension of farmers' knowledge, attitudes, and practices about the incidence, causes, treatments, prevention, and management of various ailments (Tafesse Mesfin and Mekonen Lemma, 2001).

## 2.5. Threats and Conservation of Medicinal Plant Species in Ethiopia

### 2.5.1. Threats to medicinal plant species

In addition to its therapeutic potential, people use a wide variety of wild plant species for food, closure, housing, fuel, fiber, generating cash, and meeting cultural and spiritual requirements all over the world, according to Khan *et al*. (2018). Approximately 90% of plant materials used as medical plants are gathered from the wild, which has led to the extinction of many therapeutic plant species or significant genetic loss, according to WHO data from 2005.

According to some studies (Tesfaye Awas and Zemede Asfaw, 1999; Mirutse Giday *et al*., 2003), the majority of Ethiopians' medicinal plant uses come from wild habitats. As a result, the rate of extinction of species with associated indigenous knowledge and the loss of commonly occurring medicinal plant species is accelerated. Therefore, to preserve endangered species, medicinal plants must be cultivated in an organized manner. The need for traditional medicines will rise along with the population, putting more strain than ever on the availability of medicinal plant resources (Hamilton, 2003). There is occasionally a reduction in the vegetation types where traditional medicinal plant species are harvested.

Like other African nations, Ethiopia's medicinal plant species are susceptible to issues with sustainability and continuity, mostly as a result of habitat loss and taxonomic loss (Ensermu Kelbessa *et al*., 1992). The country is currently losing MPs as a result of human and environmental forces connected to the loss of important indigenous knowledge (IK related to the plants). As a result, there is a loss of IK and an acceleration of the deterioration of plant resources as stated by (Ermias Lulekal *et al.,* 2008). As per the findings of Dawit Abebe *et al*. (2001), pressures caused mainly by humans are causing the diversity of Ethiopian flora to be lost. A rapid increase in population, the need for fuel, urbanization, the production of wood, overharvesting, destructive harvesting, invasive species, commercialization, honey cutting,

degradation, agricultural expansion, and habitat destruction are some of the hazards that humans provide to medicinal plants (Endalew Amenu, 2007).

Additionally, it has been noted that unsustainable harvesting of medicinal plant species for export and pharmaceutical extraction has an impact on these species (Farnsworth, 1985; WHO, 1998) Furthermore, recurring droughts, diseases, pest outbreaks, and bushfires are examples of natural causes (Ensermu Kelbessa *et al*., 1992).

In addition to the above-known threats to medicinal plant species, other factors such as the type of plant and its component used also have an impact on medicinal plant species. Moreover, the two biggest dangers to Ethiopia's medicinal plant population are uprooting and unsustainable use. For instance, gathering leaves for medicinal purposes is not as dangerous as harvesting the roots and bark of medicinal plants (Edwards, 2001; Haile Yineger, 2005).In addition to other factors, the younger generation has low regard for the traditional medical system (Mekonen. Wolditsadik 2018), which is unfortunate for the preservation and advancement of medicinal plant knowledge. Consequently, ethnobotanical research is helpful in recording, examining, and sharing information about the interaction between therapeutic plants and human society.

### 2. 5.2. Conservation of medicinal Plants

According to Abebe Demise (2001), to ensure that a species' genetic potential will be accessible in the future, conservation efforts should be directed at preserving the greatest amount of diversity within each species. The importance of sustainable management of traditional medicinal plant resources comes from both the dependence on traditional medicine for health and its potential as a source of new drugs (Cunningham, 1993). Several researchers have discovered that plant species of therapeutic potential are collected from the wild by professional traditional healers. These species are particularly valuable for local usage or trade and are not readily available nearby. Instead, the healers travel a distance to gather them. In contrast to this issue of shortage, traditional medicine is becoming more and more in demand, which presents a great chance for medicinal plants to be conserved ((Zemede Asfaw, 2001).

Zemede Asfaw (2001) states that excessive use and destructive harvesting (such as collecting roots and barks) put medicinal plants at risk for extinction. Different parts of the plant are utilized to make cures; however, the root is the part most frequently used. The extensive use of

the root portion for alimentary purposes for humans and animals without any substitute harms the plant's future availability.

Globally, conservation initiatives have been implemented to protect medicinal plants that are in danger of additional harm (Cunningham, 1996). Both in-situ and ex-situ conservation measures are included in this. Medicinal plant genetic resources are acquired using both in-situ and ex-situ conservation methods. The preservation of species in their native environments is known as in-situ conservation. Some traditional medicinal plants are difficult to domesticate and manage, so they must be preserved in their natural habitat (Zemede Asfaw, 2001). Furthermore, some plants that are cultivated outside of their native habitats are unable to yield the required quantity and amount of active components. Another way to preserve medicinal plants is to ensure and encourage their traditional growth in designated areas (Zemede Asfaw, 2001). This might take the place of graveyards, churches, national parks, mosques, farm margins, river banks, and so forth. According to an account by Cunningham (1993), it is prohibited to cut any plant species, medicinal or not, that are cultivated in places of worship such as churches and mosques.

Ex-situ conservation, or conservation outside of an organism's natural habitat, is the second. This covers botanical gardens, gene banks, and other place. Ethiopia should implement both in-situ and ex-situ conservation strategies to protect valuable plants, including medicinal ones, from threats posed by natural or man-made factors (Abebe Demisse, 2001).

In Ethiopia, some initiatives have been undertaken to preserve and advance the sustainable use of medicinal plants. For instance, in representative regions of the nation, such as Won do Genet and Bale-Goba medicinal plant filed gene banks, EBI has built ex-situ conservation sites. In the field, the preservation of ethnobotanical and ethnopharmacological knowledge coexists with the conservation of therapeutic plants. Through market research and interviews, ethnobotanical studies can identify issues with the management of medicinal plants. In addition, they offer answers by supporting regional customs and traditions that have the potential to be conserved (Gadgil *et al*., 1993; Turner, 2000).

## 2.6. Advantages and Disadvantages of traditional medicinal plants

### 2.6.1 Advantages of traditional medicinal plants

Almost all life on Earth depends on plants, and medicinal plants in particular are extremely valuable, essential, and helpful. One of the most important functions of plants is their phytomedicinal role or the advantages of medicinal plants. Many people rely on medicinal plants for their daily needs, including financial stability, health assistance, and the security of their future existence (Hamilton, 2003; Hamilton, 2004). Since the beginning of time, plants have been essential and the primary source of traditional preparation for cattle and humans that is both therapeutic and preventive.

There are several reasons why traditional medicine is better than modern medicine, including accessibility, therapeutic efficacy, and cost-effectiveness of medical services (MekonenWolditsadik, 2018). Because people, especially in rural areas, have a good awareness of popular medicinal herbs, traditional healers are not as commonly contacted (Acree, 2012).

### 2.6. 2 Disadvantages of traditional medicinal plants

The medical community and pharmaceutical industry do not view phytomedicine favorably because they feel that it lacks regulations and validation for safety and efficacy, as well as because of issues with inadequate standardization and quality control, mistakes in nomenclature, and challenges with identifying active ingredients and understanding their intricate mechanisms of action (Houghton, 1998). The key drawbacks of traditional medicines are inaccurate diagnosis and the potential for harm to health from combining various species of therapeutic plants without sufficient scientific evidence (Dawit Abebe, 1986).

The traditional healthcare system's recognition suffers from a lack of precision and standardization. Tolera *et al*. (2011) highlight another disadvantage of conventional treatment that could lead to toxicity due to the lack of exact doses. The measurements utilized to determine the dose are not standard and are based on the age and physical attributes of the patient, the diagnosis, the sociocultural explanation for the sickness, and the amount of experience of the herbalist (Tilahun Teklehaymanot and Mirutse Gday, 2007).

## 2.7 Antibacterial Properties of Medicinal Plants

The ability of plant extracts and their constituents to partition the lipids of bacterial cell membranes and mitochondria that disrupt cell structures and increase their porosity is a crucial property (Sikkema *et al*., 1994). The lowest concentration of an antibacterial agent needed to create a sterile culture is known as the minimum bactericidal concentration (Cheesbrough, 1991).

Treatment of infectious diseases becomes difficult by the emergence of resistant strains, which are frequently the consequence of intensive antibiotic usage (Sydney *et al*., 1980). Moreover, employing medicinal plants frequently results in fewer antibiotic adverse effects (Cunha, 2001). Compared to antibiotics, medicinal plants are more widely used, have a longer history of usage, renewable in nature, and have greater patient tolerance (Vermani and Garg, 2002). Secondary metabolites found in plants including alkaloids, flavonoids, terpenoids, tannins, coumarins, quinones, carotenoids, and steroids are sources of medicine and frequently great leads for therapeutic development (Bhatti *et al*., 2022).

## 2.8 Antibacterial activity testing of medicinal plants

In the past, the main method used to produce new medications was to extract physiologically active chemicals from plants and identify them by various bioactivity screening programs or medicinal use (Hunter, 2001). Many studies have looked into the long-standing applications of medicinal plants, but only a small number of these investigations have produced ethnobotanical findings with laboratory work to confirm these plants' true antibacterial properties (Shandesh *et al*., 2008; Mahmood *et al*., 2012). Approximately 80% of people on the planet employ traditional medical practices, and the primary source of these treatments is plant life (Magrani, 2005). It is necessary to investigate the biological activities of ethnomedical plants in countries where access to medications is limited (Mahmood *et al*., 2011).

The majority of pharmaceutical companies now invest time and energy in extracting natural compounds from plants. This procedure will result in the production of lower-cost medications that the general public may easily buy because some infectious bacteria develop resistance to synthetic medications regardless of the cost issue.

# 3. MATERIAL AND METHODS

## 3.1. Description of the study area

The study was conducted in the Telemt district, north Gondar zone, Amhara Region, Ethiopia (Figure 1). Telemt is one of the districts in the Amhara Regional State of Ethiopia. It is located about 273 km from Debark and 555 km from the capital city of the Amhara regional state, Bahir Dar. Telemt is bordered on the North by Dima, on the South by Beyeda, on the west by Adiarkay districts, and the East by Tigray Region. The administrative center of the district is Dejach Meda and encompasses 24 rural kebeles. Telemt district has a total population of 132,230, of which 65,242 are female and 67,669 are male, according to the Central Statistical Agency of Ethiopia's 2007 national census (CSA, 2007). The majority of the population practices Orthodox Christianity (97.9%), while 2.1% identify themselves as Muslims (CSA, 2007). Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia

Covering an area of 151,010.91 hectares, Telemt district has diverse ecological zones, including Weyna Dega (21%, or 5 kebeles), Dega (37%, or 9 kebeles), and Kolla (42%, or 10 kebeles) (TDAOD, 2023). Geographically, the district is located between 38°46′66.8′′ to 38°73′78′′ E longitude and 13°38′14′′ to 13°57′29′′ N Latitude with arrange of an altitude between 1335 to 1930 meters above sea level (Figure 1). The average temperature in the district is 32°C, and it receives an average annual rainfall of 1350 mm (TDAOD, 2023).

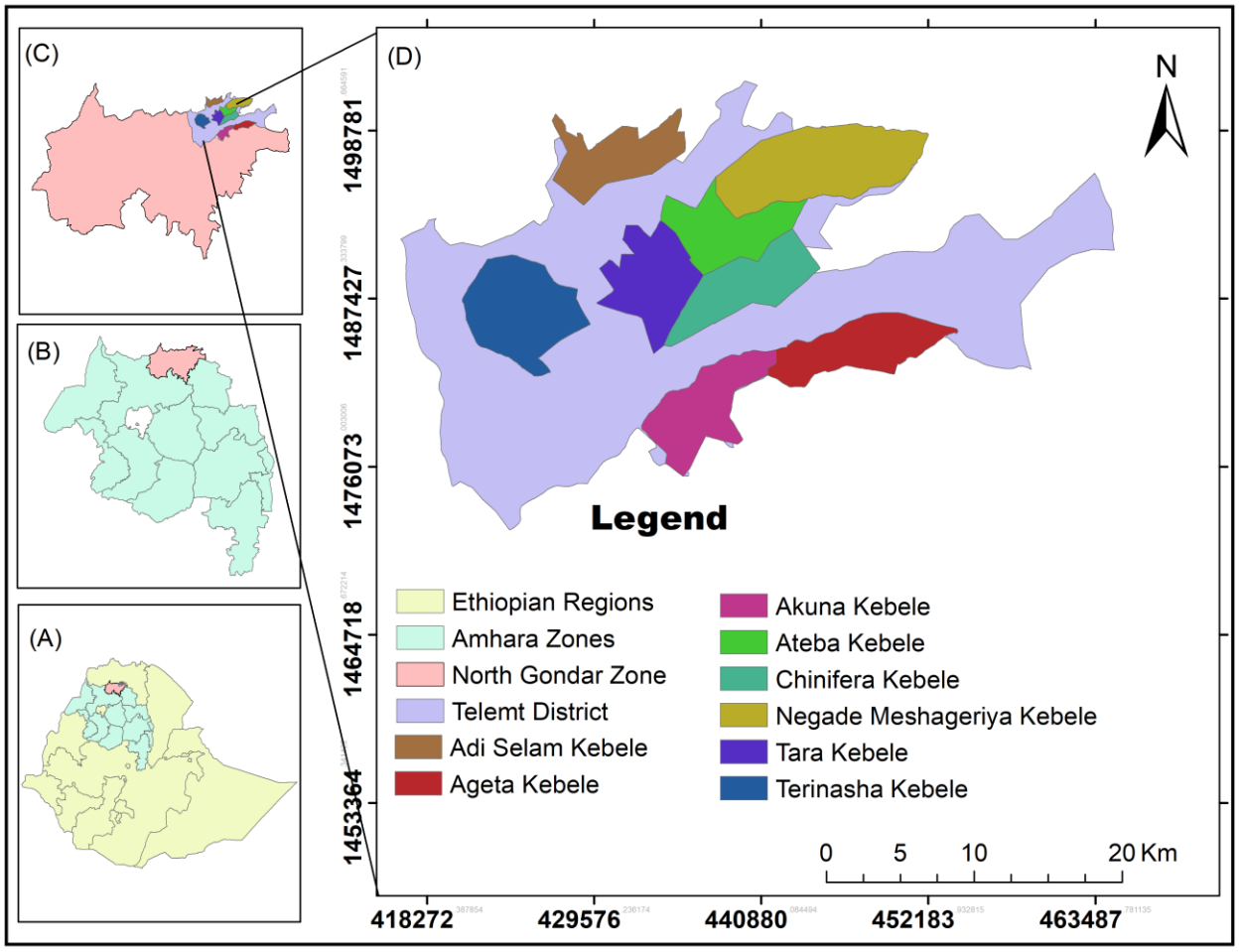



Figure 1: Map of the study area

Map of study area showing the different regions of Ethiopia (a), administrative zones of the Amhara region (b), North Gondar zone (c), Telemt district, and the study kebeles in Telemt district (d).

### 3.1.1. Soil type, land use, and agriculture

The primary soil types at the Telemt district include fertile soil, sandy soil, and clay soil. The land use in the study area is classified into five categories: construction (31,344 hectares), cultivated land (37,865 hectares), grazing land (325,478 hectares), bushes and forest land (36,787 hectares), and mountains (12,467.91 hectares) (TDAOD, 2023). Livestock production serves as a major economic activity in the district, accounting for approximately 70% of the economy, while crop production constitutes the remaining 30% (TDAOD, 2023). The total

livestock population in Telemt district is estimated to be 842,672, comprising 356,213 cattle, 425,648 sheep, 29,575 goats, 27,179 donkeys, 1,234 mules, and 1,367 horses. In terms of livestock, the most common domestic animals in Telemt District include cattle, sheep, goats, donkeys, mules, and horses. The district is also home to various wild animals, such as foxes, chalada baboons, tigers, monkeys, and apes.

### 3.1.2. Vegetation of the district

The vegetation of the Telemt District, is characterized by a number of species such as *Dodonaea angustifolia, Euclea racemosa, Olea europaea, Ficus vasta, Acacia abyssinica, Croton macrostachyus, Cordia africana, Juniperus procera, Eucalyptus camaldulensis, and Eucalyptus globulus belongs to the montane forest and woodland vegetation type in Ethiopia* (TDAOD, 2023). The major food crops cultivated in the district include teff (*Eragrostis tef*), Sorghum (*Sorghum bicolor*), nugget (*Guizotia abyssinica*), sesame (*Sesamum indicum*), telba (*Linum usitatissimum*), pea (*Pisum sativum*), bean (*Vicia faba*), and barley (*Hordeum vulgare*). Additionally, key vegetables and fruit crops are grown in the area consisting of banana (*Musa acuminata*), mango (Mangifera indica), papaya (*Carica papaya*), lomi *(Citrus aurantiifolia*), and orange (*Citrus sinensis*).

## 3.2. Ethnobotanical data collection

### 3.2.1. Reconnaissance Survey and study site selection

A reconnaissance survey was conducted from April 13 to April 20, 2024, to identify eight studied kebeles across different agro-ecological conditions. This selection was based on the availability of vegetation, the presence of traditional medicinal practitioners, and with the help of local authorities, kebele administration leaders, elders, religious leaders, and the district agricultural officers. The number of kebeles selected was determined proportionally according to the distribution of kebeles within each agro-ecological zone. The selected kebeles were Adi Selam, Terinasha, and Chinifera from the Dega (high altitude); Akuna and Tara from the Weyna Dega (mid altitude); and Ateba, Ageta, and Negade Meshageria from the Kolla zone (low altitude) agroecologies. These kebeles were purposively selected from a total of 24 kebeles following the reconnaissance survey.

### 3.2.2. Sample size and Sampling techniques

To determine a representative sample for selected kebeles (smallest administrative unit) Yamane formula was used (Yamane, 1973), which is calculated as follows:

$n = \frac{N}{1+N(e)^2}$ Where n is the research sample size, N is the targeted population size (total population of eight kebele in the study area.), e: is the level of precision or sampling error = (0.05) and 1 is the probability of the event occurring.

$n = \frac{44077}{1+44077(0.05)^2} = 396$ However, given that the population shares similar religion, language, culture, and traditions, the probability of obtaining unique information is lower. Therefore, the sample size was reduced by half, resulting in a final sample size of 198 (see Table 1). The numbers of samples from each kebele were calculated based on the proportion of households in each kebele relative to the total number of households across the eight kebeles (see Table 1). A total of 198 informants, above the age of 20 were selected, of which, 55 were key informants chosen through purposive sampling from the study kebeles, based on information gathered from residents. Additionally, 143 general informants (respondents) were randomly selected using a lottery method (Martin, 1995). Informed consent was obtained from each participant before the interviews, ensuring that they understood the purpose of the study and the responsible use of their information.

Table 1: Number of informants in each kebeles

| **Kebeles** | **Total population** | **Sample size** |
|---|---|---|
| Adi selam | 5535 | 25 |
| Terinasha | 5446 | 25 |
| Chinifera | 5866 | 26 |
| Akuna | 5727 | 26 |
| Tara | 5367 | 24 |
| Ageta | 5412 | 24 |
| Negade meshageria | 5153 | 23 |
| Ateba | 5571 | 25 |
| Total | 44077 | 198 |

### 3.2. 3. Ethnomedicinal data Collection techniques

Ethnobotanical data were collected from April 21 to June 21, 2024, following the methods outlined by Martin (1995). The data collection took place during visits to the eight kebeles selected for the presence of traditional medicinal practitioners and vegetation. The techniques employed in data collection were semi-structured interviews, guided field walks with key informants, market surveys, and group discussions. These methods were instrumental in gathering information about the knowledge and management of traditional medicinal plants used by local people to treat human and animal ailments in the district. Individual interviews with informants and discussions were conducted in the regional Amharic language, using a structured list of questions. The place and the time for discussion were settled based on the interests of the informants.

#### 3.2.3.1. Semi-Structured Interview

Semi-structured interviews were conducted to obtain ethnobotanical data, following the methodology adopted by Martin (1995). The items in the questionnaire were initially prepared in English and then translated into Amharic. The semi-structured questionnaire consisted of two main categories: First, personal information about the respondents, such as name, age, address, gender, marital status, and education level. Secondly, detailed information on medicinal plants such as the diseases treated, local names of the plants, sources of the medicinal plants (whether wild or home garden), parts of the plant used, methods of preparation, routes of administration, dosage, side effects and antidotes, ingredients and solvents used, other applications of the plants, as well as threats to the plants and methods of conservation (see Appendix 5). The interviews were conducted conversationally, providing flexibility for in-depth discussions. After securing informed consent, the interviewer engaged participants using a prepared questionnaire as a guide, which facilitated the exploration of topics and encouraged respondents to share personal experiences related to medicinal plants. Ethnobotanical data were gathered through direct interactions with community members knowledgeable about these plants, allowing for both qualitative and quantitative insights.

To ensure the reliability of the information, each informant was contacted at least twice. If responses are different and are given at different times, they are considered to be unreliable and are rejected. Conversely, if multiple informants provided similar information on the same topic, the reliability of that data was confirmed (Akil Usmane, 2016).

### 3.2.3.2. Focus Group Discussion

After collecting ethnobotanical data through semi-structured interviews, focus group discussions were conducted in each kebele with key informants One focus group discussion was conducted in each selected kebele to gather additional information on community knowledge of medicinal plants and to cross-check the reliability of the data collected through Semi-Structured Interviews, following Martin's (1995).

The selection of participants for these discussions was based on recommendations from cultural leaders, elders, and kebele administrators. During these discussions, ethnomedical knowledge was collected from households, and insights from knowledgeable community members were carefully recorded to ensure through documentation of their expertise.

Each group typically included around 10 individuals, facilitating a balanced, interactive environment where diverse perspectives could be shared. Key topics addressed included the uses of specific medicinal plants, preparation methods, dosage and administration practices, cultural significance, conservation issues related to medicinal plants, threatening factors of medicinal plants, and personal experiences regarding their effectiveness in treating various ailments (Figure 2).

Figure 2: Focus group discussion

### 3.2.3.3. Guided Field Walk

Guided field walks were conducted with traditional practitioners to visit locations where medicinal plants are growing. These walks provided an opportunity for practitioners to demonstrate and explain their ethnomedicinal knowledge in the field. During these guided field interviews, on-site notes were taken regarding all relevant information about the plants, including their local names, growth habits, sources, parts used, soil types, and major threats to their survival, and some plant species were photographed. This hands-on approach enriched the data collection process by allowing direct observation and interaction with the plants in their natural environment (Figure 3).

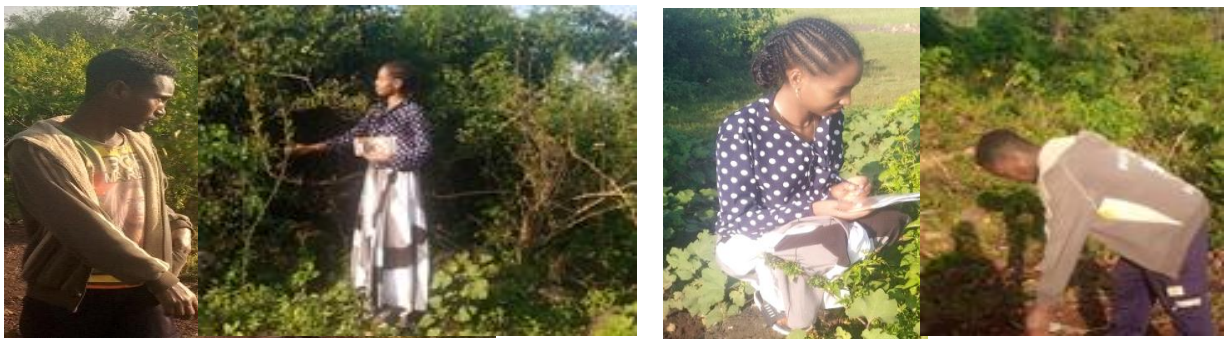


Figure 3: Guided field observation

### 3.2.3.4. Market Survey

A market survey was conducted in Dejach Meda to gather information on medicinal plants sold in the local markets of the study area. During the survey, the names of medicinal plants and other aspects of herbal drugs available for sale were recorded. Semi-structured interviews and observations were carried out with both sellers and buyers of medicinal plants to identify commercially viable species, assess various attributes of the plants, and compile information on their different uses (Figure 4).

Figure 4: A market survey in Dejach Meda town

### 3.2.3.5. Plant specimen collection and identification

At the end of the interviews, images of the reported medicinal plants were captured using a camera, with the help of local field assistants, traditional healers, and knowledgeable community members. Identification of these specimens was conducted both in the field and at Bahir Dar University by using the flora of Ethiopia and Eritrea, available taxonomic literature, taxonomic keys, NDA software, and visual comparison with pictures.

### 3.2.4. Ethnobotanical Data analysis

### 3.2.4.1. Descriptive statistics

Descriptive statistical methods, including percentages, frequencies, tables, and graphs, were employed to analyze the medicinal plants used in the study. This analysis focused on identifying the number and percentage of species, genera, and families of medicinal plants, their growth forms, proportions of parts harvested, modes of remedy preparation, dosages, routes of administration, and associated threats (Alexiades, 1996) using Excel spreadsheet software. Additionally, Traditional knowledge regarding the the use of medicinal plants across different demographics including men and women, young and elderly groups, literate and illiterate, key and general informants as well as those married and single groups was computed using excel.

### 3.2.4.2. Preference Ranking

Preference ranking was conducted using ten selected key informants to identify the most important and effective medicinal plants to treat febrile illnesses and livestock leeches. Five and four medicinal plants were chosen to be ranked preferentially by key informants based on the

curing potential of febrile illness and livestock leech respectively. The ranking system was based on assigning the highest value of 5 to the plant considered to be the best for treating febrile illness and livestock leech respectively, a value of 4 for the second-best plant, and the lowest value of 1 for plants that have lower healing power compared to the others (Martin, 1995).

#### 3.2.4.3. Direct matrix ranking

Based on the information obtained from informants regarding the multipurpose uses of various plants, a direct matrix ranking exercise was conducted for seven selected medicinal plants. This method aimed to compare the multipurpose uses of each species and to assess the relative significance of the species compared to other species, following the recommendations of Martin (1995). In this exercise, seven multipurpose species were chosen from the total list of medicinal plants, and seven use categories (firewood, construction, medicine, charcoal, furniture, fencing, and forage) were listed for ten selected key informants to assign use values to each species. Each key informant was asked to assign use values to each species within these categories. The values assigned were as follows: 5 for "the best," 4 for "very good," 3 for "good," 2 for "less used," 1 for "least used," and 0 for "not used. Finally, the values for each use category were summed for each plant species and then ranked based on their multipurpose significance.

#### 3.2.4.4. Informant Consensus Factor (ICF*)*

ICF was computed for each disease category to identify potentially effective medicinal plant species in the respective disease categories (the agreement of informants on the reported cures for the group of diseases). ICF was calculated by the number of use citations in each disease category minus the number of times a species was used divided by the number of use citations in each category minus one (Heinrich, 1998). ICF was calculated using the formula below:

$$\mathrm{ICF} = \frac{(n\mathrm{ur} - \mathrm{nt})}{(\mathrm{nur} - 1)}$$

Where nur is the number of use citations in each disease category, nt is the number of times a species is used.

### 3.2.4.5. Fidelity Level of Index (FL)

The Fidelity Level (FL) Index is used to evaluate the relative healing potential of the most frequently cited medicinal plants used to treat human and livestock ailments. FL is defined as the ratio of the number of informants who independently suggested the use of a particular species for a specific major purpose to the total number of informants who mentioned that plant for any use. FL was calculated for medicinal plants used against various human and livestock ailment categories. The formula for calculating FL is as follows:

$\mathrm{FL\%} = \frac{NP}{N} \times 100$ FL (%) where Np is the number of informants that reported the use of a plant species to treat a particular disease, and N is the number of informants that used the plants as a medicine to treat any given disease (Friedman *et al*., 1986). Accordingly, the FL value was calculated for eleven medicinal plant species used for treating Gastrointestinal and intestinal parasite dermatological, blood pressure, ear disease, leech snake bite, Coccidiosis, hemmoriod, and Cough.

## 3.3. Evaluation of the antibacterial activity of medicinal plants

The selection of plants for antibacterial testing was based on ethnobotanical information gathered from local informants, as well as the availability of the plants at the time of collection. Three traditional medicinal plant species (*Brurcea antidysenterica, Verbascum sinaticum,* and *Withania somnifera*) were selected for further study due to their relatively high Informant Consensus Factor and Fidelity Level values for treating dermatological and gastrointestinal diseases (Figure 5 and table 13) (Trotter and Logan, 2019).

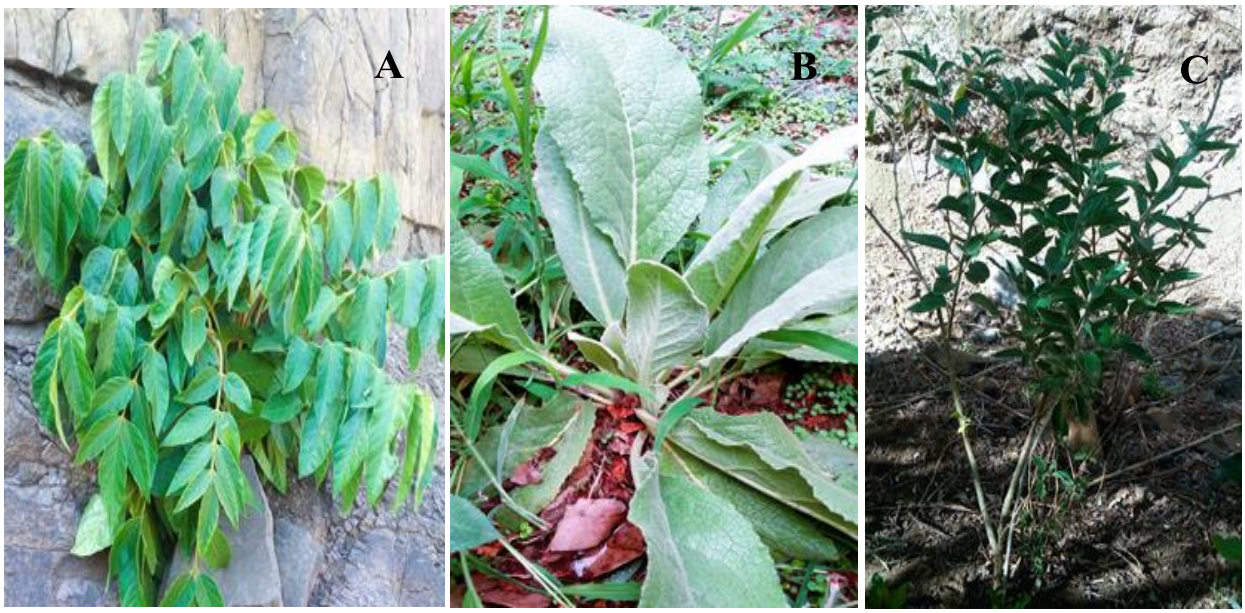



**Figure 5: Picture of some selected medicinal plants for antibacterial test**

The figure shows (a) a picture of *Brucea antidysenterica*, (b) a picture of *Verbasicum sinaticum*, and (c) a picture of *Withania somnifera*).

### 3.3.1. Plant material collection and Preparation of plant extracts

The fresh plant parts (leaf and root) with medicinal value were collected, identified, and carefully washed with running tap water, followed by distilled water to remove any contaminants. The cleaned plant materials were then dried under shade at room temperature to prevent the evaporation of volatile secondary metabolites. The procedure used for the preparation of the plant materials was adapted from Elof ( 2012). The dried leaf and root were ground to a fine powder using a mechanical grinder. The powder was sieved through a 0.6 mm wide mesh and the weight of each plant powder was measured using a precision electronic balance before extraction (Cheruiyot *et al*., 2015).

Extraction was conducted using the maceration technique. A total of 30 grams of each plant powder was mixed with 300 ml of 99.9% methanol in conical flasks, following a ratio of 1:10 (w/v). The flasks were tightly closed, and the mixture was shaken for 72 hours using an orbital shaker set at 200 rpm at room temperature. After the shaking period, the extract was filtered first through cotton and then using Whatman No. 1 filter paper to obtain a clear extract.

After obtaining the clear plant extracts through filtration, the test concentrations were prepared by diluting the extracts in methanol. The concentrated extract, which had a volume of 275 ml and a concentration of 100 mg/ml, served as a stock solution. From this stock solution, three test concentrations were prepared: the first one was 100 mg/ml, taken directly from the stock. The second concentration, 50 mg/ml, was prepared by diluting the stock with 50% methanol. Finally, the third concentration was 25 mg/ml, prepared by diluting the stock with 75% methanol following the method adopted by Gebremedhin Romha, (2018).

### 3.3.2. Description of the tested bacterial strains

Two Gram-positive bacteria (Staphylococcus aureus and epidermidis) and two gram-negative bacteria (Escherichia coli and Klebsiella pneumoniae), were selected for in vitro antibacterial activity test using. The pure cultures of these bacterial isolates were obtained from the Amhara Public Health Institute.

### 3.3.3. Preparation of test bacterial suspension/ Inoculum preparation

The pure cultures of each bacterial isolate were subcultured in nutrient broth and incubated at 37 °C for 24 hours to promote growth. Following incubation, the cultures were assessed for turbidity and subsequently diluted with distilled water to create a homogeneous suspension, which was thoroughly mixed using a vortex. The absorbance of the resulting suspension was measured at 600 nm using a spectrophotometer and adjusted to 0.132. The bacterial load is equivalent is 0.5 McFarland standard, approximately 1.5 × 10^8 colony-forming units (CFU) per mL.

### 3.3.4. Antibacterial assays

The antibacterial activity of the three selected traditional medicinal plant extracts was evaluated using the agar well diffusion method (Perez, 1990). The Mueller-Hinton agar was prepared by autoclaving the medium at 121 °C for 15-20 minutes to ensure sterility. After cooling, the agar was poured into sterilized Petri dishes.

Standardized bacterial cultures were inoculated onto Mueller-Hinton agar plates using a sterilized cotton swab, providing a suitable medium for testing the efficacy of the plant extracts

against the selected Gram-positive and Gram-negative bacteria. Wells (6 mm) were created using a sterile cork borer and each well received 100 µl of each plant extract along with positive (15 µg/ml tetracycline) and negative (methanol without plant extract) controls, ensuring triplicate testing following the method adopted by Dereje Nigussie, *et al*,(2021).

The plates were incubated at 37 °C for 24 hours, and the antibacterial activity was assessed by measuring the diameter of the zones of inhibition in millimeters using a transparent ruler (Kindu Geta and Mulugeta Kibret, 2020). The mean of the replicates for each concentration was recorded.

### 3.3.5. Data Analysis of antibacterial test

The antibacterial activities of the selected plant extracts were expressed as mean values of the inhibition zones ± standard error (SE). Data were analyzed using one way ANOVA with the aid of the SPSS software package, version 27, at a significance level of $p = 0.05$. This analysis aimed to determine whether or not the means of the selected plant extracts exhibited statistically significant differences in their effects on the test organisms.

## 3. 4. Ethical considerations

To conduct ethnobotanical research on medicinal plants and collect data appropriately, an ethical clearance was obtained from the ethical committee at Bahir Dar University's College of Science and an official support letter from the Department of Biology. Each local participant was informed about the study's objectives, methods, results, and potential benefits before being asked for their consent. The right to privacy and benefits of the participants were respected throughout the data collection process. Confidentiality of any information or sensitive details shared by the informants was strictly maintained. After explaining the purpose of the study, the informants agreed to participate, and each signed a consent form. Data were then gathered based on questionnaire items from both general and key informant interviews.

# 4. RESULTS

## 4.1. Ethnobotanical study of medicinal Plants

### 4.1.1. Informant background information

A total of 198 informants participated in this study to investigate the information related to traditional medicinal plants to treat human and livestock ailments. Of these, 69.2 % and 30.8 % of the informants were males and females, respectively. According to the age class category, 20.71 33.33, and 45.96 % were found to be young (21-30 years), middle-aged (31-45 years ), and elderly (>35 years), respectively (Figure 5). Similarly, 61.1% of the informants were illiterate (cannot read and write) and 38.9% of them were literate/read and write. In terms of informant type, 72.2 and 27.8% of the informants were general and key informants, respectively. 20.71

Large numbers of medicinal plants were reported by men than women, elder informants than younger, by illiterate informants than literate once, and by key informants than general. This indicates younger generations have less interest in educating traditional medicinal knowledge from elder people; this may be due to the effect of modern education and urbanization (see table 2 )

Table 2: Indigenous knowledge of medicinal plants compared by informant background

| Informant background | | Number of plants cited | Percentage |
|---|---|---|---|
| Age group | 21-30 | 31 | 24.78 |
| | 31-45 | 35 | 30.97 |
| | Above 45 | 47 | 44.25 |
| Sex | Male | 82 | 72.57 |
| | Female | 31 | 27.43 |
| Educational status | Litrate | 83 | 73.45 |
| | Illiterate | 30 | 26.55 |
| Informant type | Key | 69 | 61.06 |
| | General | 44 | 38.94 |

### 4.1.2. Medicinal plants used to treat human and livestock ailments

A total of 113 medicinal plant species belonging to 57 genera and 59 families were identified for treating human and livestock ailments. Among these, 77 (68.14%), 20 (17.69%), and 16 (14.16%) species were used for treating human, human livestock, and livestock ailments, respectively. In terms of species diversity, the *Fabaceae* family was the most prominent, comprising eight species (7.08%). This was followed by the *Asteraceae, Lamiaceae,* and *Solanaceae families*, each contributing six species (5.31%). The *Cucurbitaceae* and *Euphorbiaceae* families, each had five species (4.42%), while the *Moraceae* family had four species (3.54%). Further, several families *Apiaceae, Malvaceae, Myrtaceae, Ranunculaceae, Rosaceae, Rutaceae,* and *Vitaceae* each contributed three species (2.65%). Additionally, seven families, including *Asclepiadaceae, Apocynaceae, Poaceae, Polygonaceae, Rhamnaceae, Tiliaceae,* and *Verbenaceae*, were represented by two species each (1.77%). The remaining 38 families were represented by one species each (0.88%) (see Appendix -4 ).

### 4.1.3 Habit of medicinal plants

Among the 113 species of medicinal plants identified, 46 species (40.71%) were shrubs, 37 species (32.74%) were herbs, 19 species (16.8%) were trees, and 11 species (9.7%) were climbers.

### 4.1.4 Sources of medicinal plants

According to the informants, medicinal plants were obtained from different sources. In this regard, about 60.18%, 29.2%, and 10.62 % of the medicinal plants were collected from the wild, home gardens, and both wild and home gardens, respectively.

### 4.1.5 Parts of medicinal plants used

The inhabitants in the study district gathered various plant parts to prepare traditional medications/remedies. The findings indicated that the most commonly used plant parts for preparing remedies were the leaves, which accounted for 43.93% of the reported uses. This was followed by roots (24.61%) and seeds (8.9%) (Figure 6). Remedies can be made from single plant parts or a combination of many parts, depending on the condition being treated. For

instance, some remedies utilize only the leaves, roots, seeds, fruits, latex, twig, root bark, stem bark, rhizome, flower, and stem resin while others combine leaves with roots or seeds, and fruit with seed or stem bark to enhance efficacy. This diversity in preparation methods indicates the traditional knowledge in selecting specific parts based on their perceived healing properties and the desired therapeutic effects (Figure 6).

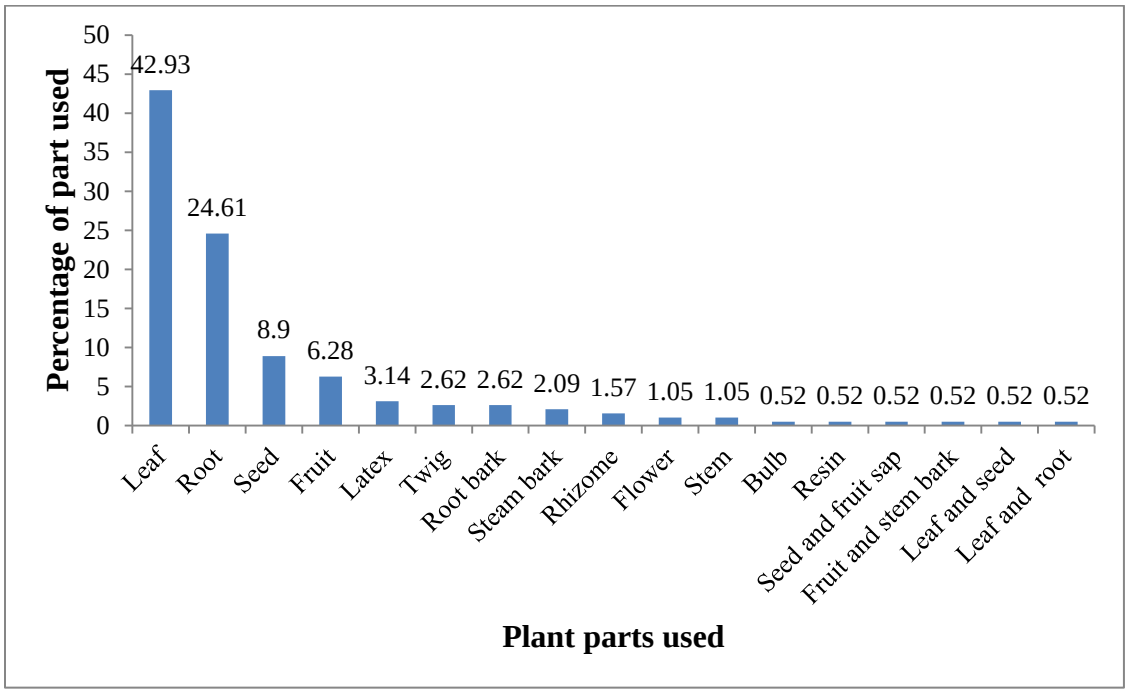



**Figure 6: Parts of medicinal plants used**

### 4.1.6. Condition of preparation

According to informants, herbal remedies were prepared mostly using fresh plant materials (64.4%) followed by dried plant materials (29.31%), the remaining were either in fresh or dried forms (Figure 7).

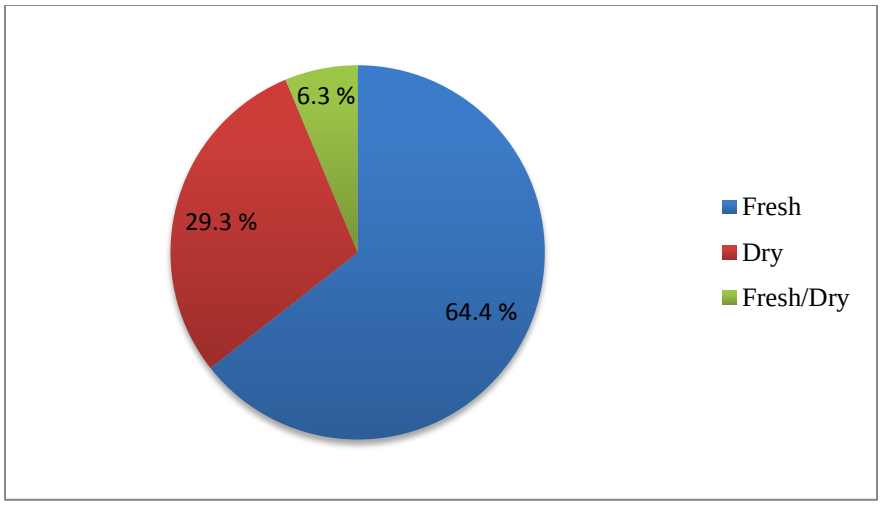



Figure 7: Condition of plant parts used in remedy preparation

### 4.1.7. Method of preparation, solvents and ingredients required in herbal medicine

Informants indicated that the preparation of remedies varies significantly based on the type and stage of the disease. The most common methods of remedial preparations were crushing (35.6%), followed by grinding (20.42%), boiling (11), chewing (8.38%), and burning (5.76%) (Figure 8). Each method serves a distinct purpose; for example, crushing and grinding are essential for breaking down plant materials to release their active compounds, while boiling is commonly employed to extract these compounds into a liquid form suitable for consumption.

The preparation of traditional herbal medicine involves a diverse array of ingredients and solvents that are crucial for the formulation of effective remedies. Common ingredients used by informants were enjera, honey, and butter, which can improve the palatability of the remedies and may carry their health benefits. The solvents utilized in these preparations also play vital roles. The most commonly used solvents were water, tela, oil, tea, milk, and coffee. Among these solvents water is the most common solvent, for its universal availability and ability to extract water-soluble compounds.

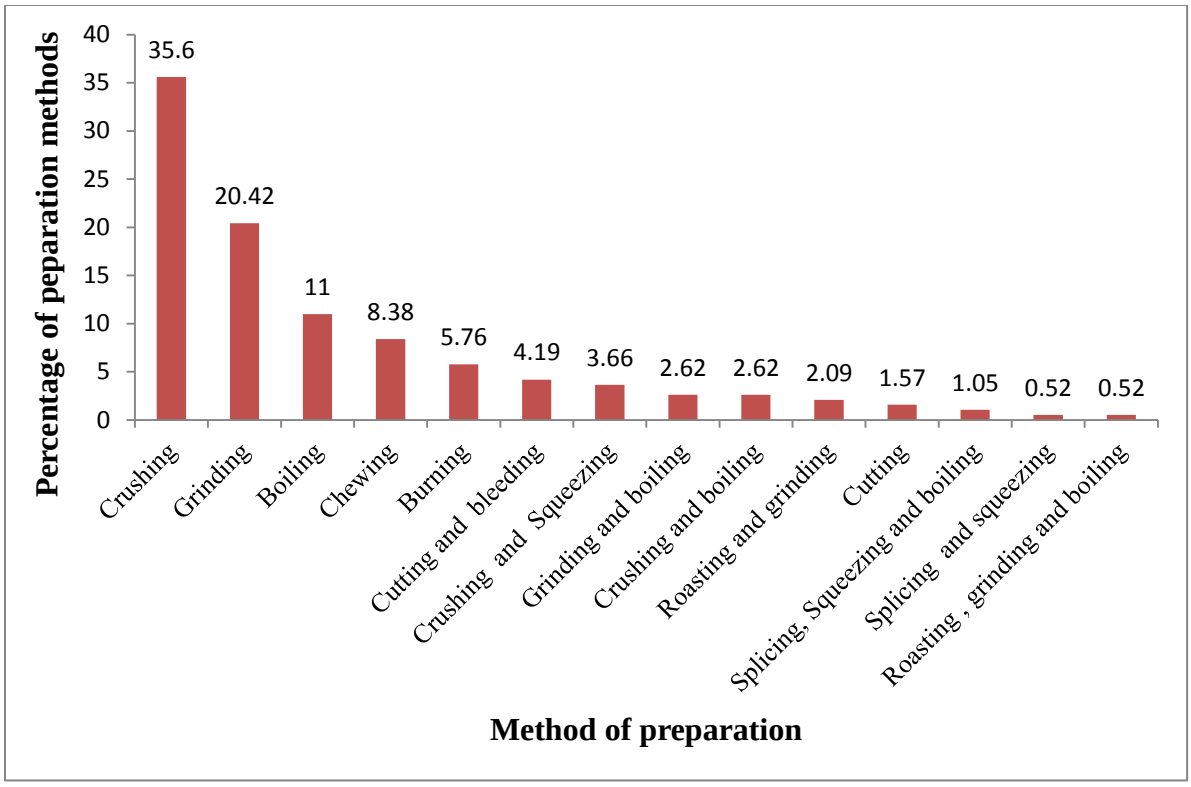



Figure 8: Method of preparation of herbal remedy

### 4.1.8 Routes of administration and ways of application for medicinal plant preparations

Various routes of administration and ways of application for medicinal plant preparations were documented for treating both human and livestock ailments. The routes of administration varied significantly based on the affected body part and the specific ailment reported by the individual patient. Oral administration was the most prevalent route, accounting for 109 preparations (57.07%). This was followed by dermal administration, with 50 preparations (26.18%), and nasal administration with 11 preparations (5.76%). Additionally, remedies were administered through the ear (6 preparations, 3.14%), oral/nasal (8 preparations, 4.19%), and eye (7 preparations, 3.66%)

Several methods were employed to apply these traditional remedies, with drinking being the most common application method, representing 40.43% of cases. This was followed by painting the skin with herbal preparations (23.96%) and eating the remedies (8.85%) (Figure 9). Internal health problems like stomachache, gastritis, abdominal cramps, and diarrhea were treated by

drinking herbal extraction. On the other hand, an external health problem like wounds, dandruff, and scabies were treated by painting herbal extraction.

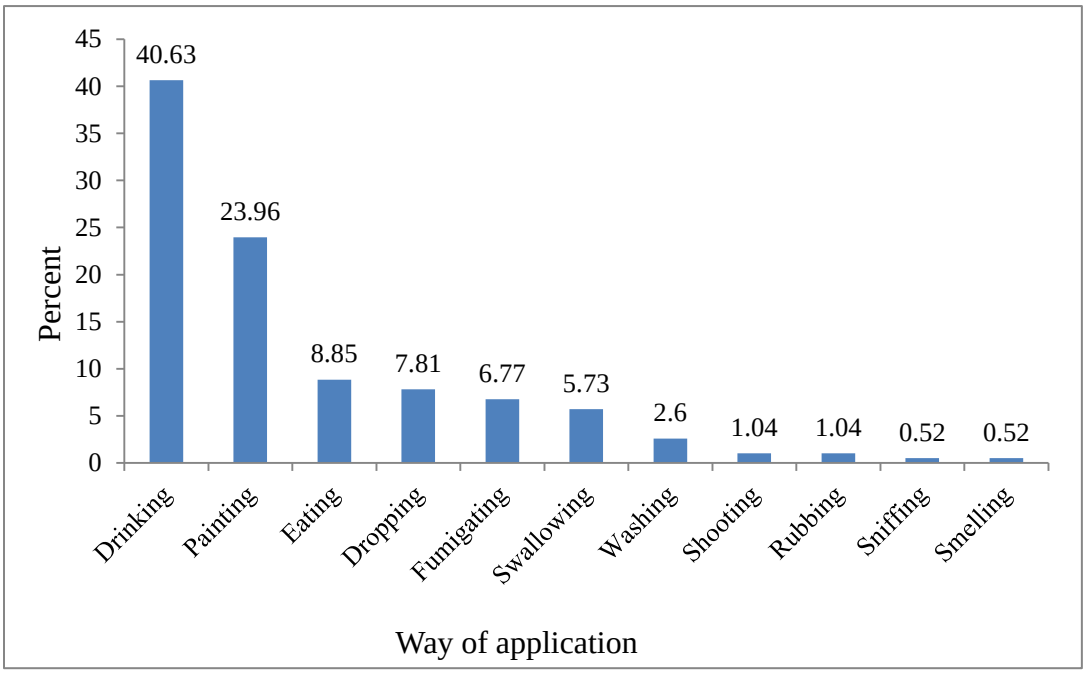



Figure 9: Way of application of herbal remedy

### 4.1.9 Dosages and antidotes of herbal remedies

Traditional healers use various measuring materials to administer herbal remedies. The dosage of herbal remedies varies based on factors such as the patient's age, gender, pregnancy status, and overall physical condition. Finger lengths for bark, roots, and stems, pinches for powdered materials, and various measuring tools like spoons, coffee cups, tea cups, and glass cups were found to be the most common dosage estimating methods in the study area. Additionally, counts were also used for administering drops of sap or extracts, as well as leaves, seeds, fruits, bulbs, rhizomes, and flowers. However, the respondents realized that the accuracy of these measurements is insufficient to pinpoint the exact amount and thus cause side effects.

The informants reported the existence of side effects due to the intake of some herbal remedies. These include diarrhea, vomiting, and stomach discomfort, particularly with plants such as *Euphorbia abyssinica, Acokanthera schimperi, Hagenia abyssinica, and Phytolacca dodecandra*.

In response to these adverse effects, informants suggested antidotes, eating cooked hen liver, and drinking milk, aguat, and yogurt immediately following the intake of medicinal plant remedies.

#### 4.1.1.10. Diseases and their diagnosing methods

In the Telemt District, a total of 46 types of human ailments were identified, which are treated using 82 traditional medicinal plant species. The most commonly reported human health problems were stomachache, abdominal cramps, gastritis, dandruff, hemorrhoids, ear diseases, and the evil eye. A total of 9 livestock ailments were identified and treated using 15 traditional medicinal plants. The most frequently reported livestock ailments were leeches, coccidiosis, black leg, anthrax, and external parasites. A total of 10 common ailments affecting both humans and livestock were identified in the study area. The most frequently reported health problems included swelling, snake bites, cough, febrilillnes, eye diseases, rabies, diarrhea, bleeding, wounds, and retained placentas. These ailments were treated using 48 different medicinal plants. One ailment can be treated by multiple plant species and one plant species can be effective for treating one or more diseases.

All traditional healers in the study area reported visual observation, hand touching, and interviews as frequent techniques for diagnosing human diseases before prescribing any herbal medicine. Traditional healers examined patients by asking about their symptoms and then observing various body parts such as the tongue, throat, eyes, skin color, and body temperature with their bare hands. On the other hand, the primary means of diagnosing livestock diseases were simple observation of symptoms in the mouth, eyes, nose, ears, and skin of the animals, touching the affected areas, and asking livestock owners about the main symptoms shown by the sick animals.

### 4.1.11. Marketability of medicinal plants

The results of the market assessment conducted at Dejach Meda town showed that many medicinal plants are traded not only for their medicinal properties but also for a variety of other uses. The marketable medicinal plants identified include those sold as spices, such as *Allium sativum, Coriandrum sativum, Nigella sativa, Ruta chalepensis, Thymus schimperi, Trigonella foenum-graecum, Ocimum basilicum*, and *Zingiber officinale*. Additionally, several plants were marketed as oil seeds, including *Carthamus tinctorius, Guizotia abyssinica, Ricinus communis,*

*Brassica carinata*, and *Linum usitatissimum*. Plants commonly used as food items were also prominent in the market, with plants like *Hordeum vulgare*, *Cucurbita pepo*, *Carica papaya*, *Citrus aurantiifolia*, *Saccharum officinarum*, *Persea Americana* (avocado), *Prunus persica* (kok), *Rhamnus prinoides* (gesho), and *Coffea arabica* being sold.

Furthermore, *Phytolacca dodecandra* is utilized for cleaning, while other plants such as *Echinops*, *Olea europaea subspp. Cuspidata* and *Silene macrosolen* are used as fumigants. Additionally, species like *Cordia africana* and *Eucalyptus globulus* are valued for their applications in firewood, construction, and other material needs. This diverse market reflects the multifaceted roles that medicinal plants play in the local economy.

### 4.1.12 Threating factor of medicinal plant

According to the informants' responses in the study area, different types of anthropogenic and natural factors affected traditional medicinal plants. Informants mentioned that the impact of the major anthropogenic factors and natural factors on medicinal plants varied. In connection with this, agricultural expansion was found to be the number one threatening factor, followed by firewood and charcoal production, overgrazing by domestic animals, drought, timber, and construction materials (Table 3). Approximately, 43.9 and 29.8 % of the informants reported agricultural expansion and firewood and charcoal production, respectively as the major threatening factors for medicinal plants.

Table 3 : Threating factors of medicinal plant species at the Telemt district

| SN | Threatening Factor | Citation of informant | | |
|---|---|---|---|---|
| | | In number | In percent | rank |
| 1 | Agricultural Expansion | 87 | 43.94 | 1 |
| 2 | Overgrazing by domestic animals | 22 | 11.1 | 3 |
| 3 | Firewood and charcoal | 59 | 29.8 | 2 |
| 4 | Timber and construction material | 13 | 6.57 | 6 |
| 6 | Drought | 17 | 8.59 | 5 |
| Total | | 198 | 100 | |

### 4.1.13. Conservation of medicinal plants

The results regarding the conservation of medicinal plants demonstrate that local communities are aware of the importance of both in-situ and ex-situ conservation techniques for preserving their flora. Some individuals started participating in conservation activities of medicinal plants such as cultivation in their home garden, around places of worship (such as churches and mosques), in agricultural fields, and along the margins of crop fields for various purposes, environmental protection, Construction of check dams, isolation of grazing land (see table 4). According to the data collected from respondents, 72 informants (36.36%) reported that they have begun conserving medicinal plants for various purposes. In contrast, a significant majority, 126 informants (63.64%), indicated that they do not engage in the conservation of medicinal plants.

They also revealed that there are medicinal plants that were cultivated in their home gardens like *Hagenia abyssinica*, *Ocimum urticifolium*, and *Ruta chalepensis*, either for medicinal purposes or for other purposes such as food, fodder, spice, live fence, and shade in their agricultural field plants like *Cordia africana* and *Acacia abyssinica* Due to their use as firewood and construction materials *and in their* field margin plants like *Ziziphus spina-christi* and *Rosa abyssincia* for windbreak and other protective purposes. Local people of the Telemt district cultivated plants in their churches like *Juniperus procera*, *Ficus vasta*, *Euphorbia abyssinica*, and *Euphorbia tirucalli*. Since harvesting plant resources from churches is culturally prohibited, they had a wider variety of plants, perhaps preserving local ethnobotanical knowledge.

Table 4 : Major Conservation activities for medicinal plants in the Telemt district

| Conservation Activity | Citation of informants | | |
|---|---|---|---|
| | Number | Percent | Rank |
| Cultivation In their Home Gardens | 37 | 18.69 | 2 |
| Cultivation in place of worship | 36 | 18.18 | 3 |
| Environmental Protection | 58 | 29.29 | 1 |
| Cultivation in Agricultural land | 28 | 14.14 | 4 |
| Construction Of Check Dams | 18 | 9.09 | 5 |
| Isolation of grazing land | 12 | 6.06 | 6 |
| Reforestation | 9 | 4.55 | 7 |
| Total | 198 | | |

### 4.1.14. Informant consensus factor (ICF) of medicinal plants

Based on data gathered from the local community, diseases such as kusl (wound), forefer (dandruff),ekek(scabies),chife(eczema),bgur(acne),Yekoda shifta (skin rash), Bugnj(boils) and aguagote (*tinea versicolor)* were the most reported health problems under the "dermatological/skin category, with the highest ICF value of 0.65. Yehod beshta(Stomachache), Yehodkurtet(abdominal cramp), Tekmat(diarrhea),Yehodtlatl (intestinal parasite), wesfat(Ascaris), Koso(tapeworm), and cheguara (gastritis) were commonly reported human diseases under the "gastrointestinal diseases" category, ranked second with an ICF value of 0.63. Leech, black leg, anthrax, and coccidiosis, were commonly reported livestock health problems under the Parasitic and Infectious livestock diseases category, ranked 3$^{rd}$ with an ICF value of 0.61 (Table 5).

For the gastrointestinal diseases category, *Verbascum, sinaiticum, Withania somnifera*, and *Zingiber officinale*, showed the highest Informant Consensus Factor (ICF) values, and each plant used for treating 6, 2, and 3 disease categories, respectively. For the dermatological disease category, *Brucea antidysenterica*, *Datura stramonium*, and *Aloe Vera* also demonstrated high ICF values, each plant being utilized for 1, 3, and 2 disease categories, respectively. Additionally, for the parasitic and infectious livestock disease category, *Nicotiana tabacum, Maytenus senegalensis*, and *Justicia schimperiana* showed high ICF values, each plant used for treating, 3,2, and 2 disease categories, respectively.

Table 5: ICF of medicinal plants used to treat human and livestock ailments

| SN | Categories of ailments | No of use citations (nur) | No of species | % of all species | % of all use citations | ICF |
|---|---|---|---|---|---|---|
| 1 | Sudden sickness (febrilillnes, headache ) | 14 | 7 | 6.19 | 3.45 | 0.53 |
| 2 | Sensorial problem (eye, ear, and tongue disease, etc) | 28 | 14 | 12.4 | 7 | 0.51 |
| 3 | Dermatological disease | 101 | 36 | 31.86 | 24.88 | 0.65 |
| 4 | Blood and circulatory problems | 21 | 10 | 8.85 | 5.17 | 0.55 |
| 5 | Gastro-intestinal and Intestinal parasites | 105 | 39 | 34.51 | 25.86 | 0.63 |
| 6 | Respiratory | 30 | 13 | 11.5 | 7.4 | 0.58 |
| 7 | Oral, dental, and pharyngeal | 8 | 5 | 4.42 | 1.97 | 0.43 |
| 8 | Rabies, scorpion bite, snake bite and malaria | 20 | 10 | 8.85 | 4.93 | 0.52 |
| 9 | Urogenital and venereal | 7 | 5 | 4.42 | 1.72 | 0.33 |
| 10 | Body swelling disease, arthritis hemmoriod and bone fracture, chest pain, abdominal pain | 29 | 13 | 11.5 | 7.14 | 0.57 |
| 11 | Evil eye and devil | 11 | 7 | 6.19 | 2.71 | 0.4 |
| 12 | Parasitic and Infectious livestock diseases | 32 | 13 | 11.5 | 7.88 | 0.61 |

### 4.1.15. Fidelity level of medicinal plants

Fidelity level values were calculated for 11 commonly used medicinal plants in the Telemt District, focusing on their effectiveness against specific human and livestock ailments (Table 6). The highest fidelity level was recorded for *Brucea antidysenterica* (94%), followed by *Verbascum sinaiticum* (88%), *Withania somnifera* (83%), and *Nicotiana tabacum* (73%). *B. antidysenterica* was reported for use against dermatological/skin disease categories. Whereas *V. sinaiticum and W. somnifera* were used against gastrointestinal and parasitic diseases, *N. tabacum* was against leech.

Table 6: Fidelity level values of medicinal plants used to treat human and livestock ailments

| SN | Local Name | Botanical name of medicinal plants | Ailment treated | NP | N | FL | FL% |
|---|---|---|---|---|---|---|---|
| 1 | Ketetina | *Verbascum sinaiticum* | Gastro-intestinal and intestinal parasite | 22 | 25 | 0.88 | 88 |
| 2 | Gzawa | *Withania somnifera* | Gastro-intestinal and intestinal parasite | 19 | 23 | 0.83 | 83 |
| 3 | Astenagr | *Datura stramonium* | Dermatological | 16 | 23 | 0.69 | 69 |
| 4 | Avalo(Waginos) | *Brucea antidysenterica* | Dermatological | 18 | 19 | 0.94 | 94 |
| 5 | Azamr | *Bersama abyssinica* | Blood pressure | 5 | 7 | 0.71 | 71 |
| 6 | Gulo | *Ricinus communis* | ear disease | 6 | 9 | 0.67 | 67 |
| 7 | Tmbaho | *Nicotiana tabacum* | Leech | 8 | 11 | 0.73 | 73 |
| 8 | Haregtemen | *Ampelocissus schimperiana* | snake bite | 8 | 12 | 0.66 | 66 |
| 9 | Atat | *Maytenus senegalensis* | Coccidiosis | 6 | 11 | 0.55 | 55 |
| 10 | Kulkual | *Euphorbia abyssinica* | hemmoriod | 5 | 8 | 0.63 | 63 |
| 11 | Amira | *Plumbago zeylanica* | Cough | 5 | 9 | 0.56 | 56 |

### 4.1.16. Direct matrix ranking of multipurpose medicinal plants

The results from the direct matrix ranking analysis showed that *Dodonaea angustifolia, Euclea racemosa, Syzygium guineense, Eucalyptus globulus, Ficus sur*, and *Croton macrostachyus* were plants with multiple uses in that order by the local people of the study area (Table 7). This finding indicated that these medicinal plants were overharvested in the research area due to their multiple uses. *D. angustifolia* ranked first (the most threatened) followed by, *Euclea racemosa*, and *S. guineense*. They were exploited for construction, firewood, charcoal, and medicine for their home consumption, and need further conservation actions. The results indicated that these plants were primarily used for firewood followed by construction and medicine.

Table 7: Direct matrix ranking of seven medicinal plants

| SN | Use Diversity | Plant Species | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *S. guineense* | *F. sur* | *C. africana* | *E. globulus* | *C. macrostachyus* | *D. angustifolia* | *E. racemosa* | Total | Rank |
| 1 | Fire wood | 4 | 2 | 2 | 5 | 4 | 5 | 5 | 27 | 1 |
| 2 | Construction | 4 | 3 | 4 | 5 | 1 | 3 | 2 | 22 | 2 |
| 3 | Medicine | 4 | 2 | 3 | 1 | 5 | 3 | 4 | 22 | 2 |
| 4 | Charcoal | 3 | 2 | 0 | 2 | 2 | 4 | 5 | 18 | 3 |
| 5 | Furniture | 3 | 3 | 5 | 3 | 1 | 2 | 1 | 18 | 3 |
| 6 | Fence | 0 | 1 | 1 | 2 | 1 | 5 | 4 | 14 | 4 |
| 7 | Forage | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 4 | 5 |
| Total | | 19 | 13 | 16 | 18 | 14 | 24 | 21 | | |
| Rank | | 3 | 7 | 5 | 4 | 6 | 1 | 2 | | |

### 4.1.17. Preference ranking of medicinal plants

A preference ranking exercise helps to determine whether the local people prefer specific medicinal plants or not for treating particular ailments. The species most frequently used for a specific disease often indicates high efficacy among the community. According to the results of the preference ranking analysis, *Zehneria scabra* was the most preferred species to treat febrile illness followed by *Echinops kebericho*, *Opimum lamiifolium*, and *Eucalyptus globulus* (Table 8).

Table 8: Preference ranking of five medicinal plants used to treat febrile illness

| SN | Medicinal plants | Key informants coded (A to J) | | | | | | | | | | Total score | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | I | J | | |
| 1 | *E. kebericho* | 4 | 5 | 4 | 4 | 5 | 3 | 4 | 3 | 4 | 4 | 40 | 2 |
| 2 | *E. globulus* | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 4 | 3 | 29 | 4 |
| 3 | *Ladoensis* | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 24 | 5 |
| 4 | *O. lamiifolium* | 3 | 4 | 3 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 36 | 3 |
| 5 | *Z.scabra* | 5 | 4 | 5 | 4 | 4 | 5 | 5 | 4 | 4 | 5 | 45 | 1 |

According to the results of the preference ranking analysis, *Nicotiana tabacum* was the most preferred species for treating livestock leeches followed by *Millettia ferruginea,* and *Satureja punctate* (Table 9).

Table 9 : Preference ranking of five medicinal plants used to treat livestock leeches

| SN | Medicinal plants | Key informants coded (A to J) | | | | | | | | | | Total score | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | I | J | | |
| 1 | *Rhus glutinosa* | 4 | 2 | 2 | 4 | 2 | 3 | 2 | 3 | 2 | 3 | 27 | 4 |
| 2 | *Millettia ferruginea* | 3 | 5 | 3 | 4 | 4 | 4 | 5 | 4 | 4 | 3 | 39 | 2 |
| 3 | *Nicotiana tabacum* | 4 | 4 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 44 | 1 |
| 4 | *Satureja punctata* | 2 | 4 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | 3 | 33 | 3 |

### 4.1.18.Ways of indigenous knowledge transfer on medicinal plants

The traditional healers in the study area were not willing to share their knowledge with everybody. The local people mostly transferred their knowledge of medicinal plants and conceptions of traditional diagnosis techniques by word-of-mouth to family members, particularly to elder sons. The local people in the Telemt district mostly learned indigenous knowledge about medicinal plants from their family members (44.44%) and grandparents (24.24%) (Table 10).

Table 10: Source of indigenous knowledge about medicinal plants in Telemt district

| Source of Knowledge | No of informants | % of informants |
|---|---|---|
| Family members | 88 | 44.44 |
| Grandfather/mother | 48 | 24.24 |
| Uncle/ Aunt | 26 | 13.13 |
| Husband/wife | 21 | 10.61 |
| Neighbor | 6 | 3.03 |
| Friends | 9 | 4.55 |
| **Total** | **198** | **100** |

## 4.2. Antibacterial Activities of some selected Medicinal Plants

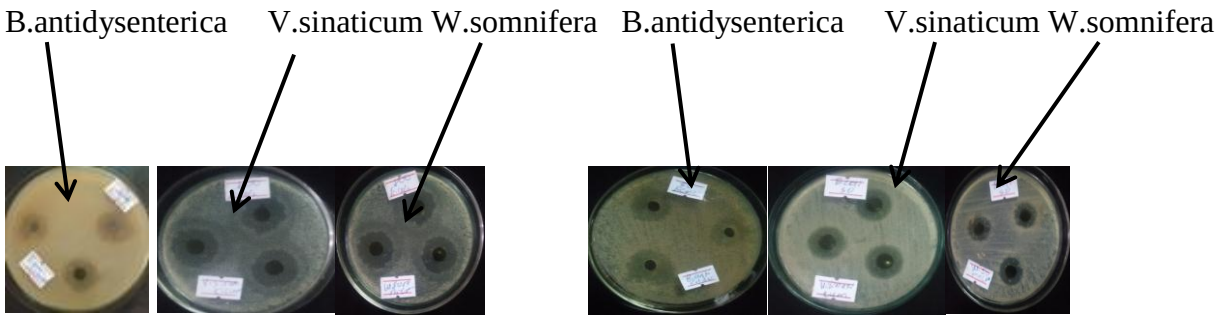
In this study, three medicinal plants were selected for extraction and antibacterial activity testing based on their high healing potential. Accordingly, the leaves of *B. antidysenterica*, *W. somnifera*, and the roots of *V. sinaticum* were gathered and biologically active ingredients were extracted using methanol as the solvent. The antibacterial activities of the crude extracts at different concentrations (100 mg/ml, 50 mg/ml, and 25 mg/ml) were evaluated against two Gram-positive and two Gram-negative bacteria (Table 11).

The negative control did not exhibit any antibacterial activity, while the positive control showed a significant growth inhibition zone of 25 mm against *Klebsiella pneumonia*. Significant differences were observed between the plant species at the different test concentrations against the tested pathogens and with positive control (Table 11)

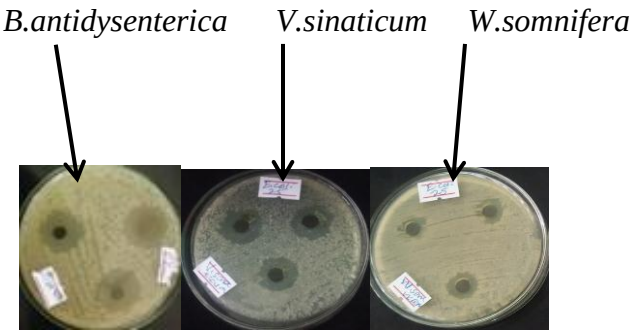
The extract *B. antidysenterica* demonstrated zones of inhibition ranging from 8 mm to 21 mm. The maximum zone of inhibition was observed against *K. pneumonia* (21 ± 0.47 mm) at the highest test concentration of 100 mg/ml, while the minimum zone of inhibition was recorded against *S. epidermidis* (8 ± 0.558 mm) at the lowest concentration of 25 mg/ml (Table 11). Among the examined bacterial strains, *K. pneumoniae* was the most susceptible, whereas *S. epidermidis* exhibited lower susceptibility. The extracts of *B. antidysenterica* were the only ones that showed an inhibitory effect against *S. aureus*.

The root extract of *Verbasicum sinaiticum* was tested against four bacterial pathogens: *Escherichia coli, Klebsiella pneumonia, Staphylococcus aureus,* and *Staphylococcus epidermis* at various concentrations. The root extract of *Verbasicum sinaiticum* showed a zone of inhibition ranging from 0 mm to 20 mm. The extract showed the maximum zone of inhibition against *E. coli* (20mm ±0.385) and the minimum zone of inhibition against *Staphylococcus aureus* (0.00) (Table 11).*V.sinaiticum* did not show any inhibitory effect against *Staphylococcus aureus*.

The leaf extract of *Withania somnifera* was tested against four bacterial pathogens: *Escherichia coli, Klebsiella pneumonia, Staphylococcus aureus,* and *Staphylococcus epidermidis* at various concentrations. The zones of inhibition for the methanol leaf extract ranged from 00 mm to 19.67 mm. The extract exhibited the maximum zone of inhibition against *E. coli* (19.67 ± 0 mm), while the minimum zone of inhibition was recorded against *Staphylococcus aureus* (0.00 mm) (Table 11). The leaf extracts of *Withania somnifera* did not demonstrate any inhibitory effect against *Staphylococcus aureus*.

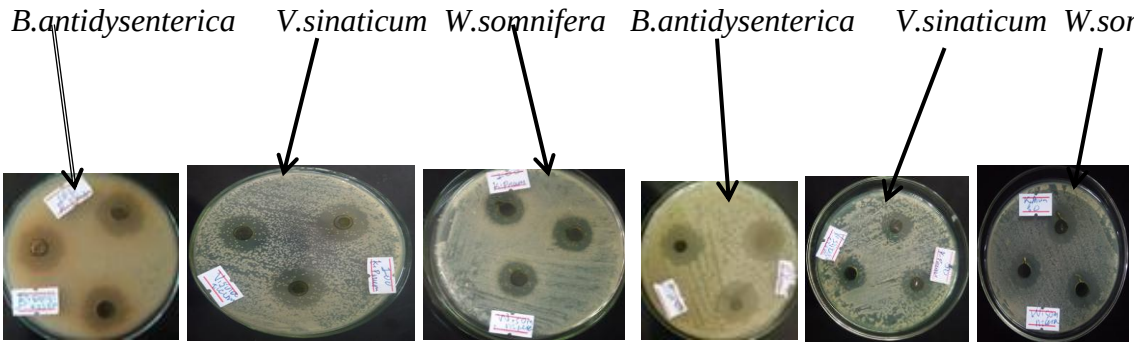



Test concentration at 100mg/ml Test concentration at 50mg/ml

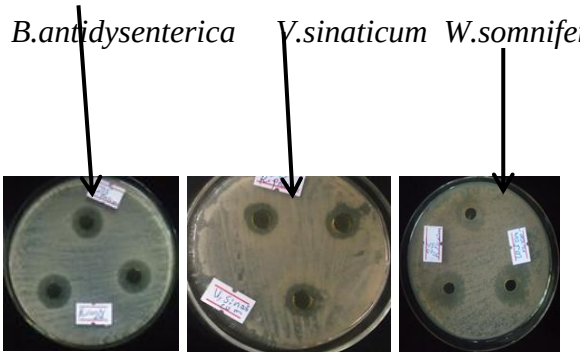



Test concentration at 25mg/ml

Figure 10: Inhibition Zones of *B.antidysenterica V.sinaticum* and *W.somnifera against E.coli.*

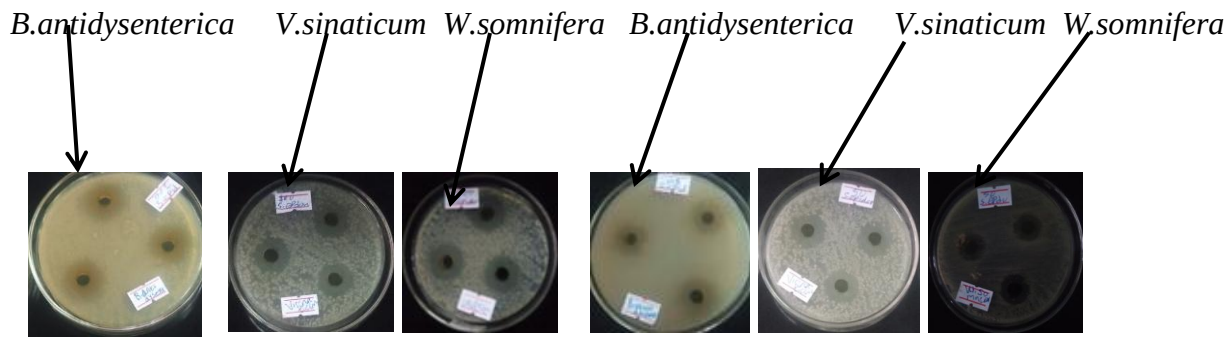



Test concentration at 100mg/ml Test concentration at 50mg/ml

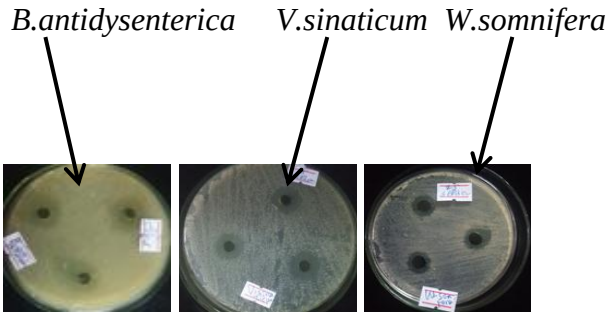



Test concentration at 25mg/ml

Figure 11: Inhibition Zones of B.antidysenterica V.sinaticum and W.somnifera against K. pneumonia.




Test concentration at 100mg/ml Test concentration at 50mg/ml




Test concentration at 25mg/ml

Figure 12: Inhibition Zones of B.antidysenterica V.sinaticum and W.somnifera against *S.epidermidis*

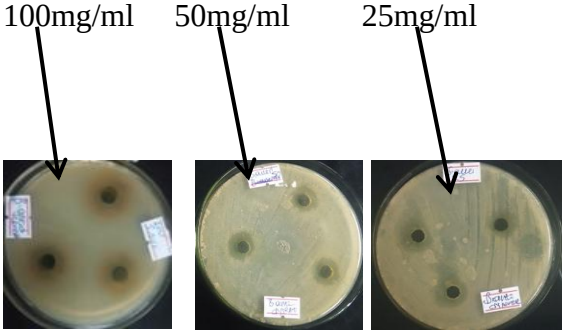



Figure 13: Inhibition Zones of B.antidysenterica S.aureus at three different test concentrations

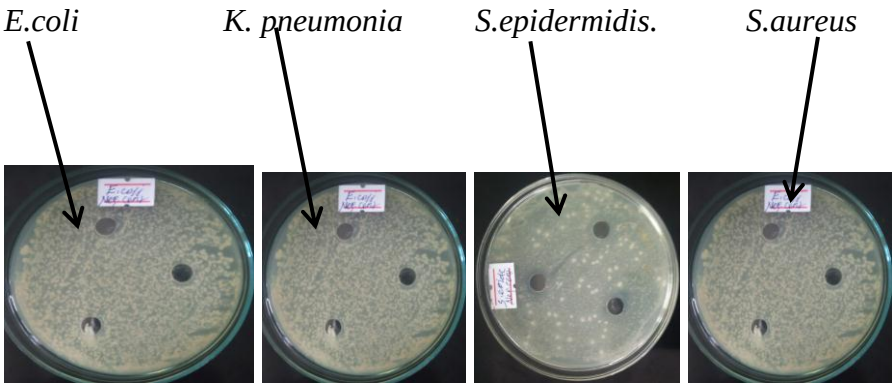



Figure 14: Inhibition Zones of negative control against four bacteria

*Klebsiella pneumoniae, Staphylococcus aureus, and Staphylococcus epidermidis*.

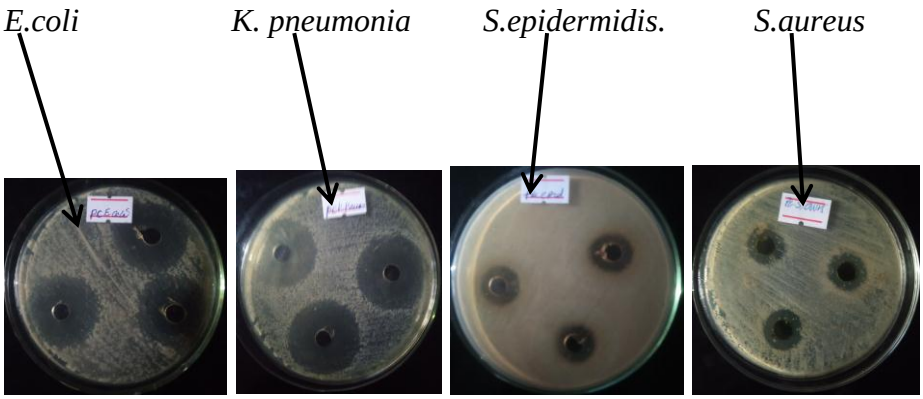



Figure 15: Inhibition Zones of positive control against four bacteria

Table 11: Antibacterial activities of three selected plant extracts against tested bacterial strains

| Plant species | Test concentrations (mg/mL) | *E.coli* | *S.epidermidis* | *K.pneumoniae* | *S.aureus* |
|---|---|---|---|---|---|
| *B. antidysentrica* | 100 | 16.33±0.33 aA | 15.00±0.58aA | 21.00±0.58aA | 18.33±0.33aA |
| | 50 | 13.33±0.33bB | 11.00±0.58bB | 16.67±0.33bA | 10.67±0.33bB |
| | 25 | 11.00±0.58cB | 8.00±0.58cC | 12.00±0.58cB | 8.67±0.33cC |
| *V. sinaticum* | 100 | 20.00±0.58aA | 15.00±0.58aA | 17.33±0.33aA | 0.00±0.00aA |
| | 50 | 15.00±0.5bB | 10.67±0.33bB | 12.00±0.58bB | 0.00±0.00aA |
| | 25 | 13.00±0.58bC | 8.33±0.33bC | 9.00±0.58cC | 0.00±0.00aA |
| *W. somnifera* | 100 | 19.67±0.33aA | 11.00±0.58aA | 14.33±0.33aA | 0.00±0.00aA |
| | 50 | 14.33±0.33bA | 8.00±0.58bA | 10.00±0.58bB | 0.00±0.00aA |
| | 25 | 5.33±0.33cB | 4.33±0.33bA | 7.00±0.58cC | 0.00±0.00aA |
| Controls | Tetracycline | 23.67±0.33 | 7.67±0.88 | 25.00±0.58 | 19.67±0.00 |
| | Methanol | 0.00±0.00 | 0.00±0.00 | 0.00±0.00 | 0.00±0.00 |

NB: Mean values in a column indicated by similar small letters and similar capital letters represent there is no significant difference between the test concentration of each plant species and between plant species for each tested bacterial strain ($p > 0.05$) respectively. Mean values in a column indicated by a similar capital letter and different capital letter represent there is a significant difference between the test concentration of each plant and between plant species each against tested each bacterial strain ($p < 0.05$) respectively.

# 5. DISCUSSION

## 5.1. Ethnobotanical study of medicinal Plants

### 5.1.1. Informant background information

This ethnobotanical study showed differences in indigenous knowledge of medicinal plants among various age groups. The investigation revealed that older individuals (aged over 45 years) mention more medicinal plants than those younger ages (21-30 years). The decline of indigenous knowledge among the younger generation can be attributed to several factors, including modernization, urbanization, and the start of modern education. Similarly, in Maale and Ari ethnic communities (Berhane Kidane *et al*., 2014,) reported that older members of the community (>40 years) knew more medicinal plants than youngers.

More male informants than female informants have participated in this study and about 72.57 percent and 27.43 percent of medicinal plants were mentioned by male and female informants respectively. This finding showed that male informants are more knowledgeable about the use of medicinal plants than female informants, which may be related to the community's custom of information flowing in a male line. This could be due to the close and tight attachment of indigenous knowledge with orthodox churches and related religious books, to which local priests may have access. Similarly, in Wolaita Zone, (Takele Bassa, 2017) reported that about 90 percent of medicinal plants were mentioned by males and 10 percent of medicinal plants were mentioned by females.

Illiterate informants in the study area had more knowledge about medicinal plants and mentioned more medicinal plants than literate ones. This might be due to the impact of modern education that decreases the interest of literate people to know this knowledge. This study is lined with a previous study conducted in Sheka Zone of Southern Nations,(Zewdie Kassa *et al*., 2020) reported that more medicinal plants were reported by illiterate informants.

### 5.1.2. Medicinal plants used to treat human and livestock ailments.

The inhabitants of Telemt district had a rich tradition of utilizing a diverse array of medicinal plant species within their herbal medicine system to address both human and livestock ailments. Among the recorded 113 medicinal plants, 77 species were specifically used for human ailments,

while 16 were for livestock ailments. Additionally, 20 species are used for both human and livestock ailments. The predominance of plants used for human health reflects a likely greater focus and concern for human health issues compared to livestock health problems. This study aligns with the findings of Ermias Lulekal *et al*. (2008), Fisseha Mesfin *et al*. (2009), and Ashenafi Osman *et al*. (2020), who have reported a higher number of species employed for the treatment of human ailments than for livestock.

In terms of diversity, the Fabaceae family ranked highest, with 8 species (7.08%), followed by Asteraceae, Lamiaceae, and Solanaceae, each contributing 6 species. This trend can be attributed to the broader distribution and abundance of these families in the local flora. This family was also reported to have the largest percentage of ethnomedicinal species in previous studies, in the Ganta Afeshum district (Leul Kidane *et al.,* 2018), in Yilmana densa and Quarit districts (Derebe Alemneh, 2021), in Metema District (Getinet Masresha *et al*., 2021).

### 5.1.3. Habit of medicinal plants

In the research area, shrubs were found to be the most commonly used medicinal plants, accounting for 40.71% of the identified species. This prevalence can be attributed to their greater abundance compared to trees and climbers, as well as their ability to be harvested year-round, unlike herbs that may have seasonal availability. This finding is consistent with other studies in Ethiopia, which have highlighted a higher usage of shrubs in traditional medicine (Awal Hussien *et al*., 2023; Ermias Lulekal *et al*., 2008). In contrast to this finding (Abraha Teklay *et al*., 2013) reported that the most used plants were herbs followed by shrubs.

### 5.1.4. Sources of medicinal plants

The major source of medicinal plant species at the Telemt district was the wild habitats, with approximately 60.18% of all reported medicinal plants derived from these areas. This finding indicates the minimum contribution of home gardens to the overall supply of medicinal plants. These results align with other studies conducted in Ethiopia, which have found that traditional medicinal plants are predominantly collected from wild habitats rather than home gardens (Yimer Assen *et al*., 2021; Asmera Amde *et al*., 2020; Muhidin Tahir *et al*., 2021). This reliance

on wild sources indicates the need for conservation efforts to protect these valuable ecosystems and ensure the sustainability of medicinal plant resources.

### 5.1.5. Parts of medicinal plants used

The result of this study showed that leaves were found to be the most widely and frequently used part of medicinal plants for remedy preparation (43.93%) followed by roots (24.61% and seeds (8.9 %). This preference can be attributed to the ease of finding and collecting leaves compared to other plant parts. Additionally, harvesting leaves does not negatively impact the survival of medicinal plants, in contrast to the harvesting of roots and whole plants, which can threaten their sustainability. This finding is consistent with other ethnomedicinal studies conducted in Ethiopia, which also identified leaves as the most frequently utilized part of plants (Abraham Teklay *et al*., 2013; Fisseha Mesfin *et al*., 2014).

In contrast to this study, (Fisseha Mesfin *et al*., (2009) in Wonago Woreda,(Ermias Lulekal *et al*.,2013), in Ankober District, Tilahun Tolossa and Moa Megersa (2018) in Berbere District reported that roots were the most frequently used plant parts. This may be because roots remain in the soil and are available even during the long dry seasons.

### 5.1.6. Condition of preparation

The preparation of herbal remedies in the study area predominantly relies on fresh plant material, accounting for 61.27% of all reported preparations. This preference might be due to the widely spread of traditional belief that fresh remedies possess higher efficacy, attributed to the presence of volatile active ingredients in the form of secondary metabolites that are more abundant in fresh plant parts. These compounds may diminish or evaporate during the drying process, potentially reducing the effectiveness of the remedies. The results of similar studies (Getnet Chekole *et al*., 2015 in Libo Kemkem District; Getnet Chekole, 2017 in Gubalafto District; Tadesse Birhanu *et al*., 2015 in Horro Gudurru Districts) support this finding, reporting a consistent preference for fresh materials over dried ones for various health conditions. This emphasis on using fresh plant material highlights the community's deep-rooted knowledge of the medicinal properties of plants and indicates the importance of maintaining access to these resources for effective traditional healing practices.

### 5.1.7. Method of preparation, Ingredients, and solvents required in traditional medicines

The major method of preparing herbal remedies in the study area was crushing accounting for (35.6%), followed by grinding accounting for (20.42%) of preparations. These techniques are favored due to their effectiveness in extracting the active compounds from the plants, which enhances their curative potential and provides an immediate response to health issues. This finding aligns with previous studies that reported crushing as the predominant method of preparation (Fitsumbirhan Tewelde *et al*., 2017 in LaelayAdi Yabo District; Tilahun Tolossa and Moa Megersa, 2018 in Berbere District, Gemedi Abdela *et al*., 2022 in Nensebo District). In contrast to this in the report of (Kalayu Mesfin *et al*., 2013) in Gemad District, the predominant method of preparation was grinding followed by crushing.

The most commonly used solvents were water, tela, oil, tea, milk, and coffee, and ingredients were enjera, honey, and butter in the preparation of traditional medicines. These components play essential roles in enhancing the efficacy and palatability of the remedies. Notably, many of these ingredients honey, butter, and solvents have been documented in other regions of the country, further supporting their widespread use (Leul Kidane *et al*., 2018; Muhidin Tahir *et al*., 2021; Mohammed Yimam *et al*., 2022).

### 5.1.8. Routes of administration and ways of applications of herbal medicine

The routes of administration for herbal remedies in the study area were determined by the affected body part and the specific ailment reported by individual patients. Oral administration was the most widely utilized route, accounting for 57.07% of the total preparations (109 preparations), followed by dermal 26.18% (50 preparations). These routes are favored because they facilitate rapid physiological reactions of the administered medicines with the pathogens and enhance their curative power (Getu Alemayehu., *et al* 2015). This observation is consistent with the findings of various ethnomedicinal studies, that reported oral administration as the predominant route, followed by dermal application ( Moa Megersa and Nigussie Tamrat, 2022; Banchiamlak Nigussie and Young, 2019; Tamru Temam and Asalfew Dillo, 2016; Mohammed Yimam *et al*., 2022; Gidey Yirga and Samuel Zeraburk, 2011).

Several methods of application were identified for the prepared traditional medicines, among which drinking was the most common, accounting for 40.43% of preparation. The prevalence of

this application method indicates the community's preference for liquid forms of herbal remedies, which may enhance absorption and efficacy. This finding aligns with the research results reported by Asmera Amde *et al*. (2020) in debark and Mekonen Wolditsadik (2018) in Dugda District, who have found drinking as the predominant method of remedy administration.

### 5.1.9. Dosage and antidotes of herbal remedies

In the Telemt district, traditional medicine practitioners employ various methods to measure the dosages of herbal remedies. However, almost all herbal medicine practitioners administer remedies based on estimation for their patient treatments. They use coffee cups, spoons, the palm of a hand, glassware, and teacups, and even counting plant parts, dropping and using finger sizes. Those measuring materials are reported by other ethnobotanical studies conducted in Ethiopia (Moa Megersa *et al*., 2023; Amare Bitew *et al*., 2022). In terms of antidotes, the most commonly used antidotes in the study area were cooked hen liver, aguat, yogurt, and milk. These antidotes are also documented in other studies across Ethiopia, highlighting their significance in traditional healing practices (Zewdie Kassa *et al*., 2020; Derbe Alemneh, 2021). This reliance on specific measurement methods and antidotes reflects the traditional knowledge and practices that have been passed down through generations within the community.

### 5.1.10. Diseases and their diagnosing methods

The findings of this study highlight the significant role that traditional medicine plays in the healthcare practices of the local population. The high patient turnout for traditional healing services suggests that this practice is deeply rooted in the community's cultural heritage. Factors such as accessibility, perceived efficacy, cultural acceptance, and affordability likely contribute to the preference for traditional healers over modern medical facilities.

Traditional healers employ a variety of diagnostic techniques, including visual observation, tactile examination, and patient interviews. This holistic approach enables them to gather comprehensive information about the patient's condition. By assessing visible signs such as changes in tongue, throat, eye, or skin color, as well as variations in body temperature traditional healers can make informed decisions regarding the appropriate herbal treatment. Those

diagnosis methods were reported in previous studies in Ethiopia (Ermias Lulekal *et al*., 2013; Derbe Alemneh, 2021).

### 5.1.11. Marketability of medicinal plants

The market assessments conducted in Dejach Meda town reveal the multifaceted roles of medicinal plants in the local economy, indicating their value beyond traditional medicinal uses. The identification of various plants traded as spices, oil seeds, and food items showed the significant cultural and economic importance of these species in the community. For instance, spices like *Allium sativum* (garlic) and *Coriandrum sativum* (coriander) are not only integral to local culinary practices but also contribute to health, as many spices are known for their medicinal properties.

The presence of oil seed plants such as *Carthamus tinctorius* (safflower) and *Ricinus communis* (castor bean) indicates a market demand for products that extend beyond food, showcasing the versatility of these plants in various industries, including cosmetics and pharmaceuticals. The inclusion of food items like *Hordeum vulgare* (barley) and *Carica papaya* (papaya) illustrates the essential role that these plants play in local diets, which is crucial for nutrition and food security.

Moreover, the use of plants like Phytolacca dodecandra for cleaning and other species for fumigation reflects the community's innovative approaches to utilizing natural resources for everyday needs. This diversity in usage not only enhances the marketability of medicinal plants but also promotes sustainable practices by reducing reliance on synthetic products. This finding is consistent with previous studies conducted in Ethiopia, which have documented the marketability of these plants (Getu Alemayehu, 2015; Getnet Chekole *et al*., 2021; Temesgen Tadesse and Alemtshay Teka, 2023).

### 5.1.12. Threats to medicinal plants

According to the informants, agricultural expansion was the major threatening factor to medicinal plants, accounting for 44% of the respondents. This finding aligns with previous research conducted in various parts of the country, which has shown that the need for agricultural land and other purposes severely threatened plant species, particularly medicinal plants (Gemedi

Abdela and Mustefa Sultan, 2018; Melesse Maryo *et al*., 2015; Moa Megersa *et al*., 2013; Fisseha Mesfin *et al*., 2009). The ongoing need for agricultural land poses significant risks to the sustainability of these vital resources. Therefore, it is crucial to enhance conservation awareness within the community to protect medicinal plants and ensure their availability for future generations. Promoting sustainable practices and educating the public about the ecological and cultural importance of medicinal plants can help mitigate these threats. In contrast to this Artuma Fursi district (Mohammed Yimam *et al*., 2022) reported charcoal production as the major threatening factor to medicinal plants.

### 5.1.13. Conservation method of medicinal plants

The study reveals a growing awareness among local communities regarding the conservation of medicinal plants, with 36.36% of respondents actively engaged in various conservation efforts but, the majority (63.64%) who do not participate in conservation efforts highlight the need for increased education on the benefits of preserving these vital resources. The major conservation activities reported by informants were cultivating plants in home gardens, agricultural fields, and places of worship, isolating grazing areas, reforestation, environmental protection, and constructing check dams. Reflecting a holistic approach to plant use that addresses multiple needs such as food, fodder, and shade. Similarly, most of the conservation efforts were reported by Ashenafi Osman *et al* (2020), in Raya Kobo District.

The cultural prohibition against harvesting plants from churches, which allows for a wider variety of species to thrive, further enriches local ethnobotanical knowledge. Similarly, Previous studies conducted by Getu Alemayehu *et al*. (2015) and Netsanet Gonfa *et al*. (2020) reported that places of worship are crucial for conserving remnant vegetation, particularly medicinal plants. These efforts reflect a growing recognition of the importance of preserving biodiversity within local ecosystems and the cultural practices that support it.

### 5.1.14. Informant consensus factor of medicinal plants

The Informant Consensus Factor (ICF) analysis provides valuable insights into the traditional medicinal practices of the local community, highlighting the most prevalent health problems and their associated medicinal plants. The highest ICF value of 0.65 for dermatological conditions,

which includes wounds, dandruff, and tinea versicolor, indicates a strong consensus among informants regarding the effectiveness of specific plants in treating these ailments.

The gastrointestinal disease category, with an ICF value of 0.63, emphasizes the commonality of digestive issues such as stomachaches, abdominal cramps, and gastritis. This indicates the high level of agreement among informants regarding the effectiveness of specific plants in treating these ailments.

For livestock, the third category, which includes leech, black leg, and coccidiosis, has an ICF value of 0.61. This indicates a notable consensus on the use of specific plants for treating these significant health challenges in animals. The community's recognition of these livestock ailments highlights the intertwined nature of human and animal health, as effective management of livestock diseases is essential for the overall well-being and economic stability of the community. Similarly Zewdie Kassa *et al*., 2020) in the sheka zone reported the highest ICF value of 0.96 for dermatological conditions.

In contrast to this study, Ermias Lulekal, *et al*., (2013) in Ankober District reported the highest ICF value of 0.70 for Gastrointestinal and parasitic.

### 5.1.15. The fidelity level value of most cited medicinal plants

The Fidelity Level (FL) analysis in the Telemt District highlights the effectiveness of commonly used medicinal plants, revealing that *Brucea antidysenterica* has the highest fidelity level value of 94%, primarily for treating dermatological conditions. Following closely are *Verbascum sinaiticum* value of 88% and *Withania somnifera* at 83%, both recognized for their roles in managing gastrointestinal and parasitic diseases. *Nicotiana tabacum,* with a fidelity level value of 73 % for treating leech infestations.

In contrast to this study Yimer Assen *et al*., (2021) in Kelala District reported that *Impatiens rothii* has the highest fidelity level value of 92.5%, for dermatological conditions and *Otostegia tomentosa* has the highest fidelity level value of 80 %, for Gastrointestinal and parasitic infections.

Similarly, Feyisa, Megersa *et al*., (2021). Adea Berga in District reported *Nicotiana tabacum* has the highest fidelity level value of % 100 for Leech infestation

### 5.1.16. Direct matrix ranking of multipurpose medicinal plants

The direct matrix ranking exercise highlights the significance of several multipurpose medicinal plants, particularly *D. angustifolia, E. racemosa, and S. guineense,* which are highly preferred by the local community. These plants serve multiple functions, including medicinal uses, construction materials, firewood, and charcoal, reflecting their integral role in the daily lives of the residents. Among those firewood was the major threat to those multipurpose medicinal plants.

However, the high demand for these versatile species raises concerns about their sustainability. The overharvesting of *Dodonaea angustifolia, Euclea racemosa,* and *Syzygium guineense* for construction and fuel, alongside their medicinal applications, poses a significant threat to their populations in the district. This increased exploitation could lead to a decline in their availability, jeopardizing both ecological balance and the traditional practices that depend on these plants. Previous studies in Ethiopia have also utilized direct matrix analysis to identify the most used and threatened plant species, reinforcing the importance of sustainable practices to ensure the continued availability of these essential medicinal plants (Ermias Lulekal *et al*., 2008; Abraha Teklay *et al*., 2013).

### 5.1.17. Preference ranking of medicinal plants

The preference ranking results showed that *Zehneria scabra* was the most preferred species for treating febrile illnesses, followed by *Echinops kebericho, Ocimum lamiifolium,* and *Eucalyptus globulus.* Whereas *Nicotiana tabacum* was the most preferred species for treating livestock leeches. This finding is consistent with previous ethnobotanical research conducted in central Ethiopia, which reported the medicinal uses of *Zehneria scabra* and *Eucalyptus globulus* for treating febrile illnesses (Ashenafi Osman *et al*., 2020). Additionally, Nigussie Amsalu (2018) documented the use of *Nicotiana tabacum* for treating leeches.

### 5.1.18. Ways of Indigenous Knowledge Transfer on medicinal plants

In the present study, the primary sources of indigenous medicinal knowledge were predominantly family members and grandparents. This aligns with findings from other studies (Guluma Kitata *et al*., 2017) that have indicated the importance of familial relationships in

knowledge transmission. Typically, this knowledge is passed down to the eldest son or trusted family members, emphasizing the role of the immediate family in maintaining traditional practices. The oldest son and reliable family members have often been the recipients of this knowledge transfer. It was passed down orally from generation to generation and maintained a secret because it was communicated only among family members. Similar findings have been found in other studies carried out in other parts of Ethiopia (Moa Megersa, 2010; Getnet Chekole, 2017; Mathewos Agize *et al*., 2022; Tensay Ayalw, and Edeget Merawi, 2021).

## 5.2. Antibacterial Activities of some selected Medicinal Plants

Significant differences were observed between the three plant extracts and the test concentrations against four bacterial pathogens: *Escherichia coli, Klebsiella pneumoniae, Staphylococcus aureus*, and *Staphylococcus epidermidis*.

The leaf extract of *Brucea antidysenterica* possesses significant antibacterial properties, particularly against *K. pneumoniae*, with the highest zone of inhibition recorded at (21 mm± 0.471) when tested at a concentration of 100 mg/ml. This suggests that the phytochemicals present in *B. antidysenterica* are particularly effective in disrupting the cellular integrity or metabolic functions of *K. pneumonia* (Table 10).In contrast, *S. epidermidis* showed the least susceptibility to the extract, with a minimum zone of inhibition of (8 mm± 0.558) when tested at a concentration of 25 mg/ml. This finding indicates that *S. epidermidis* may possess inherent resistance mechanisms or that the specific compounds in *B. antidysenterica* are less effective against *S. epidermidis*.

In contrast to this finding, Hideru Adugna *et al*. (2024) reported that the methanol leaf extract of *Brucea antidysenterica* inhibited the growth of *Klebsiella pneumonia* with a lower zone of inhibition of 7.5 ± 0.2 mm. This variation might be due to the difference in environment, bioactive compounds present, the solvent used, and the extraction method applied.

The root extract of *Verbasicum sinaiticum* showed the zones of inhibition ranged from 0.00 mm to 20 mm. The results demonstrate that *V. sinaiticum* exhibits significant antibacterial properties, particularly against *E. coli*, where the maximum zone of inhibition measured (20mm ±0.385) when tested at a concentration of 100 mg/ml. This suggests that the extract contains bioactive compounds that effectively target the growth or survival mechanisms of *E. coli*, making it a

potential candidate for further exploration in the development of natural antibacterial agents. Conversely, the extract showed minimal activity against *Staphylococcus aureus* with a zone of inhibition of 0.00mm, when tested at three concentrations.

In contrast to this finding, Solomon Yeabyo *et al*. (2018) reported that the root extracts of *Verbascum sinaiticum* displayed no antibacterial activity against *E. coli*. This variation may be attributed to differences in environmental conditions, bioactive compounds present, the solvent used, and the extraction method applied.

The leaf extract of *Withania somnifera* possesses varying levels of antibacterial efficacy, with the maximum zone of inhibition against *E. coli* (16.33 ± 0 mm), and the minimum against *S.aureus* (0.00 mm) when tested at three concentrations. Notably, *W. somnifera* showed no inhibitory effect against *S. aureus*. The pronounced activity against *E. coli* suggests that the phytochemicals present in *W. somnifera* may effectively target mechanisms involved in the growth or survival of this Gram-negative bacterium. The ability to inhibit *E. coli* is particularly important, given its association with various gastrointestinal infections and the increasing incidence of antibiotic resistance.

In contrast, the complete lack of activity against *S. aureus* indicates that *W. somnifera* may not possess the necessary compounds or concentration levels to combat these Gram-positive bacteria effectively. This disparity may be due to the structural differences in the cell walls of Gram-positive bacteria, which can make them more resistant to certain phytochemicals. Similarly; Gebremedhin Romha (2018) reported that the methanol leaf extract of *Withania somnifera* inhibited the growth of *E. coli* with a high zone of inhibition.

# 6. CONCLUSION

In the present study, a total of 113 medicinal plant species belonging to 57 genera and 59 families were recorded, demonstrating the rich plant resources and the reliance of the community on these for their primary healthcare. Of these, 77 species (68.14%) were used to treat human ailments, 16 species (14.16%) for livestock ailments, and 20 species (17.69%) for both human and livestock ailments.

The majority of the medicinal plant species were collected from the wild (60.18%), indicating the reliance of the local community on natural plant resources for their healthcare needs. Shrubs were the main source of traditional remedies, followed by herbs and tree species. Fresh plant material was the most commonly used (64.4%) followed by dried plant material (29.31%). Leaves were the most frequently utilized plant part (42.93%) followed by roots (24.61 %) for the preparation of human and livestock remedies. The major method of preparation was crushing followed by grinding, with ingredients like honey, butter, and solvents like water, oil, tea, milk, and coffee frequently utilized. Oral administration (57.07%) was the predominant route of herbal remedy administration, followed by dermal (26.18%). Drinking (40.43%) was the major mode of application.

The study identified 46 human ailments, 10 ailments affecting both humans and livestock, and 9 livestock ailments treated using the traditional medicinal plants in the study area. Visual observation, hand-touching, and interviews were the major methods for diagnosing human ailments gathering information from livestock owners about symptoms present in livestock and direct observation were the major methods for diagnosing livestock ailments. Finger lengths for bark, roots, and stems, pinches for powdered materials, and various measuring tools like spoons, coffee cups, tea cups, and glass cups were found to be the most common dosage estimating methods in the study area. Cooked hen liver, milk, aguat, and yogurt were the most commonly used antidotes when taking plant remedies with side effects.

Market assessments revealed that many medicinal plants are traded not only for health benefits but also for other uses, including spices and food items. Agricultural expansion was a major threat to medicinal plants in the study area. Some local communities are engaging in conservation efforts, mostly focusing on environmental protection activities. Differences in

medicinal plant knowledge were observed among genders, age groups, and informant types, educational backgrounds.

Among 12 disease categories, the dermatological/skin category accounts for the highest ICF value of 0.65. *Brucea antidysenterica* showed the highest fidelity level value (94%) was reported for use against dermatological/skin disease categories. The results of direct matrix ranking showed that *D. angustifolia*, *Euclea racemosa*, and *S. guineense* were the most threatened species due to their multiple uses. Preference ranking revealed that *Zehneria sc*abra was favored for treating febrile illnesses, while *Nicotiana tabacum* was preferred for livestock leeches. Family members and grandparents were the major sources of indigenous knowledge about medicinal plants. Among three selected medicinal plants the highest antibacterial activity was recorded from leaf extract of *B. antidysenterica* against *K. pneumoniae* (21 ± 0.471 mm).

# 7. RECOMMENDATION

- Local people need to be educated on the methods of cultivating medicinal plants in their home gardens around home as fences and in the margin of farmlands.
- Increasing public understanding on the importance of maintaining wild plant populations in their natural environment.
- To popularize indigenous knowledge, to improve the use of traditional medicine and the value of medicinal plants, the government should recognize and encourage local herbal medicine practitioners through licensing, certification, and other incentives.
- Training for the local peoples to prioritize medicinal plants and multipurpose tree species.
- Establish medicinal plant gardens or conservation areas within the community to cultivate and propagate the most valuable and threatened species.
- Organize awareness-raising campaigns and educational programs to engage the local community, especially the youth, in the importance of preserving medicinal plant resources and traditional knowledge.
- Provide training and support to traditional healers and local practitioners to enhance their skills in sustainable harvesting, preparation, and administration of medicinal plants.

# 8. REFERENCES


Abebe Demisse (2001). Biodiversity conservation of medicinal plants: problems and prospects. Conservation and sustainable use of medicinal plants in Ethiopia. Proceedings of the national workshop on biodiversity conservation and sustainable use of medicinal plants in Ethiopia. Addis Ababa: IBCR,

Abiyu Enyew , Zemede Asfaw, Ensermu Kelbessa, and Nagappan, R. (2014). Ethnobotanical study of traditional medicinal plants in and around Fiche District, Central Ethiopia. *Current Research Journal of Biological Sciences*, ***6***(4), 154-167.

Abraha Teklay , Balcha Abera and Mirutse Giday. (2013). An ethnobotanical study of medicinal plants used in Kilte Awulaelo District, Tigray Region of Ethiopia. *Journal of ethnobiology and ethnomedicine*, *9*, 1-23.

Abrham Belachew and Muluken Wubetu Muluye (2020). Medicinal plants utilized for hepatic disorders in Ethiopian traditional medical practices: a review. *Clinical Phytoscience*, *6*, 1-11.

Akil Usmane, Tadesse Birhanu, Mohammed Redwan, Edao Sado, and Dereje Abera. (2016). Survey of ethno-veterinary medicinal plants at selected districts of Harari Regional State, Eastern Ethiopia. *Ethiopian Veterinary Journal*, ***20***(1), 1-22.

Alexiades, M. N. (1996). Collecting ethnobotanical data: an introduction to basic concepts and techniques. *Advances in economic botany*, *10*, 53-94.

Amare Bitew , Ali Seid , and Abeba Kassa Tefera (2022). Ethnobotanical study of traditional medicinal plants used to treat human and animal diseases in Sedie Muja District, South Gondar, Ethiopia. Evidence- Based Complementary and Alternative Medicine, 2022(1), 7328613.

Aryal, P. S. (2009). *Ethnobotany of Tharu: Incorporation of culture and biodiversity conservation (A case study of Jayanagar VDC of Kapilvastu District)* (Doctoral dissertation, Thesis]. Tribhuvan University, Kathmandu, Nepal).

Asfaw Debela, Dawit Abebe, and Kelbessa Urga. (1999). An over view of traditional medicine in Ethiopia: perspective and developmental efforts. *Ethiopian Pharmaceutical Association*, *72*, 45-52.

Ashenafi Osman, Desta Berhe , Mirutse Giday (2020). Medicinal plants used to manage human and livestock ailments in Raya Kobo District of Amhara Regional State, Ethiopia. *Evidence‐Based Complementary and Alternative Medicine*, *2020*(1), 1329170.

Asmera Amde, Getinet Masresha , Hamer Hansha, Obsa Asafa. (2020). Ethnobotanical study of traditional medicinal plants in Debark District, North Gondar, Ethiopia. *Int. J. **Sc**i. Res. in Multidisciplinary Studies*, *6*(11).

Awal Hussien, Habte Telila,and Sufian Abdo. (2023). Ethnobotanical study of medicinal plants used to treat livestock ailments in Dallo Manna District, Oromia State, Ethiopia. *Asian Journal of Ethnobiology*, *6*(2).

Balcha Abera. (2014). Medicinal plants used in traditional medicine by Oromo people, Ghimbi District, Southwest Ethiopia. *Journal of ethnobiology and ethnomedicine*, *10*, 1-15.

Balick, M. J., and Cox, P. A. (2020). *Plants, people, and culture: the science of ethnobotany*. Garland Science.

Banchiamlak Nigussie and Young. D. (2019). Ethnobotanical study of medicinal plants in the Hawassa Zuria District, Sidama zone, Southern Ethiopia. *Journal of ethnobiology and ethnomedicine*, *15*, 1-21.

Berhan Mengiste , Yohannes Hagos, Fetene Moges, HabtamuTassew, G/hiwotTadesse, and Awet Teklu (2014). Invitro antibacterial screening of extracts from selected Ethiopian medicinal plants. *Momona Ethiopian Journal of Science*, ***6***(1), 102-110.

Berhane Kidane ,van Andel, T., van der Maesen, L. J. G., and Zemede Asfaw. (2014). Use and management of traditional medicinal plants by Maale and Ari ethnic communities in southern Ethiopia. *Journal of ethnobiology and ethnomedicine*, *10*, 1-15.

Bhatti, M. Z., Ismail, H., and Kayani, W. K. (2022). Plant secondary metabolites: therapeutic potential and pharmacological properties. In *Secondary Metabolites-Trends and Reviews*. IntechOpen.

Bussmann, R. W., Malca-García, G., Glenn, A., Sharon, D., Chait, G., Díaz, D., Pourmand, K., Jonat, B., Somogy, S., and Guardado, G. (2010). Minimum inhibitory concentrations of

medicinal plants used in Northern Peru as antibacterial remedies. *Journal of ethnopharmacology*, ***132***(1), 101-108.

Cheesbrough, M. (1984). *Medical Laboratory Manual for Tropical Countries, Vol. 2: Microbiology*. Tropical Health Technology.

Cheruiyot, N. K., Lee, W.-J., Mwangi, J. K., Wang, L.-C., Lin, N.-H., Lin, Y.-C., Cao, J., Zhang, R., and Chang-Chien, G.-P. (2015). An overview: Polycyclic aromatic hydrocarbon emissions from the stationary and mobile sources and in the ambient air. *Aerosol and Air Quality Research*, ***15***(7), 2730-2762.

Cotton, C. M. (1996). *Ethnobotany: principles and applications*. John Wiley and Sons.

Cunha, B. A. (2001). Antibiotic side effects. *Medical Clinics of North America*, ***85***(1), 149-185.

Cunningham, A. (1993). African medicinal plants. *United Nations Educational, Scientific and Cultural Organization: Paris, France*.

Cunningham, A. B. (1996). People, park, and plant use: recommendations for multiple-use zones and development alternatives around Bwindi Impenetrable National Park, Uganda. *People, park, and plant use: Recommendations for multiple-use zones and development alternatives around Bwindi Impenetrable National Park, Uganda.* (4).

Cunningham, A. B. (2014). *Applied ethnobotany: people, wild plant use and conservation*. Routledge.

Dawit Abebe (2001). The role of medicinal plants in health care coverage of Ethiopia: the possible benefits of integration.

Dawit Abebe, and Ahadu Ayehu . (1993). Medicinal plants and enigmatic health practices of Northern Ethiopia.

Dawit Abebe, Mehdin Zewdu, and Abebe Demissie. (2001). Biodiversity conservation of medicinal plants: Problem and prospects. Conservation and sustainable use of medicinal plants in Ethiopia Proceeding of the National Workshop on Biodiversity Conservation and Sustainable Use of Medicinal Plants in Ethiopia,

Dawit Abebe. (1986). Traditional medicine in Ethiopia: the attempts being made to promote it for effective and better utilization. *Sinet*, ***9***(Suppl.), 61-69.

Derbe Alemneh.(2021). Ethnobotanical study of plants used for human ailments in Yilmana densa and Quarit districts of west Gojjam Zone, Amhara region, Ethiopia. *BioMed Research International*, *2021*(1), 6615666.

Dereje Nigussie, Davey, G., Belete Adefris, Abebaw Fekadu, and Eyasu Makonnen.(2021). Antibacterial activity of methanol extracts of the leaves of three medicinal plants against selected bacteria isolated from wounds of lymphoedema patients. *BMC Complementary Medicine and Therapies*, *21*, 1-10.

Dery, B. B. (1999). *Indigenous knowledge of medicinal trees and setting priorities for their domestication in Shinyanga Region, Tanzania*. World Agroforestry Centre.

Desalegn Desissa, and Binggeli, P. (2000). Uses and conservation status of medicinal plants used by the Shinasha people. *EWNHS, Addis Ababa*.147.

Edwards, S. (2001). The ecology and conservation status of medicinal plants in Ethiopia: what do we know?

Endalew Amenu. (2007). Use and management of medicinal plants by indigenous people of Ejaji area (Chelya woreda) West Shoa, Ethiopia: An Ethnobotanical Approach A Thesis submitted to the school of graduate studies, Addis Ababa, Ethiopia, 104 p. June 2007.

Ensermu Kelbessa, Sebsebe Demissew, Zerihun Woldu, and Sue Edwards. (1992). Some threatened endemic plants of Ethiopia. *The status of some plants in parts of tropical Africa*, *35*, 55.

Ermias Luleka, Ensermu Kelbessa, Tamrat Bekele and Haile Yineger. (2008). An ethnobotanical study of medicinal plants in Mana Angetu District, southeastern Ethiopia. Journal of Ethnobiology and Ethnomedicine, 4, 1–10.

Ermias Lulekal ,Zemede Asfaw , Ensermu Kelbessa and Van Damme, P. (2013). Ethnomedicinal study of plants used for human ailments in Ankober District, North Shewa Zone, Amhara region, Ethiopia. *Journal of ethnobiology and ethnomedicine*, *9*, 1-13.

Ermias Lulekal, Rondevaldova, J., Bernaskova, E., Cepkova, J., Zemede Asfaw, Ensermu Kelbessa, and Van Damme, P. (2014). Antimicrobial activity of traditional medicinal

plants from Ankober district, north Shewa Zone, Amhara region, Ethiopia. *Pharmaceutical biology*,***52***(5), 614-620.

Farnsworth, N. (1985). Plants and modern medicine: where science and folklore Meet. World Health Forum,

Fassil Kibebew and Getachew Addis. (1996). Utilization and conservation of medicinal plants in Ethiopia. Proceedings of the workshop on Development and Utilization of Herbal Remedies in Ethiopia: Addis Ababa,

Fassil Kibebew. (2001). The status and availability of oral and written knowledge on traditional health care on traditional health care in Ethiopia. Conservation and sustainable use of medicinal plants in Ethiopia, Proceedings of the National workshop.

Fekadu Fullas. (2001). *Ethiopian traditional medicine: common medicinal plants in perspective*.

Fekadu Gurmessa (2015). Forest loss and climate change in Ethiopia. *Research Journal of Agriculture and Environmental Management*, ***4***(5), 216-224.

Fekadu, Fullas. (2007). The role of indigenous medicinal plants in Ethiopian healthcare. *African Renaissance*, ***4***(1), 76-80.

Feyisa, Megersa, Addis Kassahun, and Mirutse Giday. (2021). Medicinal plants used in ethnoveterinary practices in Adea Berga District, Oromia Region of Ethiopia. *Evidence-Based Complementary and Alternative Medicine, 2021(1), 5641479*.

Fisseha Mesfin Sebsebe Demissew and Tilahun Teklehaymanot (2009). An ethnobotanical study of medicinal plants in Wonago Woreda, SNNPR, Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, *5*, 1-18.

Fisseha Mesfin, Talemos Seta, and Abreham Assefa (2014). An ethnobotanical study of medicinal plants in Amaro Woreda, Ethiopia. Ethnobotany Research and Applications, 12, 341-354.

Fitsumbirhan Tewelde, Mebrahtom Mesfin, and Semere Tsewene. (2017). Ethnobotanical survey of traditional medicinal practices in LaelayAdi-Yabo District, Northern Ethiopia. *Int J Ophthalmol Visual Sci*, ***2***(4), 80-7.

FR, W. C. (2012). Performance standards for antimicrobial susceptibility testing; twenty-second informational supplements. *Clinical and Laboratory Standards Institute*, *32*, M100.

Friedman, J. H. (1989). Regularized discriminant analysis. *Journal of the American statistical association*, ***84***(405), 165-175.

Gadgil, M., Berkes, F., and Folke, C. (1993). Indigenous knowledge for biodiversity conservation. *Ambio*, 151-156.

Gari, A., Yarlagadda, R., and Wolde-Mariam, M. (2015). Knowledge, attitude, practice, and management of traditional medicine among people of Burka Jato Kebele, West Ethiopia. *Journal of Pharmacy and Bioallied Sciences*, ***7***(2), 136-144.

Gebremedhin Romha, Birhanu Admasu, Tsegaye Hiwot Gebrekidan, Hailelule Aleme, and Gebreyohans Gebru. (2018). Antibacterial activities of five medicinal plants in Ethiopia against some human and animal pathogens. *Evidence-Based Complementary and Alternative Medicine*, *2018*

Gemedi Abdela and Mustefa Sultan. (2018). Indigenous knowledge, major threats, and conservation practices of medicinal plants by the local community in Heban Arsi District, Oromia, South Eastern Ethiopia. *Adv. Life Sci. Technol*, *68*(10), 8-26.

Gemedi Abdela, Zerihun Girma and Tesfaye Awas. (2022). Ethnobotanical study of medicinal plant species in Nensebo District, south-eastern Ethiopia. *Ethnobotany Research and Applications*, *24*, 1-25.

Getachew Addis, Dawit Abebe, and Kelbessa Urga. (2001).A survey of traditional medicinal plants in Shirka District, Arsi Zone, Ethiopia.

Getinet Masresha Yirgalem Melkamu and Getnet Chekole. (2021). Ethnobotanical Study of Traditional Medicinal Trees and Shrubs Used to Treat Human and Livestock Aliments in Metema District, Amhara Regional State, Ethiopia. *Ethiopian Journal of Natural and Computational Sciences*, ***1***(2), 122-147.

Getnet Chekole Zemede Asfaw and Ensermu Kelbessa. (2015). Ethnobotanical study of medicinal plants in the environs of Tara-gedam and Amba remnant forests of Libo Kemkem District, northwest Ethiopia. *Journal of ethnobiology and ethnomedicine*, *11*, 1-38.

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

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

Gidey Yirga and Samuel Zeraburk. (2011). Ethnobotanical study of traditional medicinal plants in Gindeberet District, western Ethiopia. *Mediterr J Soc Sci*, ***2***(4), 49-54.

Gidey Yirga, Mekonen Teferi, and Mezgebe Kasaye (2011). Survey of medicinal plants used to treat human ailments in Hawzen district, Northern Ethiopia. *International Journal of Biodiversity and Conservation*, ***3***(13), 709-714.

Gidey Yirga. (2010). Assessment of indigenous knowledge of medicinal plants in Central Zone of Tigray, Northern Ethiopia. *African Journal of Plant Science*, ***4***(1), 006-011.

Gidey Yirga. (2010). Ethnobotanical study of medicinal plants in and around Alamata, Southern Tigray, Northern Ethiopia. *Curr Res J Biol Sci*, ***2***(5), 338-344.

Guluma Kitata, Debela Abdeta and Morka Amante (2017). Ethnoknowledge of plants used in veterinary practices in Midakegn district, west showa of Oromia region, Ethiopia. *Population (Tadeg et al., 2005; Giday et al., 2009)*, *26*, 7.

Haile Yineger , Delenasaw Yewhalaw, and Demel Teketay. (2008). Ethnomedicinal plant knowledge and practice of the Oromo ethnic group in southwestern Ethiopia. *Journal of ethnobiology and ethnomedicine*, ***4***(1), 1-10.

Haile Yineger .(2005). A study of ethno botany of medicinal plants and floristic composition of the dry Afromontane forest at Bale Mountains National Park. *Ethiopia, A thesis of Master of Science in Biology (Botanical Sciences), Addis Ababa*.

Haile Yineger and Delenasaw Yewhalaw. (2007). Traditional medicinal plant knowledge and use by local healers in Sekoru District, Jimma Zone, Southwestern Ethiopia. *Journal of ethnobiology and ethnomedicine*, ***3***(1), 1-7.

Haimanot Reta.(2010). An ethnobotanical study of useful plants of the farming site in Gozamen Wereda, East Gojjam Zone of Amhara Region, Ethiopia. *Addis Ababa University, Ethiopia*.

Hamilton, A. (2003). Medicinal plants and conservation: issues and approaches. *International Plants Conservation Unit, WWF-UK, 51*.

Hamilton, A. C. (2004). Medicinal plants, conservation, and livelihoods. *Biodiversity and Conservation*, *13*, 1477-1517.

Heinrich, M., Ankli, A., Frei, B., Weimann, C., and Sticher, O. (1998). Medicinal plants in Mexico: Healers' consensus and cultural importance. *Social science and medicine*, ***47***(11), 1859-1871.

Hideru Adugna, Dessie Ezez, Atnafu Guadie, and Molla Tefera. (2024). Phytochemical profiling, evaluation of heavy metal load, antioxidant and antibacterial activity of various medicinal plants. *Journal of Agriculture and Food Research*, *16*, 101190.

Himalayas and its role in the sustainability of livelihoods and socioeconomic development. *International journal of environmental research and public health*, *18*(4), 1509.

Hostettmann, K., and Marston, A. (2002). Twenty years of research into medicinal plants: results and perspectives. *Phytochemistry Reviews*, *1*, 275-285.

Houghton, P. J. (1998). Establishing identification criteria for botanicals. *Drug Information Journal*, ***32***(2), 461-469.

Hunde, D., Asfaw, Z., and Kelbessa, E. (2006). Use of traditional medicinal plants by people of 'Boosat'sub district, Central Eastern Ethiopia. *Ethiopian Journal of Health Sciences*, ***16***(2).

Hunter, D. (2001). Life in the fast lane: High throughput chemistry for lead generation and optimization. *Journal of Cellular Biochemistry*, ***84***(S37), 22-27.

Izzo, A. A., and Ernst, E. (2009). Interactions between herbal medicines and prescribed drugs: an updated systematic review. *Drugs*, *69*, 1777-1798.

Jain, S. K. (2019). The widening panorama of ethnobotany in India. *The Journal of Indian Botanical Society*, ***98***(3and4), 98-102

Jansen, P. C. M. (1981). *Spices, condiments, and medicinal plants in Ethiopia, their taxonomy and agricultural significance*. Wageningen University and Research.

Javid, T., Adnan, M., Tariq, A., Akhtar, B., Ullah, R., and Abd El Salam, N. M. (2015). Antimicrobial activity of three medicinal plants (Artemisia indica, Medicago falcate, and Tecoma stans). *African Journal of Traditional, Complementary and Alternative Medicines*, ***12***(3), 91-96.

Kalayu Mesfin , Gebru Tekle , Teklemichael Tesfay. (2013). Ethnobotanical study of traditional medicinal plants used by indigenous people of Gemad District, Northern Ethiopia. *Journal of Medicinal Plants Studies*, ***1***(4), 32-37.

Karunamoorthi, K., Jegajeevanram, K., Vijayalakshmi, J., and Mengistie, E. (2013). Traditional medicinal plants: a source of phytotherapeutic modality in resource-constrained health care settings. *Journal of Evidence-Based Complementary and Alternative Medicine*, ***18***(1), 67-74.

Kebede Deribe, Alemayehu Amberbir, Binyam Getachew, and Yunis Mussema (2006). A historical overview of traditional medicine practices and policy in Ethiopia.

Kebu Balemie, Ensermu Kelbessa and Zemede Asfaw.(2004). Indigenous medicinal plant utilization, management and threats in Fentalle area, Eastern Shewa, Ethiopia. *Ethiopian Journal of Biological Sciences*, ***3***(1), 37-58.

Ketema Tolossa, , Etana Debela, Athanasiadou .s , Adugna Tolera, Gebeyehu Ganga, and Houdijk, J. G. (2013). Ethno-medicinal study of plants used for the treatment of human and livestock ailments by traditional healers in South Omo, Southern Ethiopia. *Journal of ethnobiology and ethnomedicine*, *9*, 1-15.

Khan, M. A., Agize, M., Shonga, A., and Tora, A. (2018). The utilization and conservation of plants of medicinal value by local traditional medicinal practitioners and the associated indigenous knowledge in Dawuro Zone of Ethiopia: Northeast Africa—an ethnobotanical approach. *Plant and Human Health, Volume 1: Ethnobotany and Physiology*, 267-321.

Khan, N., Abbasi, A. M., Dastagir, G., Nazir, A., Shah, G. M., Shah, M. M., and Shah, M. H. (2014). Ethnobotanical and antimicrobial study of some selected medicinal plants used in Khyber Pakhtunkhwa (KPK) as a potential source to cure infectious diseases. *BMC complementary and alternative medicine*, *14*, 1-10.

Kindu Geta, and Mulugeta Kibret. (2020). Antibacterial activity of Acanthus sennii extracts against Staphylococcus aureus and Escherichia coli pathogens. *Ethiopian Journal of Science and Technology*, ***13***(2), 99-113.

Kloos, H. (2023). Challenges and Prospects of Medicinal Plant Sustainability in Ethiopia. *Journal of Pharmacy and Pharmacology Research*, *7*, 233-242.

Kotrlik, J., and Higgins, C. (2001). Organizational research: Determining the appropriate sample size in survey research appropriate sample size in survey research. *Information technology, learning, and performance journal*, ***19***(1), 43.

Leul Kidane, Gebrecherkos Gebremedhin and Tadesse Beyene. (2018). Ethnobotanical study of medicinal plants in ganta afeshum district, eastern zone of Tigray, northern Ethiopia. *Journal of ethnobiology and ethnomedicine*, *14*, 1-19.

Maghrani, M., Zeggwagh, N.-A., Michel, J.-B., and Eddouks, M. (2005). The antihypertensive effect of Lepidium sativum L. in spontaneously hypertensive rats. *Journal of ethnopharmacology*, ***100***(1-2), 193-197.

Mahmood, A., Mahmood, A., and Mahmood, M. (2012). In vitro biological activities of most common medicinal plants of family Solanaceae. *World Appl Sci J*, ***17***(8), 1026-1032.

Mahmood, A., Mahmood, A., and Tabassum, A. (2011). Ethnomedicinal Survey of Plants From District Sialkot, Pakistan. *Journal of Applied Pharmacy*, *3*, 212-220.

Martin, G. (1995). Ethnobotany: a methods manual, Chapman y Hall. *Nowy Jork*.

Martin, G. J. (2010). *Ethnobotany: a methods manual*. Routledge.

Mathewos Agize, Zemede Asfaw, Sileshi Nemomissa, and Tizazu Gebre. (2022). Ethnobotany of traditional medicinal plants and associated indigenous knowledge in Dawuro Zone of Southwestern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, *18*(1), 48.

Medhin Zewdu, , Tsige Gebremariam, and Kaleab Asres (2001). Global perspectives of medicinal plants.

Mekonen Wolditsadik. (2018). Ethnobotanical investigation of traditional medicinal plants in Dugda District, Oromia Regio. *SM J Med Plant Stud*, *2*(1), 1007.

Melesse Maryo, Sileshi Nemomissa, and Tamirat Bekele. (2015). An ethnobotanical study of medicinal plants of the Kembatta ethnic group in the Enset-based agricultural landscape of Kembatta Tembaro (KT) Zone, Southern Ethiopia. *Asian J Plant Sci Res*, *5*(7), 42-61.

Migissa Kaba. (1996). Utilization of plant medicine for the treatment of health problems: the case of the Oromo of Chora District, Illubabor Zone, western Ethiopia. *Ethiopian Journal of Health Development*, ***10***(3).

Mirutse Giday, and Gobena Ameni. (2003). An ethnobotanical survey on plants of veterinary importance in two woredas of Southern Tigray, Northern Ethiopia.

Mirutse Giday, Zemede Asfaw, and Zerihun Woldu. (2010). Ethnomedicinal study of plants used by the Sheko ethnic group of Ethiopia. *Journal of Ethnopharmacology*, ***132***(1), 75-85.

Mirutse Giday, Zemede Asfaw, Elmqvist, T., and Zerihun Woldu. (2003). An ethnobotanical study of medicinal plants used by the Zay people in Ethiopia. *Journal of Ethnopharmacology*, ***85***(1), 43-52.

Mirutse Giday, Zemede Asfaw, Zerihun Woldu and Tilahun Teklehaymanot. (2009). Medicinal plant knowledge of the Bench ethnic group of Ethiopia: an ethnobotanical investigation. *Journal of Ethnobiology and Ethnomedicine*, *5*, 1-10.

Mirutse Gidaya, Zemede Asfaw, Zerihun Woldu. (2009). Medicinal plants of the Meinit ethnic group of Ethiopia: an ethnobotanical study. *Journal of Ethnopharmacology*, *124*(3), 513 521.

Moa Megersa , Tesfaye Nedi, and Shiferaw Belachew. (2023). Ethnobotanical study of medicinal plants used against human diseases in Zuway Dugda District, Ethiopia. *Evidence‐Based Complementary and Alternative Medicine*, *2023*(1), 5545294.

Moa Megersa and Nigussie Tamrat. (2022). Medicinal plants used to treat human and livestock ailments in Basona Werana district, north Shewa zone, Amhara region, Ethiopia. *Evidence-Based Complementary and Alternative Medicine*, *2022*(1), 5242033.

Moa Megersa, Zemede Asfaw, Ensermu Kelbessa, Abebe Beyene and BizunehWoldeab .(2013). An ethnobotanical study of medicinal plants in Wayu Tuka district, east Welega zone of

Oromia regional state, West Ethiopia. *Journal of ethnobiology and ethnomedicine*, *9*(1), 1-18.

Moa Megersa.(2010). Ethnobotanical study of medicinal plants in Wayu Tuka Wereda, East Wollega zone of Oromia region, Ethiopia. *Addis Ababa University*.

Mohammed Adefa and Berhanu Abraha.( 2011) .Ethnobotanical survey of traditional medicinal plants in Tehuledere district, South Wollo, Ethiopia. *Journal of Medicinal Plants Research*, ***5***(26), 6233-6242.

Mohammed Yimam , Siraj Mammo and Tamirat Bekele . (2022). Ethnobotanical study of medicinal plants used in Artuma Fursi district, Amhara Regional State, Ethiopia. *Tropical Medicine and Health*, *50*(1), 85.

Muhidin Tahir , Letebrhan Gebremichael Tadesse Beyene and, Van Damme, P. (2021). Ethnobotanical study of medicinal plants in Adwa district, central zone of Tigray regional state, northern Ethiopia. *Journal of ethnobiology and ethnomedicine*, *17*, 1-13.

Muhidin Tahir, Hiwot Asnake, Tadesse Beyene, Van Damme, P and Amin. (2023). Ethnobotanical study of medicinal plants in Asagirt District, Northeastern Ethiopia. *Tropical Medicine and Health*, ***51***(1), 1.

Muhidin Tahir, Letebrhan Gebremichael Tadesse Beyene and, Van Damme, P. (2021). Ethnobotanical study of medicinal plants in Adwa district, central zone of Tigray regional state, northern Ethiopia. *Journal of ethnobiology and ethnomedicine*, *17*, 1-13.

Netsanet Gonfa, Dereje Tulu, Kitessa Hundera and Dasalegn Raga . (2020). Ethnobotanical study of medicinal plants, its utilization, and conservation by indigenous people of Gera district, Ethiopia. *Cogent Food and Agriculture*, *6*(1), 1852716.

Nigussie Amsalu , Yilkal Bezie , Mulugeta Fentahun,Addisu Alemayehu, and Gashaw Amsalu. (2018). Use and conservation of medicinal plants by indigenous people of Gozamin Wereda, East Gojjam Zone of Amhara region, Ethiopia: an ethnobotanical approach. *Evidence-Based Complementary and Alternative Medicine*, *2018*(1), 2973513.

Nolan, J. M., and Turner, N. J. (2011). Ethnobotany: the study of people-plant relationships. *Ethnobiology*, *9*,133-

Ohigashi, H. (2008). Utilization and production of medicinal plants. *Medicinal crops in Ethiopia Current status and future potential. (Makiu ed.). JAICAF (Japan Association for International Collaboration of Agriculture and Forestry)*, 4-6.

Pandey, A. K., and Tripathi, Y. (2017). Ethnobotany and its relevance in contemporary research. *J Med Plants Stud*, ***5***(3), 123-129.

Pankhurst, R. (1966). Some factors influencing the health of traditional Ethiopia. *Journal of Ethiopian Studies*, ***4***(1), 31-70.

Payyappallimana, U. (2010a). Role of traditional medicine in primary health care: an overview of perspectives and challenges.*Yokohama journal of social sciences*, ***14***(6), 57-77.

Perez, C. (1990). Antibiotic assay by agar-well diffusion method. *Acta Biol Med Exp*, *15*, 113-115.

Perumal Samy, R., and Gopalakrishnakone, P. (2010). Therapeutic potential of plants as anti-microbials for drug discovery. *Evidence-Based Complementary and Alternative Medicine*, *7*, 283-294.

Pham, H. N. T., Nguyen, V. T., Vuong, Q. V., Bowyer, M. C., and Scarlett, C. J. (2015). Effect of extraction solvents and drying methods on the physicochemical and antioxidant properties of Helicteres hirsuta Lour. Leaves. *Technologies*, ***3***(4), 285-301.

Phillips, O. L. (1996). Some quantitative methods for analyzing ethnobotanical knowledge. *Advances in economic botany*, *10*, 171-197.

Rakotoarivelo, N. H., Rakotoarivony, F., Ramarosandratana, A. V., Jeannoda, V. H., Kuhlman, A. R., Randrianasolo, A., and Bussmann, R. W. (2015). Medicinal plants are used to treat the most frequent diseases encountered in Ambalabe rural community, in Eastern Madagascar. *Journal of Ethnobiology and Ethnomedicine*, *11*, 1-16

Raskin, I., and Ripoll, C. (2004). Can an apple a day keep the doctor away? *Current pharmaceutical design*, ***10***(27), 3419-3429.

Reta Regassa, Tesfaye Bekele and Moa Megersa. (2017). Ethnobotanical study of traditional medicinal plants used to treat human ailments by Halaba people, southern Ethiopia. *Journal of medicinal plants studies*, ***5***(4), 36-47.

Russell, A. D., and Furr, J. R. (1977). The antibacterial activity of a new chloroxylenol preparation containing ethylenediamine tetraacetic acid. *Journal of Applied Bacteriology*, ***43***(2), 253-260.

Seyoum Getaneh and Zerihun Girma. (2014). An ethnobotanical study of medicinal plants in Debre Libanos Wereda, Central Ethiopia. *Afr J Plant Sci*, ***8***(7), 366-379.

Shakya, A. K. (2016). Medicinal plants: Future source of new drugs. *International journal of herbal medicine*, ***4***(4), 59-64.

Shandesh Bhattarai, S. B., Chaudhary, R., and Taylor, R. (2008). Screening of selected ethno-medicinal plants of Manang District, Central Nepal for antibacterial activity.

Sikkema, J., de Bont, J. A., and Poolman, B. (1994). Interactions of cyclic hydrocarbons with biological membranes. *Journal of Biological Chemistry*, ***269***(11), 8022-8028.

Singh, A. (2016). An ethnobotanical study of medicinal plants in Bhiwani district of Haryana, India. *Journal of Medicinal Plants Studies*, ***4***(2), 212-215.

Solomon Yeabyo, Zenebe Teka, Gopalakrishnan, V. K., Zenebe Hagos and Krishna Chaithanya, K. (2018). Antibacterial activity of root extracts of Verbascum sinaiticum against multidrug-resistant Enterobacteriaceae family Gram-negative and two Gram-positive bacteria. *Drug Invention Today*, ***10***(8), 1.

Sydney, S., Lacy, R., and Bakhtiar, M. (1980). The betalactam antibiotics penicillin and cephalosporin are in perspective. *Hodder and Stongton, London*, 224.

Tadesse Birhanu Dereje Abera and Eyasu Ejeta. (2015). Ethnobotanical study of medicinal plants in selected Horro Gudurru Woredas, Western Ethiopia. *Journal of Biology, Agriculture and Healthcare*, ***5***(1), 83-93.

Tafesse Mesfine and Mekonnen Lemma. (2001). The role of traditional veterinary herbal medicine and its constraints in the animal health care system in Ethiopia.

Takele Bassa. (2017). Ethnobotanical study of medicinal plants in Wolaita zone, Southern Ethiopia. *Journal of Health, Medicine, and Nursing*, *48*(4).

Tamru Temam and Asalfew Dillo. (2016). Ethnobotanical study of medicinal plants of Mirab-Badwacho district, Ethiopia. *Journal of BioScience and Biotechnology*, *5*(2), 151-158.

Temesgen Tadesse and Alemtshay Teka. (2023). Ethnobotanical Study on Medicinal Plants Used by the Local Communities of Ameya District, Oromia Regional State, Ethiopia. *Evidence-Based Complementary and Alternative Medicine*, *2023*(1), 5961067.

Tensay Ayalw, and Edeget Merawi.(2021). Assessment of traditional knowledge associated with medicinal plants in North Achfer District, Amhara Region, North Ethiopia. *Journal of Diseases and Medicinal Plants*, *7*(2), 35.

Tesfaye Awas and Zemede Asfaw. (1999). Report on Ethnobotanical Study of Nations, Nationalities and People in Gambella and Benishangul Gumuz Regional States. *Progress Report to Research and Publication Office, Addis Ababa University*.

Tesfaye Hailemariam Bekalo, Sebsebe Demissew Woodmatas ,and Zemede Asfaw. (2009). An ethnobotanical study of medicinal plants used by local people in the lowlands of Konta Special Woreda, southern nations, nationalities, and peoples regional state, Ethiopia. *Journal of ethnobiology and ethnomedicine, 5*, 1-15.

Teshale Sori, Merga Bekana, Girma Adugna, and Ensermu Kelbessa. (2004). Medicinal plants in the ethnoveterinary practices of Borana Pastoralists, Southern Ethiopia.

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

Tilahun Tolossa and Moa Megersa .(2018). Ethnobotanical study of medicinal plants used to treat human diseases in Berbere District, Bale Zone of Oromia Regional State, South East Ethiopia. *Evidence-Based Complementary and Alternative Medicine*, *2018*(1), 8602945.

Tilahun,Teklehaymanot and Mirutse Giday. (2007). Ethnobotanical study of medicinal plants used by people in Zegie Peninsula, Northwestern Ethiopia. *Journal of ethnobiology and ethnomedicine*, ***3***(1), 1-11.

Tolera, G. F., Wabe, N., Angamo, M., Wega, S., Dekama, N., Abdella, S. H., Mohammed, M. A., and Ali, A. H. (2011). The attitude of modern medical practitioners towards the integration of modern and traditional medical practices in Ethiopia. *Spatula DD*, ***1***(4), 199-205.

Trotter, R. T., and Logan, M. H. (2019). Informant consensus: a new approach for identifying potentially effective medicinal plants. In *Plants and indigenous medicine and diet* (pp. 91-112). Routledge.

Turner, N. (2000). Ethnobotany: Future direction for the new millennium. *Manitoba Anthropology Student's Journal*, *16*, 15-18.

Vermani, K., and Garg, S. (2002). Herbal medicines for sexually transmitted diseases and AIDS. *Journal of Ethnopharmacology*, ***80***(1), 49-66.

Warren, D. (1991). The role of indigenous knowledge in facilitating the agricultural extension process. International workshop on agricultural knowledge systems and the role of extension. Bad Boll, Germany,

WHO. (1998). The regulatory situation of herbal medicines: a worldwide review.

WHO. (2002). *Traditional medicine: growing needs and potential*.

WHO. (2002). *Traditional medicine strategy 2002-2005. WHO Publication*. WHO/EDM/2002.1. Geneva: Switzerland.

WHO. (2010). Guidelines for registration of traditional medicines in the WHO African Region

WHO. (2013). *WHO traditional medicine strategy: 2014-2023*. World Health Organization.

WHO.(2002). The WHO strategy for traditional medicine: Review of the global situation and strategy implementation in the Eastern Mediterranean Region.

Wondwosen Teshome. (2006). Impacts of urbanization on the traditional medicine of Ethiopia. *The Anthropologist*, *8*(1), 43-52.

Wubet Birhan, , Mirutse Giday, and Tilahun Teklehaymanot . (2011). The contribution of traditional healers' clinics to public health care system in Addis Ababa, Ethiopia: a cross-sectional study. *Journal of ethnobiology and ethnomedicine*, *7*, 1-7.

Yamane. (1973). Statistics: An introductory analysis. Second ed., Harper and Row, New York, London: John Weather Hill, Inc.

Yayesh Limenih, Shemsu Umer, and Messay Wolde-Mariam. (2015). Ethnobotanical study on

Yemane Tilahun. (2018). Ethnobotanical study of traditional medicinal plants used in and around Adigrat town, eastern Tigray, Ethiopia. *Journal of Medicinal Plants Studies*, *6*(4), 11-19.

Yeneayehu Fenetahun , and Girma Eshetu. (2017). A review of ethnobotanical studies of medicinal plants used by agro-pastoral communities in, Ethiopia. *J Med Plants*, ***5***(1), 33-44.

Yihenew Simegniew, Sintayehu Leshe , Yihalem Abebe , Nakachew Minuye. (2017). Ethnobotanical study of medicinal plants used to treat human diseases in Enarj Enawga district, East Gojjam zone, Amhara region, Ethiopia. *SM J Med Plant Stud*, ***1***(1), 1-20.

Yimer Assen, Mesfin Woldearegay, and Abeba Haile. (2021). An ethnobotanical study of medicinal plants in Kelala District, South Wollo zone of Amhara region, Northeastern Ethiopia. *Evidence‐based Complementary and Alternative Medicine*, *2021*(1), 6651922.

Zemede Asfaw. (2001). The role of home gardens in the production and conservation of medicinal plants.

Zewdie Kassa, Zemede Asfaw and Sebsebe Demissew. (2020). An ethnobotanical study of medicinal plants in the sheka zone of southern nations nationalities and peoples regional state, Ethiopia. *Journal of ethnobiology and ethnomedicine*, *16*, 1-15.

# 9. APPENDICES

## 9. 1. APPENDIX - 1 : List of medicinal plants used for treating human ailments

In the study area, there are many plants used for treating human ailments recorded with their scientific name, family, local name, growth form, Source: disease treated, use, plant parts used; condition of plant part uses; methods of preparation, way of application, and route of administration.

**Key for Appendix,1 2, and 3: Growth form** (Tree, T; Shrub, Sh; Herb, H; Climber, C), **Source**: Wild/W, Home garden/Hm wild and home garden/W+Hm),(use human/hu, livestock/li, both human and livestock/ hl ), **Condition of plant part uses**; (CP); (fresh/Fr, dry/Dr and fresh or dry/FD), **Parts used** (Leaf, L; Root, R; Fruit, Fr; Root bark, RB; Stem bark, SB; Flower, Fl; Bulb, Bu; Rhizome, Rh; Seed, S; Latex, Lx; Twing; TW, Tuber; Tu; Resin, Re; Seed and fruit; S+F, Fruit and stem bark; F+SB, Leaf, and seed; L+S, Leaf, and root; L+R), **Methods of preparations**( Crushing, Grinding, Boiling, Chewing, Burnning, Cutting and bleeding, Crushing and Squeezing, Squeezing and boiling, Roasting and grinding, Splicing and squeezing, Crushing and boiling, Roasting grinding and boiling, Grinding and boiling, Cutting),**wayofapplication**(Drinking, Painting, Eating, Dropping, Fumigating, Swallowing, Washing, Shooting, Rubbing, Sniffing, Smelling) and **route of administration** (Oral, Nasal, Dermal, Oral/Nasal, Ear, Eye).

| SN | Scientific Name | Family | Local Name | Growth Form | Source | Disease Treated | Parts used | CP | Mode of Preparation | Route |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *Acacia abyssinica* | Fabaceae | Bazra Girar | T | w | Stomachache | R | Fr | The fresh root is crushed and mixed with tela and the solution is drunk one cup before food until treated. | O |
| 2 | *Agave sisalana* | Agavaceae | Beska | H | hm | Ear disease | L | Fr | The fresh leaf is crushed, squeeze the juice then enter | Er |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | a drop of juice into the ear. | |
| 3 | *Allium sativum* | Alliaceae | Nech Shinkurt | H | hm | Common cold | Bu | Fr | The fresh bulb is Boiled with honey and then drink filtered liquid. | O |
| 4 | *Aloe vera* | Aloaceae | Eret | H | W | Scorpion bite | R | Fr | The fresh Root is chewed then swallowing the juicy part. | O |
| | | | | | | Wound | Lx | Fr | Cutting the leaf to harvest the jelly latex then paint on the wound. | D |
| | | | | | | Snakebite | R | Fr | The fresh root is chewed then swallowing the juicy part. | O |
| | | | | | | Dandruff | Lx | Fr | Cutting the leaf to harvest latex is painted on the affected part. | D |
| 5 | *Ampelocissus schimperiana* | Vitaceae | Hareg Temen | C | W | Snakebite | R | FD | The fresh/dry root is Chewed then swallowing the juicy part. | O |
| | | | | | | Scorpion bite | R | FD | The fresh/dry root is chewed then swallowing the juicy part. | O |
| 6 | *Artemisia afra* | Asteraceae | Chikugn | H | W+ Hm | Evil eye | L | Fr | Cutting The fresh leaf immediately smells through | N |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | the nose. | |
| 7 | *Asparagus africanus* | Asparagaceae | Yeset Kest | Sh | W | Wound | L | Dr | The dry leaves are ground, mix the powder with the latex of Calotropis procera then paint on the wound. | D |
| 8 | *Bersama abyssinica* | Melianthaceae | Azamr | Sh | W | Ascaris | L | FD | The leaves are boiled in water and eaten decoction with porridge. | O |
| | | | | | | Blood pressure | L+R | Fr | The leaves and roots are crushed and mixed with water and then drink decoction when cool in a cup. | O |
| 9 | *Cadaba farinosa* | Capparidaceae | Dngay Seber | Sh | w | Stomachache | R | Fr | The fresh root is crushed and mixed with water and drink a juicy part. | O |
| 10 | *Calotropis procera* | Asclepiadaceae | Tobia | Sh | W | External Hemorrhoids | Lx | Fr | Cutting the leaf to harvest the latex then paint on the affected part. | D |
| | | | | | | Tonsil | R | Fr | The fresh Root is crushed mixed with | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | water then drunk. | |
| 11 | *Carica papaya* | Caricaceae | Papaya | T | Hm | Gastrist | L | Fr | The fresh leaves are boiled in water and drink the decoction when cold. | O |
| | | | | | | Malaria | F | Fr | The Fresh fruit is crushed and mixed with water to then drink the filtred part. | O |
| 12 | *Carissa edulis* | Apocynacea e | Agam | Sh | w | Wound | R | Fr | The root is crushed and mixed with water then drink the juice in a cup. | O |
| | | | | | | Eye disease | TW | Fr | The twigs are crushed mix water then wash the eye. | EY |
| | | | | | | Evil eye | R | Dr | The dried root is burnt in a fire and then fumigated the smoke. | O and N |
| 13 | *Carthamus tinctorius* | Asteraceae | Suf | H | hm | Heart disease | s | Dr | The dry seed is Roasted, ground mix the powder with water then drunk. | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | *Chenopodium murale* | Chenopodiaceae | Amedmado | H | Hm | Face fungus/Tinea faciei | L | Fr | The fresh leaves are crushed and then painted on the affected part. | D |
| 15 | *Citrus aurantiifolia* | Rutaceae | Lomi | Sh | hm | Headache | F | Fr | The fresh fruit is Squeezed the juice is boiled with black cumin seeds in coffee then drunk. | O |
| | | | | | | Cough | F | Fr | The fresh fruit is Squeezed the juice is boiled with Allium sativum in water and then drink decoction. | O |
| | | | | | | Scabies/itchy | F | Fr | The fresh fruit is squeezed and painted on the affected part | D |
| 16 | *Clematis simensis* | Ranunculaceae | Azo Hareg | C | W | External Hemmorioid | L | Fr | The fresh leaves are Crushed and then painted on the affected part of the body. | D |
| 17 | *Clerodendrum myricoides* | Lamiaceae | Msrich | Sh | w | Wart/chirt | L | Fr | The fresh leaves are crushed and painted on the affected part. | D |
| 18 | *Coffea Arabica* | Rubiaceae | Buna | Sh | Hm | Diarrhea | S | Dr | Seeds are roasted and ground then the powder is | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | mixed with butter then eaten before breakfast. | |
| | | | | | | Wound | s | Dr | Dry seed roasted, grounds mix the powder with water then paint on the wound. | D |
| 19 | *Cordia africana* | Boraginacea e | Wanza | T | W+h m | scorpion bites | L | Fr | Cut The fresh leaf immediately Rub on the bitten part of the body. | D |
| | | | | | | tinea versicolor | L | Fr | The fresh leaves are crushed and then painted on the affected part of the body. | D |
| 20 | *Coriandrm sativum* | Apiaceae | Dinblal | H | hm | Swelling | F | Dr | The dried fruit is ground mix a teaspoon of powder with honey then drink. | O |
| 21 | *Croton macrostach yus* | Euphorbiace ae | Bisana | T | W+h m | liver problem | L | Dr | The dry leaves are ground then eat a teaspoon of powder by mulching on enjera. | O |
| | | | | | | Intestinal parasite /helmit | RB | Dr | The bark of the root is ground mix a teaspoon | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | of powder with honey then drink it in a cup. | |
| | | | | | | Wart/Chirt | TW | fr | Cut The fresh twing immediately Rub on the affected part. | D |
| 22 | *Cucurbita pepo* | Cucurbit Aceae | Duba | C | hm | Tapewor m | F | Dr | Dry seed is crushed boiled with milk then drunk. | O |
| 23 | *Datura stramonium* | Solanaceae | Astenagr | H | W+h m | Dandruff | L | Fr | The leaves crushed paint on the affected part. | D |
| | | | | | | wound | S | Dr | Dry seed is roasted, ground, and mixed with butter paint on the wound. | D |
| | | | | | | Ear disease | L | Fr | The fresh leaves are crushed and the squeeze enters a drop of juice into the ear. | Er |
| | | | | | | Asma | L | dr | The dry leaves are burned in fire fumigating the smoke. | O and N |
| 24 | *Dichrostac hys cinerea* | Fabaceae | Ader | Sh | w | Tonsil | R | Fr | The fresh roots are chewed and swallow the juicy part. | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 | *Dodonaea angustiroli a* | Sapindaceae | Ktikta | Sh | W | Skin rash/chifie | L | Fr | The fresh leaves are crushed paint on the affected part. | D |
| 26 | *Dorstenia barnimiana* | Moraceae | Werk Bemeda | H | W | Oral disease | L | Dr | The dry leaves are ground mix the powder with butter then eat. | O |
| 27 | *Dovyalis abyssinica* | Flacourtiace ae | Koshm | T | w | Fruncles /boils | L | Fr | The fresh leaves are crushed and painted on the affected part. | D |
| 28 | *Eucalyptus globulus* | Myrtaceae | Nech Bahirzaf | T | hm | Febirril illness/mic h | L | fr | The leaves are boiled in water and then fumigated the steam. | Oa nd N |
| | | | | | | Common cold | TW | fr | The twings are boiled with water then fugimate the steam through mouth and nose. | Oa nd N |
| 29 | *Euclea racemosa* | Ebenaceae | Dedeho | Sh | W | toothache | R | Fr | The fresh roots are chewed then swallowing juicy part. | O |
| 30 | *Euphorbia abyssinica* | Euphorbiace ae | Kulkal | T | W | Hommorio ds | Lx | Fr | Cutting the stem to harvest the latex then paint on the affected part. | D |
| | | | | | | Leishmani asis | Lx | Fr | Cutting the stem to harvest the latex and | D |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | paint on the affected part. | |
| | | | | | | Malaria | RB | Dr | The dried root bark is ground and mixed with porridge then eaten finally a lot of aguat is drunk as the antidote. | O |
| | | | | | | Rabies | RB | Dr | The dry root bark is ground the powder is mixed with aguat then drunk, and finally eat Cooked hen liver as the antidote. | O |
| 31 | *Euphorbia tirucalli* | Euphorbiaceae | Knchb | Sh | Hm | Hemorrhoid | Lx | Fr | Cutting the stem harvest the latex and then paint on the affected part. | D |
| 32 | *Ferula communis* | Apiaceae | Dog | H | W | Bleeding after birth | R | Fr | The fresh root is ground mix the powder with water then drink in a cup of tea. | O |
| 33 | *Ficus capreaefolia* | Moraceae | Beles | Sh | w | TB | L | Fr | The leaves are crushed and then painted on the affected part. | D |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 34 | *Ficus sur* | Moraceae | Shola | T | W | constipation | L | Fr | The fruit is boiled with milk and drink the decoction. | O |
| 35 | *Foeniculum vulgare* | Apiaceae | Enslal | H | w | Eye disease | L | Fr | The fresh leaves are crushed and mixed with water then wash the eye with a solution. | EY |
| | | | | | | Dysuria | L | FD | The leaves are boiled with Thymus vulgaris leaves in water then Drink the decoction. | O |
| 36 | *Gomphocarpus fruticosus* | Asclepiadaceae | Tfrna | Sh | W | External Hemorrhoid | L | Fr | Cut the leaf to harvest the latex then paint on the affected part. | D |
| | | | | | | Leishmaniasis 1 | L | Fr | Cut the leaf to latex and paint on the affected part. | D |
| 37 | *Guizotia abyssinica* | Asteraceae | Nug | H | hm | Constipation | S | Dr | Dry Seed is roasted, ground, and boiled with water then drunk. | O |
| 38 | *Hagenia abyssinica* | Rosaceae | Kosso | T | Hm | Tapeworm | S | Dr | The dry seeds are ground, mixed with milk then drunk. | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Gastritis | S | Dr | The dry seeds are ground in a teaspoon of powder mixed with water and then drunk on an empty stomach finally drink yoghurt as an antidote. | O |
| 39 | *Hordeum vulgare* | Poaceae | Gebs | Sh | Hm | Dandruff | L | Fr | The fresh leaves are Crushed and then painted on the affected part. | D |
| 40 | *Jasminum abyssinicum* | Oleaceae | Tembelel | Sh | w | blood pressure | R | Fr | The fresh root is Crushed, with Cyphostemma adenocaule roots soaked in water, and drank a cup of tea. | O |
| | | | | | | abdominal cramp | R | Fr | The fresh roots are chewed and swallowing the juicy part. | O |
| 41 | *Juniperus procera* | Cupressaceae | Yeabesha Tsid | T | W+ Hm | Diarrhea | Re | fr | The resin is chewed swallowing the liquid part. | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 42 | *lepidium sativum* | Brassicaceae | Feto | H | HM | Acne | S | Dr | The dry seeds are ground mix the powder with water paint on the affected part. | D |
| | | | | | | Devil | S | dr | The dry seeds are ground and mixed with water to paint the body. | D |
| 43 | *lippia adoensis* | Verbenaceae | Kese | Sh | W | Febrile illness | L | Fr | The leaves are boiled with water then fumigate the steam. | Oa nd N |
| 44 | *Lobelia rhynchopet alum* | Lobeliaceae | Jibara | T | W | Evil eye | R | Dr | The dry root is burned in the fire and then fumigates the smoke. | N |
| | | | | | | Chest pain | S | fr | The fruit is Boiled with honey and drink filtered part. | O |
| 45 | *Moringa oleifera* | Moringaceae | Shiferaw | Sh | Hm | Gastrist | L | Dr | The dry leaves are ground and eat the powder with enjera. | O |
| 46 | *Mukia maderaspat ana* | Cucurbitacea e | Yamora Misa | C | W | Syphilis | L | fr | The leaves are crushed with leaves of Brucea antidysenterica and then painted on the affected part. | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 47 | *Myrtus communis* | Myrtacea E | Ades | H | hm | Dandruff | L | D R | Dry leaves are ground mixed with butter paint on the affected part. | D |
| | | | | | | Scabies(itc hes) | L | dr | Dried leaves are ground and mixed with butter and paint on the affected part. | D |
| 48 | *Nigella sativa* | Ranunculace ae | Tikur Azmud | H | hm | Stomachac he | S | dr | The dry seeds are ground with Allium Sativum and Ruta chalepensis, then mixed with lemon juice and finally drunk. | O |
| 49 | *Ocimum lamiifolium* | Lamiaceae | Damakese | Sh | Hm | Febirilillne s | L | Fr | The leaves are boiled with tea and then drink filtered part. | O |
| | | | | | | Ear moth/ear mice | L | Fr | The fresh leaves are crushed and Squeezed then enter a drop of juice into the ear with a cotton ball. | Er |
| 50 | *Osyris quadriparti ta* | Santalaceae | Keret | Sh | W | Swelling | TW | FR | The twinges are burned in the fire and then shot on the affected part by heating the twigs. | D |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 51 | *Otostegia integrifolia* | Lamiaceae | Tnjut | Sh | W | Abdominal cramp | L | FR | The fresh leaves are chewed and then swallowing the juice. | O |
| 52 | *Persea americana.* | Lauraceae | Avocado | T | HM | Diabetes | L | dr | The dry leaves are ground and mix teaspoon powder with honey then eat it on an empty stomach. | O |
| 53 | *Pterolobium stellatum* | Fabaceae | Kentafa | Sh | w | Hemorrhoid | TW | dr | The twings are ground with Aframomum corrorima and mixed with butter then paint on the affected part. | D |
| 54 | *Rhamnus prinoides* | Rhamnaceae | Gesho | Sh | Hm | Tinea versicolor | F | Dr | The dry fruits are ground and mix the powder with water then paint it on the affected part of the body. | D |
| 55 | *Ricinus communis* | Euphorbiaceae | Gulo | Sh | Hm | Ear disease | L | Fr | The leaves are crushed and squeezed with the juice then enter a drop of it to ear. | Er |
| | | | | | | Dandruff | S | Dr | The seeds are ground and then painted on the affected part of the body. | D |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 56 | *Rosa abyssinica* | Rosaceae | Kega | Sh | w | Devil | R | Dr | The dry roots of Rosa abyssinica are burned in the fire and then fumigated the smoke through the nose. | N |
| | | | | | | Cough | F | Dr | The dried fruits ground with Allium sativum boil in water then drink the filtered part. | O |
| 57 | *Ruta chalepensis* | Rutaceae | Tene Adam | H | hm | Stomachache | L | Fr | The fresh leaves are boiled with coffee and then drunk in the filtered part. | O |
| 58 | *Saccharum officinarum* | Poaceae | Shenkora | H | hm | Cough | St | Fr | The stems are crushed and boiled in the water finally drinking the filtered part. | O |
| 59 | *Schefflera abyssinica* | Araliaceae | Qustya/Getem | T | W | syphilis | RB | Fr | The bark of the root is chewed then swallowing juicy part. | O |
| 60 | *Securidaca longepedunculata* | Polygalaceae | Este Menahe | Sh | w | Ear disease | L | Fr | The fresh leaves are crushed with leaves of Dorstenia barnimiana then enter a drop of juicy parts into the ear. | Er |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 61 | *senna multigland ulosa* | Fabaceae | Bibisha | Sh | W | scorpion bites | R | Fr | The roots are chewed then the juicy part. | O |
| | | | | | | Oral disease | FL | Dr | The dry flowers are ground with one teaspoon of powder mixed with honey and then eaten. | O |
| 62 | *Sida rhombifolia* | Malvaceae | Gorjejite | H | W | Wound/life | L | Fr | The leaves are crushed and then painted on the affected part. | D |
| 63 | *Silene macrosolen* | Caryophyllaceae | Wogert | H | w | Stomachache | R | Fd | The roots are boiled with honey and then drinking filtered part. | O |
| 64 | *Solanum anguivi* | Solanaceae | Zerech Embuay | C | W | Abdominal cramp | R | Fr | The roots are chewed and then swallowing the juicy part. | O |
| 65 | *Solanum nigrum* | Solanaceae | Tkur Awitt | H | w | Wound/ Lifie’ | L | Fr | The Fresh leaves are crushed and then painted on the affected part. | D |
| 66 | *Sparmannia ricinocarpa* | Tiliaceae | Wulkfa; | Sh | W | Fire burn | L | Fr | The fresh Leaves are crushed and painted on the affected part. | D |
| 67 | *Syzygium guineense* | Myrtaceae | Dokma | T | w | Stomachache | F +SB | dr | The dry fruits and the stem bark are ground | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | mix the powder with honey then eat. | |
| 68 | *Thalictrum rhynchocarpum* | Ranunculaceae | Srebzu | H | w | Blood pressure | R | dr | The roots are ground mixed with honey and eaten for seven days. | O |
| 69 | *Thymus schimperi* | Lamiaceae | Tosgn | H | W | Pneumonia | L | Dr | Dry leaves are ground mix the powder with honey then eat. | O |
| | | | | | | Blood pressure | L | FD | The leaves are boiled with tea then drink the filtered part. | O |
| 70 | *Trigonella foenum-graecum* | Fabaceae | Abish | H | hm | Gastric problem | S | Fr | The seeds are ground and boiled with water then drink in the morning. | O |
| 71 | *urtica simensis* | Urticaceae | Sama | H | W+hm | Blood cancer | L | Fr | The fresh leaves are crushed and mixed in water then drink in a cup on an empty stomach. | O |
| 72 | *Verbascum sinaiticum* | Scrophulariaceae | Ketetina | Sh | W | Abdominal cramp | R | FD | The roots are chewed then swallowing the juicy part. | O |
| | | | | | | Gastritis | R | Fr | The roots are crushed with water and drink the filtered part. | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | kidney disease | R | Dr | The roots are ground and boiled with a teaspoon of powder with honey then drink the filtered part. | O |
| | | | | | | abdominal pain | R | Fr | The roots are crushed mixed with water then drank. | O |
| | | | | | | headache | Fl | Fr | The flower with the flower of Bidens prestinaria is crushed and squeezed then sniff the juice through the nose. | N |
| | | | | | | Ear disease/Deafness | F | Dr | The fruits are ground with a teaspoon of powder mixed with Sesamum orientale oil, then enter drop of it in the ear and wiped with cotton. | Er |
| | | | | | | heart disease | R | Fr | The roots are crushed and boiled with tea then drink the filtered liquid part when cold. | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 73 | *Verbena Officinalis* | Verbenaceae | Atuch | H | w | Tongue disease | L | Fr | The leaves are boiled with, gargle Spilanthes costata in water then washed the mouth with boiled water after cold finally spit out. | O |
| 74 | *withnia somnifera* | Solanaceae | Gzawa | Sh | w | Gastrist | L | Dr | The dry leaves are ground mix a teaspoon of powder with honey then eat. | O |
| | | | | | | Heart disease | L | Dr | The leaves are Burned with fire and then fumigate the smoke through the nose. | N |
| | | | | | | bloating | R | Dr | The dry roots are ground with cotton seed boiled in water and drunk it | O |
| 75 | *Xantium strumarium* | Asteraceae | Gidzemedie | H | W | Tinea versicolor | L | Fr | The fresh leaves are Crushed paint on the affected part. | D |
| | | | | | | Dandruff | L | Fr | The fresh leaves are crushed paint on the head. | D |
| 76 | *Zehneria scabra* | Cucurbitaceae | Haregresa | C | W+Hm | Febrile illness | L | Fr | The fresh leaves are boiled in water to | Na nd O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | fumigate the steam through the nose and mouth. | |
| 77 | *Ziziphus spina-christi* | Rhamnaceae | Gaba | Sh | W+hm | Dandruff | L | Dr | The dry leaves are ground and mixed with butter then painted on the affected part. | D |

## 9.2. APPENDIX - 2 : List of medicinal plants used for treating livestock ailments

In the study area, there are many plants used for treating livestock ailments recorded with their scientific name, family, local name, growth form, Source: disease treated, plant parts; condition of plant part uses; methods of preparation, way of application, and route of administration.

| SN | Scientific Name | Family | Local Name | Growth Form | Source | Disease Treated | Part used | CP | Mode of preparation | Route |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *Brassica carinata* | Cabombaceae | Gomen | H | Hm | Diarrhea | S | Dr | The dry Seeds are ground and mixed with water then given to cattle to drink. | O |
| 2 | *Cissus petiolata* | Vitaceae | Alke | C | W | cough | St | Fr | The stems are crushed and mixed with water then give the filtered part to the sheep to drink. | O |
| 3 | *Clausena anisata* | Rutaceae | Lmch | Sh | W | Coccidiosis | L | Fr | The fresh leaves are crushed and mixed with water then the filtered liquid is given to chicken pox to drink. | O |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | *Cyphostemmaa denocaule* | Vitaceae | Aserkus h | C | W | Rabies | R | FD | The roots are boiled with milk then drink the decoction to a dog. | O |
| | | | | | | Snakebit e | R | Dr | The dried roots are ground and a teaspoon of powder is mixed with water drank by cattle. | O |
| 5 | *Discopodium penninervum* | Solanaceae | Almit | T | W | Blackleg | L | Fr | The fresh leaves are crushed and mixed with water then drunk by cattle. | O |
| 6 | *Erythrina abyssinica* | Fabaceae | Kuara | T | W | Anthrax | L | Fr | The leaves are crushed and mixed with water then drunk. | O |
| | | | | | | Snakebit e | S | Dr | The seeds are ground mixed with water and then drunk by cattle. | O |
| 7 | *Ficus vasta* | Moraceae | Warka | T | W | Wound | L | Fr | The leaves are crushed, then paint the affected part. | D |
| 8 | *Maytenus senegalensis* | Celastraceae | Atat | Sh | W | Coccidio sis | L | Fr | The fresh leaves are crushed and mixed with water then drunk to hen. | O |
| | | | | | | Eye disease | L | Fr | The fresh leaves are crushed and filtered using cotton cloth adding three drops of filtrate to the eyes of cattle. | Ey |
| 9 | *Millettia ferruginea* | Fabaceae | Birbra | T | W | Tick | F | Fr | The fruits are crushed mix with water painted on the affected part. | D |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Leech | L | Fr | The leaves are crushed and mixed with water then drunk by cattle. | O |
| 10 | *Nicotiana tabacum* | Solanaceae | Tnbuha | H | W/Hm | leech | L | Fr | The leaves are leaves are crushed mix with water drop the juicy part into the cattle's nostril. | N |
| | | | | | | cough | L | Fr | The leaves are crushed and mixed with water then drink the filtered part to cattle. | O |
| | | | | | | Internal parasites | L | Fr | The leaves are crushed and mixed with water to drink the filtered part to cattle. | O |
| 11 | *Ocimum basilicum* | Lamiaceae | Zikakibe | H | Hm | Bloating | L | Fr | The leaves are crushed with the bulb of Allium sativum and salt together little of the solution is to drink to cattle. | O |
| 12 | *Prunus persica* | Rosaceae | Kok | Sh | W/hm | Diarrhea | L | Fr | The leaves are crushed and mix water for a few minutes and then drunk by cattle. | O |
| 13 | *Rumex nepalensis* | Polygonaceae | Tult | H | W | Anthrax | R | Fr | The roots are crushed mixed with water then drank by cattle. | O |
| 14 | *Rumex nervosus* | Polygonaceae | Enbuacho | Sh | W | Eye disease | L | Dr | The dry leaves are crushed with the fruit of Ruta chalepensis and mix the powder with tella then drop the solution into the cattle eye. | Ey |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | *Satureja punctata* | Lamiaceae | Yenbosa chenger | Sh | w | Leech | L | Fr | The leaves are crushed, and mixed with water, and a drop solution is entered into the cattle nose. | N |
| 16 | *Tragia brevipes* | Euphorbiaceae | Abelbalit | H | W | Coccidiosis | R/L | Fr | The leaves are crushed and mixed with water then drunk to hen. | O |

### 9.3. APPENDIX – 3 : List of medicinal plants used for treating both human and livestock ailments

In the study area, there are many plants used for treating both human and livestock ailments recorded with their, scientific name, family, local name, growth form, Source: disease treated, plant parts; condition of plant part uses; methods of preparation, way of application, and route of administration.

| SN | **Scientific Name** | Family | Local name | Growth form | Source | Use | Disease Treated | Part used | CP | Mode of preparation | Route |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *Achyranthes aspera* | Amarantaceae | Telenj | H | w | Hu | Fire burn | L | Dr | The dry leaves are ground and the powder mixes with butter paint on the burned part. | D |
| | | | | | | Li | Eye disease | R | Fr | The fresh and mixed with water then enter a drop of the juice into the cattle eye. | Ey |
| | | | | | | hu | Ascaris | R | Fr | The fresh root is crushed and mixed with water then drunk. | O |
| 2 | *Acokanthera schimperi* | Apocynaceae | Merez | Sh | w | Hu | Liver Problem | L | Dr | The leaves are ground then eat one teaspoon of powder with honey finally drink milk as an antidote. | O |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Li | Rabies | R | Fr | The fresh roots are crushed mixed with cold water and then drunk. | O |
| 3 | *Brucea antidysenterica* | Simaroubaceae | Waginos | Sh | w/hm | Hl | Wound | L | Fr | The fresh leaves are crushed and then painted on the wound. | D |
| | | | | | | Hu | Scabies/ itch | L | Dr | The leaves are ground and mix the powder with butter then paint on the affected part. | D |
| | | | | | | Li | External parasites (lice) | L | Fr | The leaves are crushed and mixed with water then paint on the affected part. | D |
| 4 | *Buddleja polystachya* | Loganiaceae | Anfar | Sh | w | Hu | Abdominal cramp | SB | FD | The stem barks are boiled in water then drink the solution. | O |
| | | | | | | Li | Eye disease | L | Fr | The fresh Leaves are crushed and squeezed enter a drop of the juicy part in to cattle eye. | Ey |
| | | | | | | hu | Tonsil | L | Fr | The fresh leaves are chewed and swallow the juicy part | O |
| 5 | *Calpurnia aurea* | Fabaceae | Dgta | Sh | W | Hu | Diarrhea | L+s | Dr | The dry leaves and seeds are ground and mixed with water then drink. | O |
| | | | | | | Li | External parasite/ lice | L | Fr | The fresh leaves are crushed and painted on the skin. | D |
| 6 | *Cucumis ficifolius* | Cucurbitaceae | Yemdir enbuay | C | W | HL | Swelling | R | Fr | The fresh roots are crushed paint on the swollen part. | D |
| | | | | | | Hu | Toothache | R | Fr | The fresh roots are boiled with Capsicum annuum then wash the mouth with decoction and spit out the water. | O |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hu | Liver problem | R | Dr | The roots are burned in the fire and fumigate the smoke. | Oand N |
| 7 | *Echinops kebericho* | Asteraceae | Kebercho | H | W | HL | Febiril illness | R | Dr | The dry roots are burned in the fire and then fumigate the smoke. | Oand N |
| | | | | | | HU | Devil | R | Dr | The dry roots are burned in a fire to fumigate the smoke. | Nand O |
| 8 | *Gossypium herbaceum* | Malvaceae | Titt | Sh | Hm | Hu | Bronchitis | S | Dr | The dry seeds are ground and the powder is mixed with honey and eaten. | O |
| | | | | | | Li | Diarrhea | L | Fr | The fresh leaves are crushed mixed with water and given to cattle to drink. | O |
| 9 | *Grewia ferruginea* | Tiliaceae | ALenkoza | Sh | W | Li | Bloating | SB | Fr | The fresh barks are boiled in water then drink the decoction. | O |
| | | | | | | Li | Retained placenta | SB | Fr | The fresh barks are boiled in water to drink the decoction. | O |
| | | | | | | hu | Dandruff | SB | Fr | The fresh barks are crushed and mixed with water and wash the hair with the filtered part when cool. | D |
| 10 | *Justicia schimperiana* | Acanthaceae | Smiza | Sh | Hm | Hu | abdominal cramp | R | Fr | The roots are crushed and mixed with tela then drunk. | O |
| | | | | | | Li | Cococodis | L | Fr | The leaves are crushed, mixed with water, and given to the hen to drink | O |
| | | | | | | Li | Blackleg | L | Fr | The leaves are crushed with dried fruit of Ricinus communi drink solution to cattle. | O |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | ***Kalanchoe petitiana*** | Crassulaceae | Yekola Endahula | H | w/hm | Hu | Eczema /chfe | R | Fr | The fresh roots are crushed and then painted on the affected part. | D |
| | | | | | | Hu | Toothache | R | Fr | The roots are chewed and then swallowing the juicy part. | O |
| | | | | | | hL | Swelling | L | Fr | The fresh leaves are placed on fire and shoot on the affected part. | D |
| 0.12 | *Lagenaria siceraria* | Cucurbitaceae | kil | C | hm | Li | Leech | F | Fr | The fresh fruit sap is crushed and mixed with water to drop the solution to the cattle through the nose. | N |
| | | | | | | hu | Evil eye | S + f | Dr | The Seeds and fruit saps are burned in fire then fumigating the smoke through the nose. | N |
| 13 | *Linum usitatissimum* | Linaceae | telba | H | Hm | Hl | Retained placenta | S | Dr | The dry seeds are ground and the powder is boiled with water then drink the solution after cooling. | O |
| 14 | *Malva verticillata* | Malvaceae | Lutt | H | W | HL | Cough | L | Fr | The fresh leaves are crushed and mixed with water then drink the juicy part. | O |
| 15 | *Phytolacca dodecandra* | Phytolaccaceae | Endod | Sh | w | HU | Malaria | R | Fr | The fresh root was crushed and mixed with a teacup of water then the drink finally ate cooked hen liver as an antidote. | O |
| | | | | | | Hl | Rabies | R | Fr | The fresh root is crushed and mixed with water then drunk and finally eat cooked hen liver as an antidote. | O |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hu | Miscarry /abortion | F | Dr | The dry Fruit is ground and a teaspoon of powder is mixed with a cup of water then drink finally eat the cooked hen liver as an antidote. | O |
| 16 | *Plumbago zeylanica* | Plumbaginaceae | Amira | Sh | W | Hl4 | Swelling | R | Fr | The fresh roots are crushed and mixed with water then drunk by humans or cattle. | O |
| | | | | | | HU | Cough | L | Fd | The leaves are boiled with butter then drink the filtered part | O |
| | | | | | | hu | Asma | R | Fr | The root is crushed and mixed with water then drink | O |
| 17 | *Rhus glutinosa* | Anacardiacea | Emebsa | T | W | HU | Wound | RB | Fr | The bark of Rhus glutinosa is crushed, powdered, and painted on wounded areas. | D |
| | | | | | | Li | Leech | L | Fr | The fresh leaves are crushed and squeezed then drop a few solutions through the nose. | N |
| 18 | *Ipomoea tenuirostris* | Convolvulaceae | Yeayithareg | C | w | Hu | Wound | L | Fr | The fresh Leaves are crushed and a small amount is painted on the wound. | D |
| | | | | | | Li | Anthrax | R | Fr | The roots are crushed, mixed with water, and given to the animal (cattle, goat, or sheep) to drink. | O |
| 19 | *Vernonia amygdalina* | Asteraceae | Grawa | Sh | Hm | Hu | Syphilis | L | Dr | The dry leaves are ground mix the powder with honey then eat. | O |
| | | | | | | Li | Bloating | L | Fr | The fresh leaves are Crushed mixed with water then drunk to animals. | O |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | *Zingiber officinale* | Zingiberaceae | Zinjible | H | HM | HU | Common cold | Rh | Fd | The fresh/dry rhizome is crushed then boiled in water and drank in a cup of tea. | O |
| | | | | | | HU | Abdominal cramp | Rh | Fd | The fresh/dry rhizome is crushed then boiled in water and drank in a cup of tea. | O |
| | | | | | | Li | Eye disease | Rh | Fr | The root/ rhizome is crushed and mixed with water the juice part is dropped on the cattle eye. | Ey |

## 9.4. APPENDIX - 4 : Number of species in each family

| **Family name** | **Number of species** | **Percent of species** |
|---|---|---|
| Asclepiadaceae | 2 | 1.77 |
| Apocynaceae | 2 | 1.77 |
| Poaceae | 2 | 1.77 |
| Polygonaceae | 2 | 1.77 |
| Rhamnaceae | 2 | 1.77 |
| Tiliaceae | 2 | 1.77 |
| Verbenaceae | 2 | 1.77 |
| Apiaceae | 3 | 2.65 |
| Malvaceae | 3 | 2.65 |
| Myrtaceae | 3 | 2.65 |
| Ranunculaceae | 3 | 2.65 |
| Rosaceae | 3 | 2.65 |
| Rutaceae | 3 | 2.65 |
| Vitaceae | 3 | 2.65 |
| Moraceae | 4 | 3.54 |
| Cucurbitaceae | 5 | 4.42 |
| Euphorbiaceae | 5 | 4.42 |
| Asteraceae | 6 | 5.31 |

| | | |
|---|---|---|
| Lamiaceae | 6 | 5.31 |
| Solanaceae | 6 | 5.31 |
| Fabaceae | 8 | 7.08 |
| Acanthaceae | 1 | 0.88 |
| Agavaceae | 1 | 0.88 |
| Alliaceae | 1 | 0.88 |
| Aloaceae | 1 | 0.88 |
| Amaranthaceae | 1 | 0.88 |
| Anacardiacea | 1 | 0.88 |
| Araliaceae | 1 | 0.88 |
| Asparagaceae | 1 | 0.88 |
| Boraginaceae | 1 | 0.88 |
| Brassicaceae | 1 | 0.88 |
| Cabombaceae | 1 | 0.88 |
| Capparidaceae | 1 | 0.88 |
| Caricaceae | 1 | 0.88 |
| Caryophyllaceae | 1 | 0.88 |
| Celastraceae | 1 | 0.88 |
| Chenopodiaceae | 1 | 0.88 |
| Convolvulaceae | 1 | 0.88 |
| Crassulaceae | 1 | 0.88 |
| Cupressaceae | 1 | 0.88 |
| Ebenaceae | 1 | 0.88 |
| Flacourtiaceae | 1 | 0.88 |
| Lauraceae | 1 | 0.88 |
| Linaceae | 1 | 0.88 |
| Lobeliaceae | 1 | 0.88 |
| Loganiaceae | 1 | 0.88 |
| Melianthaceae | 1 | 0.88 |
| Moringaceae | 1 | 0.88 |
| Oleaceae | 1 | 0.88 |
| Phytolaccaceae | 1 | 0.88 |
| Plumbaginaceae | 1 | 0.88 |
| Polygalaceae | 1 | 0.88 |
| Rubiaceae | 1 | 0.88 |
| Santalaceae | 1 | 0.88 |

| | | |
|---|---|---|
| Sapindaceae | 1 | 0.88 |
| Scrophulariaceae | 1 | 0.88 |
| Simaroubaceae | 1 | 0.88 |
| Urticaceae | 1 | 0.88 |
| Zingiberaceae | 1 | 0.88 |

## 9.5 APPENDIX - 5 : English version of consent form and questionnaire

Consent form

I, the undersigned information provider, understand the purpose of the study titled Medicinal Plants Used to Treat Human and Animal Diseases and Evaluating the Anti-bacterial Properties of Selected Medicinal Plants in Telemt Woreda ". I agree to provide information about plant species that are used to treat human and livestock diseases and to provide information on their preparation methods. I confirm my agreement by signing in front of my name.

Signature of informants: _____

Date: _____

Code no._____

**Checklist of interview questions for Collecting Personal and Ethnobotanical data from Key informants and non-traditional medicinal practitioners in the Telemt district.**

Dear Respondents, these interview questions are meant to elicit information on the use of traditional medicines of plants. You will be giving information only based on your willingness after reaching a consensus. The aim of this study is only for educational purposes, but not for any other uses.

**I. General Information on respondents:**

1. Name of the respondent
2. Respondent's gender: Male / Female
3. Marital status of the respondent: Married/widowed/divorced/single (Underline)
4. Age of the respondent
5. Educational status: Read and write? (Yes/No) Underline

Indicate level/grade completed.

6. Occupations

7. Residence (1. Urban 2. Rural) Underline

8. For how long have you lived in the area?

**II. Ethnobotanical Data**

1. What are the main human health problems/diseases in your locality?

2. What are the main livestock health problems/diseases in your locality?

3. How do you diagnose each disease/health problem?

4. What are the symptom(s) of the disease/health problem?

5. List the medicinal plants used to treat human, livestock, and both human and livestock disease with:

- Local name
- Disease treated
- Source of medicinal plant ( wild, cultivated, and wild/cultivated).
- Growth form (tree, shrub, climber, herb, and epiphyte).
- Plant parts used in medicine (Root, leaf, stem, root bark, stem bark, small twigs With leaves, seeds, flowers, fruit whole, and others) underline.
- Ingredients added: Used alone, mixed with water or other materials (Underline) other.
- Form of the medicinal plant used: Fresh only dried only, fresh or dried (Underline) Other.
- Method of preparation (crushing, pounding, concoction, decoction, unprocessed, heating, roasting, and others) underline.
- Route of administration (Oral, Nasal, Optical, and Dermal).
- Way of application (drinking, eating, put on, and others).
- Dose.
- Any noticeable adverse/side effect(s) (Yes, No, and mention if yes.
- Any antidotes for adverse/side effect(s) (yes, No, and mention if yes.

7 Does the dose vary among age groups (children, pregnant women, and elders), and sex (males/ females)? If you say yes why?

8. Are there any taboos associated with medicinal plant use and utilization of medicinal plants? (Method of collection, time of collection, sex, age, storage, etc.)

What is the implication of the taboo? If any, state

9. Are medicinal plants marketable?

10. For what other purposes do you use traditional medicinal plants Food/firewood/charcoal/house construction/forage/etc.

11. Which medicinal plants are used for multiple uses and mention the use?

12. Are there any threats to the medicinal plants? List out the main threats, starting with the most serious threat.

13. Which medicinal plant species is commonly threatened in your local area?

14. How do you conserve traditional medicinal plants?

15. How is the knowledge of traditional medicine passed to the next generation in the community?

16. How does modernization interfere with traditional medicinal knowledge?

IDENTIFICATION:

Name of: Survey Woreda Telemt

Kebele_____

Interviewer Emebet Teka

Date/Month/Year: _____

Time: From_____Am. /P.m. to _____A.m./P.m.

## 9.6. APPENDIX — 6 : Amharic version of consent form and questionnaire

**የፍቃድ ፎርም**

እኔ፣ በስሩ የፊረምኩት መረጃ ሰጭ በጠለምት ወረዳ ውስጥ የሰዉ እና የእንስሳት በሽታዎችን ለማከም የሚያገለግሉ የመድኃኒት ዕፅዋቶች እና የተመረጡ ዕፅዋቶችን ፀረ-ባክቴሪያ ባህሪ መገምገም በሚል ርዕስ የሚደረገውን ጥናት ዓላማ ተረድቻለሁ። ስለ ተክሎች ዝርያዎች የትኞቹን በሽታዎችን ለማከም ጥቅም ላይ እንደሚውሉ እና የአዘገጃጀት ዘዴዎች ላይ መረጃ ለመስጠት ተስማምቻለሁ። ስምምነቴን በስሜ ፊት በመፈረም በፊረማየ አረጋግጫለሁ።

ፊርማ: _____

ቀን: _____

በጠለምት ወረዳ ውስጥ ላሉ መረጃ ሰጭዎች የግላዊ እና የኢትኖቦታኒካል መረጃዎችን ለመሰብሰብ የቃለ መጠይቅ ጥያቄዎች ማረጋገጫ ዝርዝር።

ውድ ምላሽ ሰጪዎች፣ እነዚህ የቃለ መጠይቅ ጥያቄዎች የዕፅዋቶች ባህላዊ መድሃኒትነት እና አጠቃቀም በተመለከተ መረጃ ለማግኘት ነው። መረጃን የምትሰጡት በስምምነት ላይ ከደረሱ በኋላ በፍላጎትዎ በመመስረት ብቻ ነው።

I. ስለ መላሾች አጠቃላይ መረጃ፡-

1. ስም

2. ጸታ፡ (ወንድ ፣ ሴት)

3. የጋብቻ ሁኔታ፡ (ያገባ/ች፣ያላገባ/ ፣የሞተችበት/ባት፣የተፋታ/ች (አስምሩ)

4. ዕድሜ

5.የትምህርት ደረጃ: ማንበብ እና መጻፍ የሚችል ፣ማንበብ እና መጻፍ የማይችል፣ዲፕሎማ፣ዲግሪ ወዘተ (አስምሩ)

6. ስራ

7. የመኖሪያ ቦታ (1.ከተማ 2. ገጠር) (አስምሩ)

8. በአካባቢው ለምን ያህል ጊዜ ኖረዋል?

II. የኢትኖቦታኒካል መረጃ

1. በአካባቢዎ ያሉ ዋና ዋና የሰዎች የጤና ችግሮች/በሽታዎች ምንድን ናቸው?

2. በአካባቢዎ ያሉ ዋና ዋና የእንስሳት ጤና ችግሮች/በሽታዎች ምንድን ናቸው?

3. እያንዳንዱን በሽታ እንዴት ነው የሚመረመረው?

4. የበሽታው ምልክቶች?

5. በአካባቢዎ ውስጥ ለሰው፣ለእንሰሳትን፣ እና ለሁለቱም የሰው እና የእንስሳት በሽታን ለማከም ጥቅም ላይ የሚውሉ የዕፅዋት ዝርያዎችን ዘርዝሩ፡

- የዕፅዋቱ አካባቢያዊ ስም
- የሚያድነው በሽታ
- የዕፅዋቱ የዕድገት ሁኔታ (ዛፍ፣ቁጥቋጦ፣አረም፣ሀረግ ፣ተቀጥያ ወ.ዘ.ተ
- የዕፅዋቱ መገኛ (ዱር፣ የሚለማ ወይም ሁለቱም)
- ለመድኃኒትነት የሚውለው የዕፅዋት ክፍል (ሥር፣ ቅጠል፣ ግንድ፣ የሥሩ ቅርፊት፣ የግንዱ ቅርፊት፣ ትናንሽ ቀንበጦች እስከ ቅጠላቸው፣ ዘር፣ አበባ፣ ፍሬ ) (አስምሩ)
- የሚጨመሩ ንጥረ ነገሮች፡- ብቻውን ጥቅም ላይ ይውላል፣ ከውሃ ወይም ከሌሎች ነገሮች ጋር ተቀላቅሎ ፣ ሌላ (አስምሩ)
- የአዘገጃጀት ሁኔታ (ያልደረቀ፣የደረቀ፣ያልደረቀ ወይም የደረቀ (አስምሩ)
- የአዘገጃጀት ዘዴ ( መቀጥቀጥ ፣ማፍላት ፣መፍጨት ፣ማቃጠል)
- የሚሰጥበት መንገድ፡(በአፍ፣ በቆዳ ፣በአፍንጫ ፣በጆሮ፣ በዓይን ፣በጥርስ ወዘተ የሚወስድበት ዘዴ (በመጠጣት፣በመብላት ፣በማኘክ ፣በመቀባት፡ በመታጠን፣ በመታጠብ፣በማሸት ፣በመቦረሽ ሌሎች)አስምሩ)
- ማንኛውም የሚታይ የጎንዮሽ ጉዳት አለ ? (አዎ፣አይደለም ፣ አዎ ከሆነ ይጥቀሱ)፡
- የጎንዮሽ ጉዳቱን ለማስወገድ ምን ይወስዳሉ ? ይጥቀሱ
- መጠን (ግምታዊ፣የታወቀ).

7. መጠኑ በእድሜ ቡድኖች(ለልጆች ለወጣት እና ለሽማግሌዎች)፣ በጸታ (ወንዶች፣ ሴቶች፣ ፣ለነፍሰ ጡር ሴቶች? ይለያያል? አዎ ካልክ ለምን?

8. የመድኃኒት እፅዋት አጠቃቀም ጋር የተያያዙ የተከለከሉ ነገሮች አሉ? (የመሰብሰቢያ ዘዴ፣ የመሰብሰቢያ ጊዜ፣ ያታ፣ ዕድሜ፣ ማከማቻ፣ ወዘተ) የገደቡ ጥቅም ምንድን ነው? ዘርዝሩ

9. የትኞቹ የመድኃኒት ዕፅዋቶች ለገበያ ይቀርባሉ? ይጥቀሱ

10. ለየትኛው ዓላማ ባህላዊ መድኃኒት ዕፅዋቶች ይጠቀማሉ (ለምግብ ፣ለማገዶ ፣ለእንጨት ፣ለከሰል ፣ለቤት ፣ ለግንባታ እና ለመኖ / ወዘተ).

11. የትኞቹ የመድኃኒት ዕፅዋቶች ለብዙ ጥቅም ይውላሉ እና ጥቅማቸውን ይጠቅሳሉ?

12. በአካባቢዎ ውስጥ ለመድኃኒት ዕፅዋት ተጽእኖ የሚያደርሱ ነገሮች አሉ? በጣም ከባድ ከሆነው ተጽእኖ ጀምሮ ዋና ዋናዎቹን ዘርዝሩ።

13. በአከባቢዎ የበለጠ የትኞቹ የመድኃኒት ዕፅዋት ዝርያዎች ችግር/ተጽእኖ ውስጥ ናቸው? ይጥቀሱ?

14. ባህላዊ መድኃኒት ዕፅዋቶች እንዴት ይጠበቃሉ? የመትከል፣ የማሳደግ ሁኔታ አለ?

15. በባህላዊ ሕክምና ላይ ያለው እውቀት ለቀጣዩ ትውልድ በማህበረሰቡ ውስጥ እንዴት ይተላለፋል?

16. ዘመናዊነት በባህላዊ መድኃኒት ስርዓት ላይ ያለው ጣልቃ ገብነት እንዴት

ነው ? ካለ ይጥቀሱ

የጥናቱ ወረዳ ጠለምት።

ቀበሌ_____

ጠያቂ እመቤት ተካ

ቀን/ወር/ዓመት፡_____

ሰዓት፡ ከ_____

## 9.7. APPENDIX – 7 : List of the informants participated in the ethnobotanical study

| SN | Name | Sex | Age | Marital status | Education status | Informant type | Occupation | Duration of time | Kebele |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Abebe Tegegne | M | 56 | Married | Illiterate | Key | Farmer | Since Birth | Adi Selam |
| 2 | Dejen Alelgn | M | 35 | Single | Illiterate | General | Farmer | Since Birth | Adi Selam |
| 3 | Meselu Cherkos | F | 41 | Married | Illiterate | General | House Wife | Since Birth | Adi Selam |
| 4 | Abraham Asmare | M | 62 | Married | Illiterate | General | Farmer | Since Birth | Adi Selam |
| 5 | Dawit Kebede | M | 32 | Single | Illiterate | General | Farmer | Since Birth | Adi Selam |
| 6 | Tiftu Birhanu | M | 45 | Married | 12th Drop | General | Farmer | Since Birth | Adi Selam |
| 7 | Worknesh Mulaw | F | 28 | Single | Illiterate | General | Merchant | Since Birth | Adi Selam |
| 8 | Wuditu Fentie | F | 58 | Single | 8th Drop | General | Merchant | Since Birth | Adi Selam |
| 9 | Aschalew Adugna | M | 39 | Married | Illiterate | Key | Farmer | Since Birth | Adi Selam |
| 10 | Yemsrach Tsegaw | F | 43 | Married | Illiterate | General | House Wife | Since Birth | Adi Selam |
| 11 | Adisu Tesfaye | M | 29 | Single | 11th | General | Student | Since Birth | Adi Selam |
| 12 | Zewuditu Adugna | F | 67 | Married | 10th Drop | General | House Wife | Since Birth | Adi Selam |
| 13 | Molalgn Birhane | M | 43 | Married | Illiterate | Key | Farmer | > 24 years | Adi Selam |
| 14 | Azanaw Kasahun | M | 38 | Married | Illiterate | General | Farmer | Since Birth | Adi Selam |
| 15 | Zenebe G/Silasie | M | 37 | Married | Illiterate | General | Farmer | Since Birth | Adi Selam |
| 16 | Melshw Mengista | F | 55 | Married | Illiterate | Key | House Wife | Since Birth | Adi Selam |
| 17 | Genet Mengesha | F | 31 | Single | Illiterate | General | House Wife | Since Birth | Adi Selam |
| 18 | Desie Tilahun | M | 65 | Married | Illiterate | General | Farmer | Since Birth | Adi Selam |
| 19 | Ayalnesh Abebe | F | 61 | Married | Illiterate | Key | House Wife | Since Birth | Adi Selam |
| 20 | Alemtsehay Birhane | F | 28 | Married | Illiterate | General | House Wife | Since Birth | Adi Selam |
| 21 | Solomon Gobeza | M | 39 | Married | Diploma | General | Government Employee | Since Birth | Adi Selam |
| 22 | Yeshhareg Dagnew | F | 27 | Single | 10th | General | Student | Since Birth | Adi Selam |
| 23 | Mulat Asefa | M | 82 | Married | Illiterate | Key | Farmer | Since Birth | Adi Selam |
| 24 | Mequanit Teklie | M | 73 | Married | Illiterate | General | Farmer | Since Birth | Adi Selam |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 25 | Ljalem Temerto | M | 66 | Married | Illiterate | General | Farmer | Since Birth | Adi Selam |
| 26 | Misanesh Andualem | F | 68 | Married | Illiterate | General | House Wife | Since Birth | Terinasha |
| 27 | Shambel Miretie | M | 33 | Single | 12th Drop | General | Merchant | Since Birth | Terinasha |
| 28 | Moges Wubetu | M | 45 | Married | Illiterate | General | Farmer | Since Birth | Terinasha |
| 29 | Menber Amare | F | 29 | Single | 10th Drop | General | Merchant | Since Birth | Terinasha |
| 30 | Betelhem Aschalew | F | 48 | Married | Illiterate | Key | House Wife | Since Birth | Terinasha |
| 31 | Maru Aragie | M | 30 | Single | 10th Drop | General | Merchant | Since Birth | Terinasha |
| 32 | Aklilu Mulusew | M | 34 | Single | Illiterate | Key | Farmer | Since Birth | Terinasha |
| 33 | Getu Getahun | M | 37 | Married | Illiterate | General | Farmer | Since Birth | Terinasha |
| 34 | G/Egziabher Lakew | M | 65 | Married | Illiterate | General | Farmer | Since Birth | Terinasha |
| 35 | Moges Fentie | M | 83 | Married | Illiterate | General | Farmer | Since Birth | Terinasha |
| 36 | Ambaw Maru | M | 78 | Married | Illiterate | General | Farmer | Since Birth | Terinasha |
| 37 | Beyene Zegeye | M | 53 | Married | Illiterate | General | Merchant | Since Birth | Terinasha |
| 38 | Zenawit Desalegn | F | 76 | Married | Illiterate | General | Merchant | Since Birth | Terinasha |
| 39 | Wagaye Abera | F | 56 | Married | Illiterate | General | House Wife | Since Birth | Terinasha |
| 40 | Mitku G/Medin | M | 74 | Single | Illiterate | General | Farmer | Since Birth | Terinasha |
| 41 | Trunesh Asresie | F | 51 | Married | Illiterate | General | House Wife | Since Birth | Terinasha |
| 42 | Belete Bezabh | M | 39 | Married | 5 Th Drop | Key | Farmer | Since Birth | Terinasha |
| 43 | Worku Mamuye | M | 24 | Single | 12th | General | Student | Since Birth | Terinasha |
| 44 | Meseret Mulugeta | M | 27 | Single | Illiterate | General | Farmer | Since Birth | Terinasha |
| 45 | Mesele Truneh | M | 26 | Divorce | Illiterate | Key | Farmer | Since Birth | Terinasha |
| 46 | Getachew Haile | M | 56 | Married | Illiterate | General | Farmer | Since Birth | Terinasha |
| 47 | Kefialew Zewale | M | 22 | Single | 12th | General | Student | Since Birth | Terinasha |
| 48 | Alemu Mulaw | M | 25 | Divorce | Illiterate | Key | Farmer | Since Birth | Terinasha |
| 49 | Tobia Tesfaye | F | 27 | Single | 10th | General | Student | Since Birth | Terinasha |
| 50 | Fentanesh Shiferaw | F | 63 | Divorce | Illiterate | General | House Wife | Since Birth | Terinasha |
| 51 | Maru Beyene | M | 36 | Married | Diploma | General | Government Employee | Since Birth | Chinifera |
| 52 | Tadele Wubie | M | 41 | Married | Illiterate | Key | Farmer | Since Birth | Chinifera |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 53 | Sisaynesh Chekole | F | 53 | Divorce | Illiterate | General | House Wife | Since Birth | Chinifera |
| 54 | Werku Ayalew | M | 82 | Married | Illiterate | Key | Merchant | Since Birth | Chinifera |
| 55 | Alemu Demsie | M | 29 | Single | 7 Th Drop | Key | Farmer | Since Birth | Chinifera |
| 56 | Cherkos Embiale | M | 68 | Divorce | Illiterate | General | Farmer | Since Birth | Chinifera |
| 57 | Destaw Mengesha | M | 63 | Married | Illiterate | General | Merchant | Since Birth | Chinifera |
| 58 | Bayush Chekole | F | 53 | Married | Illiterate | Key | House Wife | Since Birth | Chinifera |
| 59 | Alemitu Lakew | F | 34 | Divorce | Illiterate | General | House Wife | Since Birth | Chinifera |
| 60 | Tigist Wondmeneh | F | 46 | Married | 5th Drop | Key | Merchant | Since Birth | Chinifera |
| 61 | Tamiru Aguade | M | 47 | Divorce | Diploma | General | Government Employee | Since Birth | Chinifera |
| 62 | Yeshwas Kebede | M | 73 | Married | Illiterate | Key | Merchant | Since Birth | Chinifera |
| 63 | Wendie Zewudu | M | 28 | Married | Illiterate | General | Merchant | Since Birth | Chinifera |
| 64 | Serkalem Demsie | F | 25 | Married | 10th | General | Student | Since Birth | Chinifera |
| 65 | Tewabech Dres | F | 28 | Married | 7 Th Drop | General | House Wife | Since Birth | Chinifera |
| 66 | Kidan Legese | F | 66 | Married | Illiterate | Key | Merchant | Since Birth | Chinifera |
| 67 | Asmare Setegn | M | 43 | Married | Diploma | General | Merchant | Since Birth | Chinifera |
| 68 | Arega Getie | M | 42 | Married | 10th Drop | Key | Farmer | Since Birth | Chinifera |
| 69 | Tasew Godadaw | M | 34 | Married | Illiterate | General | Farmer | > 31 years | Chinifera |
| 70 | Mequannt Alemu | M | 55 | Married | Illiterate | Key | Merchant | Since Birth | Chinifera |
| 71 | Amarech Azanaw | F | 48 | Widowed | 8th Drop | General | Merchant | Since Birth | Chinifera |
| 72 | Asefa Werku | M | 32 | Married | 12th Drop | General | Farmer | Since Birth | Chinifera |
| 73 | Turusew Asmamaw | F | 55 | Married | Illiterate | General | House Wife | Since Birth | Chinifera |
| 74 | Wendie Alemu | M | 67 | Married | 8th Drop | Key | Merchant | Since Birth | Chinifera |
| 75 | Alemneh Ayanaw | M | 57 | Divorced | Illiterate | General | Farmer | Since Birth | Chinifera |
| 76 | Degu Ayenew | M | 33 | Married | Illiterate | General | Farmer | Since Birth | Chinifera |
| 77 | Moges Nebse | M | 32 | Married | Illiterate | General | Farmer | Since Birth | Akuna |
| 78 | Yeshalem Abebe | F | 37 | Married | Illiterate | General | House Wife | Since Birth | Akuna |
| 79 | Endalew Mersha | M | 29 | Single | 12th | General | Student | Since Birth | Akuna |
| 80 | Endeshaw Mersha | M | 33 | Married | Illiterate | General | Farmer | Since Birth | Akuna |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 81 | Wubrst Ayele | F | 44 | Married | Illiterate | General | House Wife | Since Birth | Akuna |
| 82 | Tringo Getu | F | 63 | Married | Illiterate | General | House Wife | Since Birth | Akuna |
| 83 | Mahlet Shgutie | F | 67 | Married | Illiterate | Key | House Wife | Since Birth | Akuna |
| 84 | Addis Amare | M | 73 | Married | Illiterate | Key | Farmer | Since Birth | Akuna |
| 85 | Anlegn Mola | M | 76 | Divorce | Illiterate | General | Farmer | Since Birth | Akuna |
| 86 | Chalachew Alebachew | M | 28 | Single | Diploma | General | Government Employee | Since Birth | Akuna |
| 87 | Tesfaye Ewunetu | M | 45 | Married | Illiterate | Key | Farmer | Since Birth | Akuna |
| 88 | Birhanu Desalegn | M | 56 | Married | 7 Th Drop | General | Farmer | Since Birth | Akuna |
| 89 | Birhanu Mesfin | M | 36 | Married | 12th Drop | General | Farmer | Since Birth | Akuna |
| 90 | Tiwures Zelalem | F | 27 | Married | Illiterate | General | Merchant | Since Birth | Akuna |
| 91 | Tigistu Werkye | M | 36 | Single | Illiterate | Key | Merchant | > 22 years | Akuna |
| 92 | Fikadu Teka | M | 24 | Married | 11th | Key | Student | Since Birth | Akuna |
| 93 | Zerihun Abyu | M | 43 | Married | Degree | Key | Government Employee | Since Birth | Akuna |
| 94 | Werkneh Eshetie | M | 65 | Married | Diploma | General | Farmer | Since Birth | Akuna |
| 95 | Zenebu Kidanemariam | F | 52 | Married | Illiterate | Key | House Wife | Since Birth | Akuna |
| 96 | Eshetu Zemene | M | 28 | Single | Diploma | General | Government Employee | Since Birth | Akuna |
| 97 | Eshetu Getaneh | M | 56 | Married | Diploma | General | Self Employed | Since Birth | Akuna |
| 98 | Alebel Getnet | M | 39 | Married | Degree | Key | Merchant | Since Birth | Akuna |
| 99 | Alehegn Asmamawu | M | 41 | Married | 10th Drop | General | Merchant | Since Birth | Akuna |
| 100 | Shumetachew Adane | M | 29 | Married | Illiterate | Key | Farmer | Since Birth | Akuna |
| 101 | Bedlu Zewudu | M | 49 | Widowed | Illiterate | General | Farmer | Since Birth | Akuna |
| 102 | Amare Baye | M | 21 | Single | 9th | General | Student | Since Birth | Akuna |
| 103 | Dejene Asmamawu | M | 56 | Widowed | Illiterate | Key | Merchant | > 35 years | Tara |
| 104 | Tizta Tamru | F | 67 | Married | Illiterate | General | House Wife | Since Birth | Tara |
| 105 | Etenesh Zewudu | F | 43 | Married | 12th Drop | General | House Wife | Since Birth | Tara |
| 106 | Shwaye Demlew | F | 59 | Widowed | Illiterate | General | House Wife | Since Birth | Tara |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 107 | Nardos Ngusie | F | 29 | Single | Degree | General | Government Employee | Since Birth | Tara |
| 108 | Tadele Tigab | M | 30 | Single | 11th Drop | General | Farmer | Since Birth | Tara |
| 109 | Marshet Bayu | M | 36 | Married | Illiterate | Key | Farmer | Since Birth | Tara |
| 110 | Mulat Demoz | M | 37 | Widowed | Illiterate | General | Farmer | Since Birth | Tara |
| 111 | Azanaw Adugna | M | 66 | Married | Illiterate | General | Farmer | Since Birth | Tara |
| 112 | Misganaw Mret | M | 31 | Married | 8th Drop | Key | Farmer | Since Birth | Tara |
| 113 | Esubalew Dereje | M | 45 | Married | Diploma | General | Merchant | Since Birth | Tara |
| 114 | Mebratu Asmare | M | 59 | Married | Degree | General | Self Employed | Since Birth | Tara |
| 115 | Bantenew Zewudu | M | 67 | Widowed | 11th Drop | Key | Farmer | Since Birth | Tara |
| 116 | Baynesagn Amare | M | 61 | Married | Degree | General | Government Employee | Since Birth | Tara |
| 117 | Megabiyaw Tezera | M | 56 | Married | 12th Drop | General | Merchant | Since Birth | Tara |
| 118 | Gzachew Beyene | M | 34 | Married | Illiterate | General | Farmer | Since Birth | Tara |
| 119 | Birku Biresaw | M | 37 | Married | Illiterate | General | Farmer | Since Birth | Tara |
| 120 | Mantegbosh Adisu | F | 68 | Married | Illiterate | General | House Wife | Since Birth | Tara |
| 121 | Mulatie Alebel | M | 53 | Married | Illiterate | Key | Farmer | Since Birth | Tara |
| 122 | Direje Mersha | M | 36 | Married | Illiterate | General | Merchant | Since Birth | Tara |
| 123 | Habtamu Asmare | M | 42 | Divorce | Illiterate | General | Farmer | Since Birth | Tara |
| 124 | Azmeraw Getahun | M | 65 | Married | Illiterate | General | Farmer | Since Birth | Tara |
| 125 | Debaka Ascheneke | F | 45 | Married | Illiterate | General | House Wife | Since Birth | Tara |
| 126 | Marie Ngusie | F | 31 | Married | 7th Drop | Key | House Wife | Since Birth | Tara |
| 127 | Sisay Tiruneh | M | 48 | Married | 12th Drop | Key | Self Employed | Since Birth | Ageta |
| 128 | Samrawit Aychew | F | 57 | Divorce | Illiterate | General | House Wife | Since Birth | Ageta |
| 129 | Debre Fikadu | F | 22 | Single | 12 Th | Key | Student | Since Birth | Ageta |
| 130 | Anteneh Shferaw | M | 38 | Married | Illiterate | General | Merchant | Since Birth | Ageta |
| 131 | Belete Mamao | M | 49 | Divorce | Diploma | General | Merchant | Since Birth | Ageta |
| 132 | Fkadu Haile | M | 62 | Married | Illiterate | General | Farmer | Since Birth | Ageta |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 133 | Dereje Alemneh | M | 56 | Married | 10th Drop | Key | Merchant | Since Birth | Ageta |
| 134 | Marew Gebru | M | 23 | Single | Illiterate | General | Farmer | Since Birth | Ageta |
| 135 | Yalew Tajebe | M | 47 | Married | 12th Drop | General | Farmer | Since Birth | Ageta |
| 136 | Degu Marew | M | 67 | Married | Diploma | General | Self Employed | Since Birth | Ageta |
| 137 | Getaneh Asmare | M | 68 | Married | Illiterate | General | Farmer | Since Birth | Ageta |
| 138 | Wubetu Chane | M | 47 | Married | Illiterate | General | Farmer | Since Birth | Ageta |
| 139 | Zeleke Alamrew | M | 69 | Married | 4 Th Drop | General | Farmer | Since Birth | Ageta |
| 140 | Mesafint Mulaw | M | 46 | Divorce | Illiterate | General | Farmer | Since Birth | Ageta |
| 141 | Bewuket Abera | M | 24 | Married | Illiterate | General | Farmer | Since Birth | Ageta |
| 142 | Nibret Asfaw | M | 22 | Married | Illiterate | General | Farmer | Since Birth | Ageta |
| 143 | Nguse Fkadie | M | 22 | Single | Degree | Key | Student | Since Birth | Ageta |
| 144 | Alebachew Setargew | M | 46 | Married | 8 Th Drop | General | Farmer | Since Birth | Ageta |
| 145 | Tiftie Getu | F | 68 | Married | Illiterate | General | House Wife | Since Birth | Ageta |
| 146 | Demeku Gebre | F | 64 | Married | Illiterate | General | House Wife | Since Birth | Ageta |
| 147 | Mulunesh Nebsie | F | 46 | Married | 8th Drop | General | House Wife | Since Birth | Ageta |
| 148 | Aynadis Chekole | F | 40 | Married | Illiterate | General | House Wife | Since Birth | Ageta |
| 149 | Tamrat Asrat | M | 35 | Married | 6th Drop | General | Farmer | Since Birth | Ageta |
| 150 | Ayalew Stotaw | M | 63 | Married | Illiterate | General | Farmer | Since Birth | Ageta |
| 151 | Wondie Tarekegn | M | 34 | Married | Diploma | General | Merchant | Since Birth | Negade Meshageria |
| 152 | Ayenat Tefera | F | 46 | Married | 10th Drop | General | House Wife | Since Birth | Negade Meshageria |
| 153 | Adane Tewachew | M | 45 | Married | Illiterate | Key | Farmer | Since Birth | Negade Meshageria |
| 154 | Godada Smegnew | F | 38 | Married | Illiterate | General | House Wife | Since Birth | Negade Meshageria |
| 155 | Truken Asres | F | 69 | Married | Illiterate | General | House Wife | Since Birth | Negade Meshageria |
| 156 | Trefe Tsegaye | M | 35 | Married | 12th Drop | General | Farmer | Since Birth | Negade Meshageria |
| 157 | Adugna Hailemeskel | M | 46 | Married | Illiterate | General | Farmer | Since Birth | Negade |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Meshageria |
| 158 | Demsie Biru | M | 73 | Married | 8th Drop | Key | Farmer | > 21 years | Negade Meshageria |
| 159 | Dagnaw Walelgn | M | 45 | Married | Diploma | General | Merchant | Since Birth | Negade Meshageria |
| 160 | Delelegn Wasie | M | 37 | Married | Illiterate | General | Farmer | Since Birth | Negade Meshageria |
| 161 | Berihun Zemene | M | 46 | Widowed | 11th Drop | General | Farmer | Since Birth | Negade Meshageria |
| 162 | Chekole Berihun | M | 58 | Married | 10th Drop | General | Farmer | Since Birth | Negade Meshageria |
| 163 | Endager Demoz | M | 64 | Married | Diploma | Key | Government Employee | Since Birth | Negade Meshageria |
| 164 | Asres Tarekegn | M | 25 | Single | Illiterate | General | Self Employed | Since Birth | Negade Meshageria |
| 165 | Netsanet Weldegebrel | F | 21 | Married | Illiterate | Key | House Wife | Since Birth | Negade Meshageria |
| 166 | Tilanesh Admasu | F | 46 | Single | Illiterate | General | Self Employed | Since Birth | Negade Meshageria |
| 167 | Atrsawgebeyew | M | 58 | Married | Illiterate | Key | Farmer | Since Birth | Negade Meshageria |
| 168 | Tigetu Ashenafi | M | 64 | Married | Illiterate | General | Farmer | Since Birth | Negade Meshageria |
| 169 | Demoz Asfaw | M | 58 | Married | Illiterate | Key | Merchant | Since Birth | Negade Meshageria |
| 170 | Habtam Sewagen | F | 68 | Married | Illiterate | Key | House Wife | Since Birth | Negade Meshageria |
| 171 | Hailemariew Goadie | M | 63 | Married | Illiterate | General | Farmer | Since Birth | Negade Meshageria |
| 172 | Girmay Addisu | M | 52 | Divorce | 7th Drop | Key | Farmer | Since Birth | Negade Meshageria |
| 173 | Begosew Dagnaw | F | 45 | Widowed | 12th Drop | General | Government Employer | Since Birth | Negade Meshageria |
| 174 | Tigabu Ambachew | M | 42 | Married | Illiterate | General | Farmer | Since Birth | Ateba |
| 175 | Genetu Geremaw | M | 38 | Married | Degree | General | Government Employee | Since Birth | Ateba |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 176 | Alene Mewsha | M | 64 | Married | Illiterate | Key | Farmer | Since Birth | Ateba |
| 177 | Sifrash Berie | F | 26 | Married | Diploma | General | Government Employee | Since Birth | Ateba |
| 178 | Yemsrach Wendmagegn | F | 38 | Married | 10th Drop | Key | House Wife | Since Birth | Ateba |
| 179 | Habtie Kiflu | M | 27 | Married | Illiterate | General | Self Employed | Since Birth | Ateba |
| 180 | Habtie Weres | M | 67 | Married | Illiterate | Key | Farmer | Since Birth | Ateba |
| 181 | Wubnesh Ayalew | F | 35 | Married | Illiterate | General | House Wife | Since Birth | Ateba |
| 182 | Atrsaw Tsehayu | M | 48 | Married | Illiterate | General | Farmer | Since Birth | Ateba |
| 183 | Ayenew Sisay | M | 32 | Married | Diploma | General | Teacher | Since Birth | Ateba |
| 184 | Wudadis Fentie | M | 45 | Married | Illiterate | Key | Farmer | Since Birth | Ateba |
| 185 | Tilahun Zewale | M | 25 | Single | Illiterate | General | Farmer | Since Birth | Ateba |
| 186 | Aschalew Tajebe | M | 38 | Married | 9 Th Drop | General | Merchant | Since Birth | Ateba |
| 187 | Azanaw Wubsera | M | 43 | Married | Diploma | Key | Government Employee | Since Birth | Ateba |
| 188 | Syum Teshale | M | 24 | Single | 10th | General | Student | Since Birth | Ateba |
| 189 | Mehabaw Chane | M | 47 | Married | 12th Drop | Key | Merchant | Since Birth | Ateba |
| 190 | Degie Bayeh | F | 38 | Married | Illiterate | General | House Wife | Since Birth | Ateba |
| 191 | Adanu Tadese | F | 43 | Married | Illiterate | General | House Wife | > 25 years | Ateba |
| 192 | Alemsra Endalew | F | 27 | Single | 11th Drop | General | Merchant | Since Birth | Ateba |
| 193 | Marye Getu | M | 23 | Married | Illiterate | General | Farmer | Since Birth | Ateba |
| 194 | Birhanu Molla | M | 25 | Married | Illiterate | General | Farmer | Since Birth | Ateba |
| 195 | Tsehayu Zewdie | M | 26 | Single | Illiterate | General | Farmer | Since Birth | Ateba |
| 196 | Genet Mewesha | F | 36 | Married | 8th Drop | Key | Merchant | Since Birth | Ateba |
| 197 | Melaku Werkneh | M | 24 | Single | Illiterate | General | Farmer | Since Birth | Ateba |
| 198 | Fetlework Shetie | F | 48 | Married | Illiterate | General | House Wife | Since Birth | Ateba |