

JIMMA UNIVERSITY



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Department of Biology

Ethnobotanical Investigation of Medicinal plants Used
to Treat Human and Livestock Ailments in Duna
District, Hadya Zone, SNNPRs, Southern Ethiopia.

A Thesis submitted to the Department of Biology, College of Natural Sciences,
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Masters of Science in Botanical Sciences

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APPROVAL SHEET

This is to certify that the thesis entitled as the "Ethnobotanical investigation of medicinal plants used to treat human and livestock ailments in Duna district, Hadya zone, SNNPRs, South Ethiopia." submitted to Jimma University for the award of the degree of Master of science (Msc.) and is a record of genuine research work carried out by Mr. Abebe Awoke, under our guidance and supervision.

Therefore, we hereby declare that no part of this thesis has been submitted to any other university or institutions for the award of any degree or Diploma.

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Table of Contents

APPROVAL SHEET	i
ACKNOWLEDGEMENT	ii
Table of content	iii
List of tables	vii
List of Figures	vii
Appendices.....	x
LIST OF ABBREVIATIONS AND ACRONYMS.....	xi
<i>ABSTRACT</i>	xii
1. INTRODUCTION	1
1.1. Background of the study	1
1.2. Statement of the problem	3
1.3 RESEARCH QUESTIONS.....	4
1.4 objectives of the study	4
1.4.1. General objective	4
1.4.2 Specific objectives	4
1.5 Significance of the study.....	4
1.6 Scope of the study	4
2. LITERATURE REVIEW	5
2.1. Origin and development of Ethnobotany	5
2.2. Indigenous knowledge	6
2.3 Traditional Medicine.....	8
2.4 Role of traditional medicine for human health care services	9
2.5 Role of medicinal plant species in ethnoveterinary services	10
2.6 Ethnobotanical investigation of medicinal plant in Ethiopia	11
2.7 medicinal plant species as a base for development of modern drugs.....	12
2.8 Threats of medicinal plants	13
2.9 Conservation of medicinal plant resources	14
3. Materials and Method	15
3.1 Description of the study area	15
3.1.1 Geographical location	15
3.1.2 Soil and Topography	16
3.1.3 Climate.....	16

3.1.4 Vegetation of the study area.....	16
3.1.5 Population and economic activitie	16
3.1.6 Human health care service	17
3.1.7 Land use.....	17
3.1.7.1 Agriculture	17
3.1.7.2 Livestock.....	19
3.1.7.3 veterinary services.....	19
3.2 Materials to be used	19
3.3 Reconnaissance survey and site selection	19
3.4 Sampling of informants.....	20
3.5 Data collection	20
3.5.1 Semi-structured interviews	20
3.5.2 Focus group discussion	20
3.5.3 Field observation.....	21
3.5.4 Plant specimen identification	21
3.6 Data Analysis	21
3.6.1 Descriptive statistics	21
3.6.2 Informant consensus factor (ICF)	21
3.6.3 Preference Ranking.....	22
3.6.4 Direct matrix ranking.....	22
3.6.5 Paired comparison.....	23
3.6.6 Fidelity level (FL)	23
3.7 Ethical Considerations	24
4. RESULT AND DISCUSSION	25
4.1 Summary of information about informants in the study area	25
4.1.1 Age of the informants	25
4.1.2 Occupation of the informants.....	25
4.1.3 Religion.....	26
4.1.4 Marital status.....	26
4.1.5 Educational level of informants	26
4.2 Knowledge of local people on health.....	27
4.3 Taxonomic diversity of medicinal plants in the study area.....	27
4.4 Growth form of the plant species in the study area.....	30

4.5 Plant parts used	31
4.6 The condition of plant materials to prepare herbal remedies	32
4.7 Method of preparation.....	33
4.8 Route of administration.....	34
4.9 Method of application of herbal medicine	35
4.10 Medicinal plants used to treat only human ailments.	36
4.10.1 Growth form.....	37
4.10.2 Plant parts used	38
4.10.3 Method of preparation of remedies	38
4.10.4 Rout of administration of species used to trea humanr ailments.....	39
4.10.5 Method of application	40
4.11 Medicinal plant species used to treat live stock health problems	41
4.11.1 Habitat of the plant species	41
4.11.2 Growth form of the plant species	42
4.11.3 Plant parts used for preparation.....	43
4.11.4 Methods of preparation of herbal remedies	43
4.11.5 Rout of administration	44
4.11.6 Methods of application.....	45
4.12 Medicinal plants used to treat both human and livestock ailments.....	45
4.12.1 Growth form and parts of the plants used for both human and livestock ailments	45
4.12.2 Methods of preparation, Rout of administration and application.....	47
4.13 Informant Consensus	50
4.14 Informant Consensus Factor (ICF)	52
4.15 Fidelity level index	53
4.16 Preference ranking	53
4.17 Direct matrix ranking.....	54
4.18 Paired comparison.....	57
4.19 Dosage use, antidotes and side effect of medicinal plant.....	58
4.20 Local beliefs and taboos for gathering and application of plant remedies.....	59
4.21 Threats on medicinal plants and indigenous knowledge transfer	61
4.21.1 Major threats of medicinal plant	61
4.21.2 Threatened medicinal plants	61
4.21.3 Indigenous knowledge of medicinal plant Transfer.....	62

4.21.4 Conservation of medicinal plants.....	63
5. CONCLUSION AND RECOMMENDATION.....	64
5.1 Conclusion	64
5.2 Recommendation	65
7. REFERENCES	66

List of Table

Pages	Tables
Table.1 Major food crop grown in the study area.....	18
Table.2 Age of informants in the study area.....	25
Table.3 occupation of the informants.....	25
Table.4 Religion of the informants.....	26
Table.5 Marital status of informants.....	26
Table.6 Educational levels of informants.....	27
Table.7 Medicinal plant species in different familie.....	28
Table.8 Habit of medicinal plant species used to treat livestock ailments.....	44
Table.9 The result informant consensus on medicinal plants in the study area.....	51
Table.10 Informant consensus factor (ICF).....	52
Table.11 Preference ranking of six selected medicinal plants used to treat Fibrillness.....	54
Table.12 Direct matrix ranking of six plant species.....	55
Table.13 Paired comparisons of six medicinal plant species.....	58
Table.14 Ranking of factors threatening medicinal plants species.....	61
Table.15 Ranking of threatened medicinal plants species in the study area.....	62

List of Figures

Figures	Pages
Figure1 .Map of study area.....	15
Figure2. Proportional number of medicinal plants used for human and livestock.....	29
Figure3.Proportional number of medicinal plants collected from different habitats.....	30
Figure4.Growth form of medicinal plant species in the study area.....	31
Figure5. Plant parts used.....	32
Figure6. Conditions of remedies preparation from plant materials.....	33
Figure7. Mode of remedy preparation in the study area.....	34
Figure8. Route of administration medicinal plant remedies.....	35
Figure9. Application ways of medicinal plants in the study area.....	36
Figure10. Habitat of medicinal plants used for only human being.....	37
Figure11. Growth form of medicinal plants used to treat human ailments.....	37
Figure12. Plant part used only for Human ailments.....	38
Figure13. Methods of preparation of remedies.....	39
Figure14. Rout of administration of plant remedies.....	40
Figure15. Methods of application.....	41
Figure16. Habitat of the medicinal plants for livestock ailments.....	42
Figure17. Plant parts used for treatment of livestock ailments.....	43
Figure18. Methods of preparation.....	44
Figure19. Rout of administration.....	44
Figure20 Methods of application of the plant remedies for livestock ailments.....	45
Figure21. Growth form of the medicinal plants.....	46
Figure22. Plant parts used to treat both human and livestock ailments.....	47

Figure23Methods of preparation of remedies for human and livestock ailments.....	.48
Figure24. Rout of administration49
Figure25 Ways of application of remedies for both human and livestock ailments.....	.49

Appendices

Appendice1. List of human and livestock disease in the study area.....	75
Appendice2. List of medicinal plant species in the study area.....	78
Appendice3. Medicinal plant species with their collection numbers and altitude.....	105
Appendice4. List of Informants in the Study Area.....	116
Appendice5.Semi-structured Interview Question for Collecting Ethnobotanical data.....	121

LIST OF ABBREVIATIONS AND ACRONYMS

DDHO	Duna district health office
DDANRDO	Duna District agriculture and natural resources development office
DDCTO	Duna District Culture and Tourism office
DDFEPO	Duna District forest and environmental protection office
DDLFRDO	Duna District livestock and fish resources development office
FGD	Focus group Discussion
FLI	Fidelity Level Index
Ha	Hectare
HZSA	Hadya Zonal statistical Abstract
ICF	Informant Consensus Factor
IK	Indigenous Knowledge
R	Respondent
STDs	Sexually transmitted diseases
SNNPRs	South Nation Nationality People`s Regional State
UNEP	United Nations Environmental Program
WHO	World Health Organization

ABSTRACT

*An Ethnobotanical investigation on traditional use of medicinal plants and associated indigenous knowledge to treat human and livestock ailments was conducted on the people of Duna District, Hadya Zone, South Nation Nationality People's Regional State (SNNPs), in the Southern Ethiopia. A total of 110 (85 males and 25 females) above the age of 20 were sampled from 11 kebeles and used for the study. Data was collected using semi structured interviews, field observations and focus group discussions. Informant consensus, preference ranking, paired comparison, direct matrix ranking and informant consensus factor (ICF) were calculated. A total of 116 medicinal plant species; of which 50 species from wild, 38 species from homegarden and 28 species were common for both habitats were identified and recorded. Of these 63 species were used for the treatment of human ailments, 43 species for both human and livestock ailments and 10 species were used to treat livestock ailments. Herbs were the most widely used plants, which were accounting for (45.68%) followed by shrubs (24.13%), trees (21.55%), climbers (6.89%) and epiphyte (1.72%). The most frequently used plant part was the leaves accounted for (40.5%) followed by fruit (11.2%). The most widely used method of preparation was crushing (34.48%). The most common route of medicine administration was oral (56.03%). The most commonly used application of medicinal plant was drinking (37.93%). There was high preference for *Ocimum lamiifolium* in treating fibrillness while paired comparison showed *Echinops kerebicho* Mesfin the most preferred species in treating acute sickness. *Eucalyptus globulus* was shown the most multipurpose use species while agricultural expansion was considered as major threat to plants in general and medicinal plants in particular. Awareness creation on valuing indigenous knowledge and plant resources should be encouraged.*

Key word: *Ailments, Ethnobotany, Duna district, Indigenous knowledge, Medicinal plants.*

1. INTRODUCTION

1.1. Background of the study

People in different parts of the world depend on plant resources for their survival and are aware of many useful plant species occurring in their surroundings. Then they have continuously built their knowledge on traditional use of plant resources, its management and conservation (Cotton, 1996). This knowledge which, were developed through time around the plant resources in their surrounding is known as Ethnobotanical knowledge. Ethnobotany is defined as the study of local people`s interactions with the natural environment in their surrounding; how they care, classify, manage and use plants available around them (Martin, 1995). Over a centuries, indigenous people have experienced their own locality specific knowledge on plant`s care, use, management and conservation (cotton, 1996). The complex knowledge, beliefs and practices generally known as indigenous knowledge or traditional knowledge develops and changes with time and spaces with change of resources and culture. To show this Ethnobotanical investigations are useful in gathering, documenting, analyzing and disseminating knowledge and interactions between biodiversity and human society, how diversity in nature is used and influenced by human activities (Martin, 1995).

According to Mathewose Agize *et al.* (2013), plants are essential for multipurpose such as food, medicine, fuels, shelter, clothing, fodder, dyes, agricultural implements, narcotics, hunting, poisons, gums, fibers, income generation and the fulfilling of cultural and spiritual needs throughout the world. Local communities have indigenous knowledge in classification where they use their perception and experiences to classify plants. From their experience, a number of categorization and classification criteria were developed which is useful in plant diversity, conservation and management. The common criteria here include plants use, habit, habitat, color, abundance, morphological characteristics and combinations (Martin, 1995; Cotton, 1996). Furthermore the use of plants in medicinal sector by local people over the past period takes a huge concern as they have long year linkage of utilization and management. This has been achieved through many generations of age old, time-tested practices and as a consequent accumulation of knowledge through a consecutive observation, interaction and innovations (Cunningham, 1996). There are about 258650 higher plant species are used as a medicinal plants (Shinwari, 2010). Plants are the best medicines to cure ailments because they contain drugs which are very effective against diseases and have no negative side effects (Gilani and Rahman, 2005).

Traditional knowledge of plants used by human beings is based on thousands of years practice by “check and fault”, people learnt how to distinguish and use plants, including those with a magic religious purposes. Therefore, the science of Ethnobotany deals with the complete relationships between people and plants and explores both the traditional botanical knowledge of local people and how they exploit plants for varieties of purposes (Amjad and Arshad, 2014). It emphasizes the dynamic relationships between botanical diversity and social and cultural systems (Husain *et al.*, 2008) and Ethnobotanists are increasingly focusing on the application of different quantitative and statistical approaches to understand and accumulate knowledge on valuable plants in certain communities (Ahmad *et al.*, 2014). Medicinal knowledge about plants is controlling the increasing attention and is recognized as a useful asset throughout the world for healing care properties as a reinforcer of the conservation of medicinal plants (Balick, 1996). For instance, ethnobotanical and Ethnopharmacological knowledge is considered to be a part of the knowledge necessary for drug synthesis. Ethnomedicine deals with traditional interpretation of health, disease and illness with a focus on different curing experiences or practices concerned with obtaining intended health (Thrumalai *et al.*, 2012). Despite the fact that cultural or traditional Ethnobotanical approaches may be considered to be out dated relative to modern westernized approaches to health care, the WHO report estimates that about 80% of the population in developing countries depend up on herbal medicine for curing ailments (Tangjitman *et al.*, 2015). Even in Ethiopia around 90% of population use and /or depend on traditional medicine due to the local accessibility of traditional practitioners, local pharmacopeias, the relatively low cost of traditional medicine and difficult to access the modern health facilities (WHO, 2002 and Endashaw Bekele, 2007). However, environmental degradation, over exploitation, overgrazing, fire, loss of forest and woodland, agricultural expansion, cultivation of marginal lands, over harvesting, industrialization, urbanization, population growth and others appear to be the major threats to the plant resources of Ethiopia. This threat poses a significant threat to the wellbeing of the human and animal population that have for generation, relied on these resources to combat various ailments (Endashaw Bekele, 2007).

Therefore, documentation of indigenous and related knowledge on the conservation and utilization of plant resources is required from each part of the region to know the major threats to useful plants and to share the general knowledge on conservation measures that have been taken

by the local people. As a whole, ethnobotanical study on medicinal plants in the country are limited as compare to the multiethnic and cultural diversity of the people, the diverse flora of the country and vital role played by the medicinal plants for the primary healthcare (Debela Hunde *et al.*, 2006).

1.2. Statement of the problem

Indigenous knowledge in using medicinal plant species is transferred secretly from generation to generation orally (UNEP, 2008); in developing countries like Ethiopia. So there is a gap in document and records of such valuable plant resources in different parts of our country. Furthermore the indigenous knowledge or traditional knowledge on using medicinal plants as remedies are getting lost due to migration of people from rural to urban areas, industrialization, habitat destruction, expansion of modern education and lack of willingness of traditional healers to convey their knowledge to next generation. In addition to that in most part of the country wild plant forests are declining at an alarming rate by human activities like, deforestation, agricultural expansion, population growth, over exploitation and likes. Then there is evident that loss of biodiversity. This problem is series in our part of the country and little has been done to document ethnobotanical knowledge which is the base for conservation of those useful plants and community development strategies.

This study was conducted in Duna district, Hadya zone of SNNPRs, Southern Ethiopia. The indigenous people of the area have diverse and local specific interaction with plants of their surroundings. However there was no research has been conducted on ethnobotanical study of medicinal plants and associated indigenous knowledge on utilization, threats and management of those useful plants in the district. Therefore the finding of this study would contribute to the people of the study area to be aware of the problems associated with those valuable plant species and develop the positive attitude of the people towards those useful plant species. In addition to that, the document of the finding can be a part of information sources for those who want to conduct a research on further ethnobotanical investigation and syntheses of modern drugs. Hence this study would be conducted to fill gaps in the documentation of ethnobotanical knowledge in the study area.

1.3 RESEARCH QUESTIONS

- Which plant species are used by local people and for what purposes in the study area?
- From where do the local people gather this plant resource in the study area?
- How the local people identify, collect, prepare and administer specific medicinal plants?
- Which part of the plants most frequently used for preparation of remedies?
- What are the factor currently threatening these plant resources?
- How the indigenous people conserve the useful plants?

1.4 objectives of the study

1.4.1. General objective

The general objective of this study was to assess and document the traditional use of medicinal plant species, their threats, conservation and associated indigenous knowledge of the local people in using medicinal plants to treat both human and livestock ailments

1.4.2 Specific objectives

1. To collect and identify different plant species used to treat human and livestock ailments.
2. To record and document indigenous knowledge of local people on using medicine from plant resources and specific informations on medicnally useful plants species.
3. To assess major threats and the role of management and conservation of useful plants.

1.5 Significance of the study

Until now, no Ethnobotanical investigation has been conducted on using medicinal plants in the area. So the finding of this investigation which is initial in the area, could create people of the study area to be aware of the problems associated with useful plant resources and would give attention for the threatened plant resources. Furthermore the documentation of the indigenous knowledge on plant resources would be the type of information sources for those who want to carry out a further investigation on the same issue and for the syntheses of modern drugs.

1.6 Scope of the study

The investigation was not included the whole area of Duna district. It was limited only on selected sites. Furthermore it was limited in content considering on traditionally using medicinal plants, parts of plants used for remedies, mode of preparation and dosage of administration. It did not go far to the chemical constituents and pharmacological properties and mechanism of action.

2. LITERATURE REVIEW

2.1. Origin and development of Ethnobotany

There has been an ever-increasing interest by naturalists, botanists, anthropologists and explorers throughout the world to record and document the potential sources or economic sources of plants used by indigenous people (Cotton, 1996). Christopher Columbus interested this at 1442 when he discovered the potential use of tobacco plant (*Nicotiana* species) by indigenous people of Cuba. Around 1858 British traveler, R. Spruce recognized for the first time the psychoactive characteristics of the vine plant (*Banisteriopsis*) (Cotton, 1996). Such investigation gradually built a tough base to scientific study of the interaction between people and other organisms through recording, documenting analysis and use of indigenous knowledge of biological organisms. Eventually, the work in Ethnobotany promoted this subject to be an independent field in biological sciences. Though the term “Ethnobotany” was not coined until 1895 by the US botanist John William Hershberger, the origin of the field begins long before that may be as early as Neanderthalman, plants were believed to have healing powers. The ancient recorded uses are found in Babylon circa 1770 B.C in the code of Hammurabi and in ancient Egypt circa 1550B.C (www.acessexcellence.org). Therefore different author used different ways to defining the term Ethnobotany. However, still now definitive agreement in its justification has not been reached.

This rooted logic, that different justification and definitions has been given for the term Ethnobotany is depending on the need of the investigators involved in the study (Cotton, 1996). Another researcher, Martin (1995) widely defined the term, Ethnobotany as the subject dealing with the science of direct interaction between humans and plants. Furthermore, Balick and Cox (1996) elaborated this field of science by including the use of plants for food, medicine, fodder and any other economic value within the field of Ethnobotany.

As Cotton (1996), Ethnobotany includes all studies that deal with the mutual relationships between plants and cultural people. According to the work of Balick and Cox (1996) investigation concerned with Ethnobotany involves documenting the knowledge on the cultural interaction of people and plants, finding how local people have culturally used plant resources for different purposes and how they incorporate plant resources in to their culture and beliefs. Anyhow to obtain detailed and factual information around this concern, Ethnobotanical research needs to incorporate investigators from different field of studies, like plant taxonomy, plant

ecology, pharmacology, linguistic, anthropology, economic botany, geography, mathematicians and the like (Martin, 1995). There are different techniques of inquire tools based on the aims, objectives and goals of the ethnobotanical investigation at hand (Martin, 1995; Alexiades, 1996). This inquire techniques encompasses participant observation, field interviews, group discussion, simulation, checklist interview and market survey.

The focus of Ethnobotany on plants is how they have been used, managed and perceived by human societies Balick and Cox (1996). Generally Ethnobotany is the scientific study of plants as used by indigenous knowledge for food, medicine, shelter, textile, clothing, rituals, household utensils, building, musical instruments, cosmetics, firewood, pesticides, dyeing, currency, aesthetic value, spices and other purposes. Furthermore, this discipline of study analyzes the result of indigenous manipulation of plant materials in line with the cultural context in which plants are used (Balick and Cox, 1996). The field of study is multidiscipline which is related with almost all branches of natural sciences, it searches to find out the secret knowledge of the local people on plant resources that can be the base of multipurpose development of the society (Aryal, 2009).

As Balick and cox (1996) stated that Ethnobotanical study documents the knowledge on cultural interaction of human being with plants and discuss on how local people have traditional knowledge on using the valuable plant resources for different purposes and how they incorporate plant resources in to their cultural and religion. Researches on Ethnobotany are often significant in revealing locally useful plant species particularly for the discovery of the drugs. Application of the field can lead to a strengthening of traditional diversity conservation, proper sustainability in exploitation of plant resources and the synthesis of new plant products (Hamilton, *et al.*, 2003). The field of Ethnobotany is highly growing discipline that attracting people from varying academic background and interest (MacDonald, 2009) and currently it has tended to became more analytical, quantitative, cross disciplinary and multi institutional (Hamilton, *et al.*, 2003)

2.2. Indigenous knowledge

Indigenous knowledge (IK) can be defined as the knowledge that is particularly unique to a certain culture or society which serves as a base for agriculture, food preparation, health care, education, environmental protection, natural resources conservation and other life experiences on local stage (Thomas, 1995). The terms used in the study of sustainable development to

indicate this concept encompasses local technical knowledge, traditional environmental knowledge, rural knowledge, and farmer`s knowledge or pastoralist`s knowledge. It refers to the accumulation of knowledge, attitudes, skills, rules, standards and mental setups that are possessed by local people in a certain area (Quanash, 1998).

Currently indigenous knowledge is assumed to be traditional knowledge in its comprehensive sense including the social aspects, political aspects, economic aspects and spiritual aspects of a cultural way of life. However, the researchers around sustainable development have found that indigenous knowledge to be of specific interest; the knowledge of managing resources and the tools, techniques, practice, skills, experiences and rules and regulations related to pastorals, agriculture, agroforestry water resources management and collecting of wild food; identification and classification systems for animals, plants, soils, water and climatic condition; detailed knowledge of flora, fauna, and inanimate resources and their potential uses and the recognition of the world or the direction that indigenous people understand its relationship to the natural world (Emery, 1996). Indigenous knowledge is an essential stand point for development projects and serves as a base for better innovation and adaptation of technologies. Furthermore, it is used as springboard for scientific knowledge, increases awareness between researchers and local people; among researchers and among local people, built the local potential to experiment and innovate and empowers local people (Warburton and Martin, 1999).

The necessity of indigenous knowledge system is its adaptive skills or techniques for local people acquired informally through direct interaction with the natural environments (Zemedede Asfaw and Tigist Wondimu, 2007). Among those popularly used indigenous knowledge skill in many countries one is knowledge and application of traditional medicine, which is known as ethnomedicinal knowledge that involves traditional diagnosis, gathering of raw materials, preparation of remedies and its prescriptions to patient (Farnsworth, 1994). According to Shinwari (2010) the indigenous knowledge of plants has been transferred from one generation to next generation through oral communication and personal experience.

As Martin (1995) stated that the immediate and intimate dependence of indigenous people on local resources resulted in the accumulation of indigenous knowledge which supports the people to adapt and survive in the areas in which they inhabited. However, the incorporation of indigenous knowledge in to scientific knowledge needs the extraction of useful knowledge

through a process of scientific validation and evaluation in order to screening out the unbiased information, objective from subjective and the indigenous science from indigenous belief (Nakashima, 2007).

2.3 Traditional Medicine

World health organization (WHO, 2008) stated the term traditional medicine as “the sum total of all knowledge and practice either explicable or not, used the diagnoses, prevention and elimination of physical, psychological or social disturbance and completely depends on practical experiences and observation handed downwards from generation to generation either verbally or in writing. “This system of health care is alternatively called as folk medicine, Ethnomedicine or indigenous medicine. “

As Fassil Kebebew (2001) explained that, about 75-90% of the rural population in the world excluding the western countries depend up on traditional medicines only for their health care system. This is not only because of poverty where people are unable to afford to buy costly modern drugs but also traditional knowledge is more culturally valued and meet mental interest in a way modern medicine does not. The application of traditional medicine is more substantial in developing countries. However, its application is widely spread in developed countries, like China, India, Pakistan, Japan and likes. It is a part of the people`s culture despite the fact that it is not as well organized as India and China.

The traditional medicines play a crucial role in the lives of many people in the context of health care, income generation and livelihood security (Hamilton *et al.*, 2003). Plant resources in general and medicinal plants in particular are fundamental and most crucial to almost all life on earth. One of its most significant uses is the phytomedicinal role, i.e., product of medicinal plants. Ethnomedicines are not necessarily safe since they are “natural” and have a long history of use (Dawit Abebe, 1986). Because the measurements used to determine the dosages are not standardized and depend on age, sex, and physical appearance of the patient, sociocultural justification of the illness, experience and diagnosis of individual herbalist (Dawit Abebe and Ahadu Ayehu, 1993).

2.4 Role of traditional medicine for human health care services

Traditional medicines are considered as easily affordable and accessible source of treatment in traditional diagnosis of resources poor communities and the local therapy is the only option of medical treatment for such communities. As Haile Yineger *et al.* (2008) indicated that, the availability of modern health care services is not only insufficient but also inaccessible and unaffordable for the majority of them. This concept is common in Ethiopia where 80% of population still now depends up on plant resources to treatment of different health problems. The reasons that developing countries inclining to and favoring medicinal plants are because of inaccessibility and unaffordability of modern health services and cultural influences (Dawit Abebe, 2001).

Medicinal plant resources attract and hold up the attention of many people by being as a source of health problems prevention, food security, financial support and others (Abdulhamid Bedri *et al.*, 2004; Hamilton, 2004). The value of plant resources have been indispensable and are most useful sources of both preventive and curative traditional medicine preparation sources for people's health problems since time immemorial. Therefore all these importance of plant resources are directly or indirectly related with health care systems (Kelbessa Urga *et al.*, 2004). Furthermore health care and botany (particularly Ethnobotany) have originated as inseparable domain of human activities because many plant resources are paramount valuable in health care systems.

As estimation of World Health Organization (WHO, 2008) about 80% of the world's people depend particularly on traditional medicine, more of plant sources to fulfill their primary health care requirements (Duke, 1992). According to Mekonnen Bishaw (1980) and Tesema Tanto *et al.* (2003) there are about 80% of the population in Ethiopia depend on traditional medicine for their health care services. This is not only in Ethiopia but also throughout the world and in developing countries particularly in tropical Africa, using plants origin traditional medicine is common and back bone of cultural therapy, however the degree of using is not uniform throughout the world. Because of majority of the people in the world depend on those medicinal plant resources for their health care, the global importance and utilization of those medicinal plants has considerably increased in the last few decades. Besides their pivotal role in the health care provision they have also economic advantage to world population (Medihn Zewdu *et al.*,

2001). These plants are commonly traded in different forms in different parts of the world. Recently many medicinal plant species have been found their ways as raw materials for modern bio-pharmaceutical industries (Rai *et al.*, 2000). Ethiopia is not well known in developing the rule and regulation for importing and exporting medicinal plant resources in advance.

The degree of interest or magnitude towards medicinal plant resources depend up on socio-cultural accessibility, affordability and biomedical benefit in Ethiopia (Dawit Abebe, 2001). That means almost in all parts of developing countries, traditional medicine has high acceptability because it is an integral part of local culture and then people often relay on its effectiveness and it is also less costly alternative health care system with respect to modern health services (Konno, 2004). Because of its easily accessibility, affordability and less cost effectiveness relative to modern medical services, most people in Ethiopia depend on the medicinal plant resources for treating their livestock and human ailments (Dawit Abebe, 2001).

2.5 Role of medicinal plant species in ethnoveterinary services

Ethnoveterinary medicine is one of the most important way by which health problems of livestock can be prevented. It refers to traditional animal health care knowledge practices comprising traditional surgical and manipulative techniques, cultural immunization, magic religious practices and beliefs, management skill and the importance of herbal remedies to prevent livestock diseases, (Tefesse Mesfine and Mekonnen Lemma, 2001).

Ethnoveterinary medicine provides traditional medicines which are locally accessible and cheaper than modern treatments. Livestock disease has been justified as a series constraint to micro-level economic development in Africa and the well-being of millions of poor livestock keepers (Andy, 1999). The production of livestock plays a crucial role in livelihood and economy for majority of Ethiopians. Ethiopia is one of the leading countries of Africa in livestock population (MirutseGiday and Gobena Ameni, 2003). But it is one of the countries in the world with the lowest output. This is because of poor health condition and its livestock has potentially been responsible for the low productivity (Mirutse Giday and Gobena Ameni, 2003). Modern expensive drug is not affordable for majority of Ethiopian farmers and pastoralists. Therefore, they depend on the traditional knowledge practices and locally available medicinal plant resources to prevent disease from their livestock (Mirutse Giday and Gobena Ameni, 2003).

However, for life long livestock health care systems the different traditional veterinary practices remained undocumented in Africa and in Ethiopia (Dawit Abebe and Ahadu Ayehu, 1993). Thus awaring the people on this issue focusing on useful plant resources for treatment and management of livestock is paramount important. Furthermore the proper documentation and understanding of farmer`s knowledge experiences, attitude and practices about the occurrence, cause, diagnosis, treatment, prevention and control of different ailments is important in designing and implementing successful livestock production (Tefesse Mesfine and Mekonnen Lemma, 2001).

2.6 Ethnobotanical investigation of medicinal plant in Ethiopia

It is known that Ethiopia is a country with mosaic geographical setup which allows the presence of diverse flora and fauna, diverse culture and ethnic groups. Furthermore it is a country of Lucy, Selam, and Ardi which signifies the country to be the origin of human being is not that much exaggeration to have a multiple culture and indigenous knowledge (Dawit Abebe and Ahadu Ayehu, 1993). This indigenous experience integrated with plant resources based health care systems in use since time immemorial (Dawit Abebe, 1986), and was expected to be the only option available for health care before the introduction of allopathic medicine to be cured from diseases caused by worms, fungi, virus and protozoa (Dawit Abebe, 2001). According to this researcher 80% of the population in Ethiopia depend on traditional medicine as a primary health care service. Beside to this World Health Organization (WHO, 2002), report showed that about 90% of the Ethiopian use traditional medicinal plant resources for their primary health care. This figure is more than other developing countries utilization status, like Benin (70%), Rwanda (70%), Tanzania (60%) and Uganda (60%). This information indicated that the status of using traditional medicine in Ethiopia for primary health becoming accepted and popular relative to other African countries. As Mesfin Tadesse and Sebsibe Demissew (1992), stated that research and documentation on medicinal plants has been begun very recently. Still the studies of the Ethiopian medicinal plants have not been realized as fully as like India or other traditional communities elsewhere (Iwu, 1993). However, now a day many researchers have been interested on medicinal plants. Some of them, those documented the knowledge of indigenous people on medicinal plant resources from different parts of the country are Amare Getahun, 1976; Dawit Abebe, 1986; Dawit Abebe and Ahadu Ayehu, 1993; Mirutse Giday, 2001; Belachew Wassihun *al.*, 2003; Debela Hunde *et al.*, 2004; Kebu Balemi *et al.*, 2004; Tizazu Gebre, 2005; Haile

Yineger and Delnasaw Yehwalaw, 2007; Endalew Amenu, 2007; Tilahun Teklehaymanot and Mirutse Giday, 2007; Etana Tolessa, 2007 ; Haile Yineger *et al.*, 2008; Fisseha Mesfin, 2009; Mirutse Giday *et al.*, 2009; Tesfaye Hailemariam *et al.*, 2009; Teferi Flatie *et al.*, 2009; Gidey yirga, 2010; Matheows Agize *et al.*, 2013; AbadiBirhanu and Haji Fato, 2017;etc

2.7 medicinal plant species as a base for development of modern drugs

Ethnopharmacology is a field of investigation that deals with drug discovery which involves the observation, description and experimental investigation of traditional drugs and their biological role. This science is rooted on the sciences, like botany, chemistry, biochemistry, anthropology, archeology, linguistics and the likes that support the discovery of natural products with biological activities (Vllientik and Vanden, 1991). This field of study is the cross-cultural investigation of how people extract medicine from plants, animals, fungi or any other naturally existing resources (Casagrand, 2005).

Berhanemeskel Weldegerma (2009), report showed that, searching new drug from traditionally known medicinal plant resources can be the shortest and easiest path to success and the indigenous people remain the ultimate sources for retrieving this information for the purposes of application particularly in modern medicine. According to Mahesh and Satish (2009), the number of higher plant species estimated to be 250,000-500,000. From this only 6% have been identified for biological activity and a reported 15% have been phytiochemically evaluated (Fabricant and Farnsworth, 2001). Their finding estimated that about 25,000 to 75,000 species of higher plants have been used as medicinal plants. In fact traditional knowledge of medicinal plants is important in development of new drugs. As Balick and cox (1996), stated that about 80% of the drugs prescribed in the industrialized world as a whole, most of them were discovered based on the information originated from ethnobotanical studies. Medicinal plant resources have a pivotal role in synthesis, development and advancement of modern drug investigation by being initial point for the development of novelties in drug (Wright, 2005). At an average 25% of new drugs incorporate one or more active principles from plants (Medihn Zewdu *et al.*, 2001). Different new drugs were synthesized from medicinal plants by using plant materials as indigenous cure in folklore or traditional technique of medicine (Verma and Singha, 2008). Furthermore, it is believed that half of the top 25 best commercial medicines in the world originated from natural materials including plant resources (Ohigashi, 2008).

According to Roberson (2008). Among the top 150 prescription drugs in USA, at least 118 are based on natural resources. For example Quinine which is used to treat malaria was extracted from the bark of Cinchona tree, has long played a crucial role. Even though Ethiopia has a rich source of medicinal plants, the knowledge and use of plants are an integral part of most ethnic rural cultures and the extent of which has not yet been investigated in depth (Abbink, 1995). May be the best known species is *Phytolacododeandra*. Extracts of plants, commonly known as endod is used as an effective mollucides to control shistomiasis (Aklilu Lemma, 1970) and Maytansine, an active principle against cancer was extracted from *Maytenus* species (Sebsibe Demissew and Ermias Dagne, 2001). Therefore the synthesis, development and advancement of new drugs in associating it with traditional medicinal plant resources is best option in order to alleviate the health problems.

2.8 Threats of medicinal plants

According to Ensermu Kelbessa *et al.*, (1992), Ethiopian`s traditional medicinal plant resources, as elsewhere in Africa, is facing a problems of sustainability. The major causes of this problem are loss of habitat of medicinal plants and then loss of medicinal plants and loss of indigenous knowledge. Certain investigations have been shown that most of the medicinal plants utilized by Ethiopian people are gathered from wild habitats. As Zemedede Asfaw (2001), stated that apart from medicinal value, people use many wild plant species for different purposes, like food, clothing, shelter, fuel, fiber, etc. therefore medicinal plants are considered to be at conservation risk due to extra use and destructive harvesting and also root and bark collection may kill the plant during harvesting (Zemedede Asfaw, 2001). As Kebu Balemi *et al* (2004), finding report showed that in Fentalle area medicinal plants were threatened due to drought, harvesting for charcoal, firewood, agriculture, house use, trades and like. Declining in traditional knowledge and utilization of medicinal plants in zay people is because of environmental degradation and intense deforestation (Mirutse Giday, 2001). The indigenous knowledge for the medicinal plant resources is affected by modern education (Debela Hunde *et al.*, 2004).

As Tesfaye Hailemariam *et al.* (2009) showed that elders who are 45-50 years old have handled most of the knowledge on medicinal plant remedies. It is obvious that ethnomedicinal knowledge is concentrated in the elders of the community and its transfer from elders to younger generation is relatively difficult. According to Mirutse Giday *et al.* (2009), the traditional medicinal

knowledge and practice in young generation become a major threats. In fact, ethnomedicinal knowledge diminishes with the death of elderly knowledgeable members of the community, since a few members of young generations are willing to acquire the knowledge.

2.9 Conservation of medicinal plant resources

According to the work of Cunningham (1993), there have been some conservation measures undertaken around the world which are purposely designed to protect threatened medicinal plants from more damage. However some conservation activities like cultivation of medicinal plants in and around home garden and refrain from destructive uses of medicinal plants as well as exercising of in-situ conservation of medicinal plants, protection of fire and telling to concerned body if anyone is found cutting prohibited trees like *Hagenia abyssinica* and *Junipers procera* (Haile Yineger *et al.*, 2008).

As Zemedet Asfaw (2001), showed home gardens are strategic sites for in-situ and ex-situ conservation of traditional medicinal plant resources. For certain traditional medicinal plants in-situ conservation preferable may be due to the difficulty for domestication and management or failure to produce the sufficient amount and quality of the active principle under cultivation (Zemedet Asfaw, 2001); who showed that ,in ex-situ conservation method, traditional medicinal plants can be conserved in gene banks, botanical gardens and field gene banks. Furthermore the conservation measure should be taken by government officers, non government officers (NGO), educators and likes to reduces the threats of existing medicinal plants (Seyoum Getaneh, 2009). As Mirutse Giday *et al.* (2009) recommended that awareness should be created among the youth on the potential value of the traditional medicinal plants in fulfilling the primary health care services. Moreover, since young generation lack interest to know about traditional medicinal plants, then effort should be made in order to integrate traditional medicine in school curricula so that youth can appreciate its usefulness (Mirutse Giday, 2009). In order to ensure conservation of the declining medicinal plants the indigenous knowledge and making herbaria should be documented for future use (Muthuswamy and Solomon Mequanente, 2009).

3. Materials and Method

3.1 Description of the study area

3.1.1 Geographical location

The study was conducted in Duna District, Hadya Zone, South Nation Nationality people`s Regional state (SNNPRs), in the Southern Ethiopia at a distance of 277km from Addis Ababa, 211km from the Regional City(Hawassa) in the South West and 42km from the Zonal Town(Hosanna). The total area of the District land is estimated to be 43,104 hectares (222.5 square kilometers). Geographically the District lies between 7°10' 30"N -7°28' 0"N latitude and 37°35 ' 0"E - 37°47 '30"E longitudes (Fig.1). Duna is one among 13 Districts found in Hadya Zone, was established in 2002. It has 32 kebeles including 1 urban (Ansho town). The District currently shares boundaries with Soro District (Hadya Zone) in the North, Doyogena District (Kembata Tanbaro Zone) in the South, Tanbaro District (Kembata Tanbara Zone) in the west and Soro District (Hadya Zone) in the east.

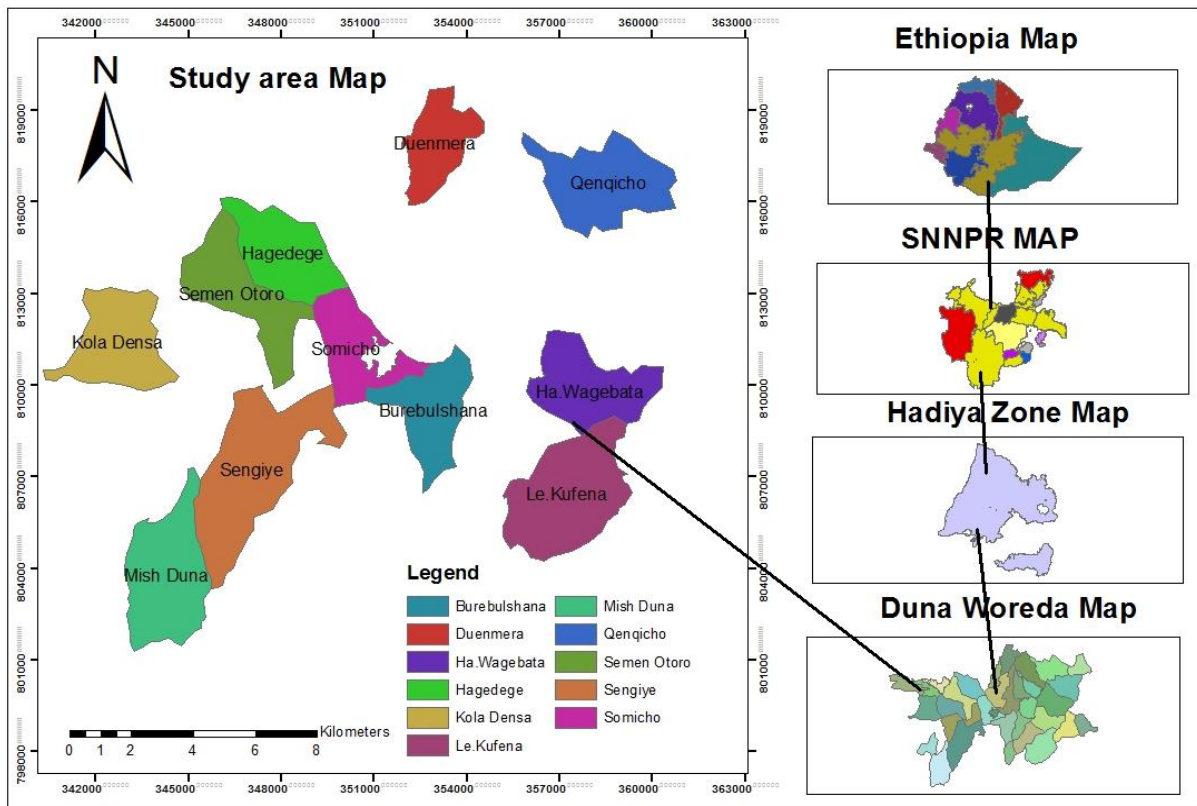


Figure 1 map of study area.

3.1.2 Soil and Topography

Duna District has different topographic features including mountain, plain land and hilly and also river gorges (DWLEPO, 2019).

Three types of soils have been recognized in the districts such as Clay soil (34.6%) followed by Vertisols (32.1%) which is characterized by its vertic nature and water logging property. This soil is too hard when dry and too heavy when wet. This soil has two classes: black vertic soil and red vertic soil. Black is highly vertic and also more water logging character than red. Mollisols is a dark top soil with high organic matter content. This soil is more fertile and suitable for almost all the crops (Erkossa Teklu and Ayele Getachew, 2003). The third type of soil is loam soil (33.3%). It is the most fertile and productive soil

3.1.3 Climate

Agro ecologically, the District was classified in to three categories like as Dega (highland) 85%, Weinadega (midland) 10% and kola (lowland) 5% and its raining seasons are from March to September with annual rainfall ranges from 1001mm to 1400mm based on 7 years (2010 – 2017) data of National Meteorological Service Agency (NMSA, 2017). The elevation of the district ranges from 1000 meter above sea level to 2970 meter above sea level. The average elevation of the District is taken as to be 2619 meter above sea level. Temperature of the District ranges from 10° c to 18° c in a wet season and 20°c to 25°c in a dry season.

3.1.4 Vegetation of the study area

The vegetation of the study area consists of various shrubs, trees and herbaceous species. Some common plant species in the District were, *Eucalyptus globulus*, *Juniperus procera*, *Ficus spp*, *Olea europea spp*, *Podocarpus falcatus*, *Acacia abyssinica*, *Cordia africana*, *Croton macrostachyus*, *Calpurnia aurea*, *Vernonia spp* and *Hagenia abyssinica*. The vegetation of the study area are degraded due to agricultural expansion, urbanization, over grazing, timber production, high demand of wood for construction, firewood and charcoal.

3.1.5 Population and economic activities

According to SNNPRs, Hadya Zonal statistical Abstract, 2014-2015 (HZSA, 2015), total population of the District is 157936 of which 78755 (49.87%) are male and 79181 (50.13%) are female and 149125 (94.42%) live in rural and 8811 (5.58%) are living in urban setting. Regarding to religion 88.38% of the total population are protestant, 7.95% are catholic, 3.32% are orthodox and 0.56% are Muslim. About 95% of the total population belongs to Hadya ethnic group. The majority people of the District are Hadyisa language speakers. The majority (85%) of the people in the District are mainly depend on mixed farming (both crop and livestock production) with traditional farming system economy. Next to agriculture petty trade is also a common income sources for the people in the District. The population density of the District is

619.58 per s/km. Out of 43,104 hectares of the land potentially cultivated land is 30172.8 hectares (70%).

3.1.6 Human health care service

There are four health station and 32 health posts in the district. The report from the office showed that 157936 people are assisted by these services, which covers only 60% of the population. The service does not cover the need of 40% of the total population in the study area. In addition there are private health services even though their standard is under question. Private health facilities of the district as recorded; there are three medium clinics, four lower clinics, one drug store and five rural drug vendors. (DDHO, 2018).

According to Duna district health office, the first ten major diseases such as Stomachache, diarrhea, tonsillitis, gastritis, typhoid, internal parasite, malaria, skin rash, rheumatism and STDs have been identified in Duna district. These diseases mostly affect people living in the rural areas where the health services are scanty and do not satisfy their needs; as well they are unable to afford the high cost of modern drugs (DDHO, 2018).

3.1.7 Land use

In the study area Land inheritance and ownership from generation to generation is culture based and only males inherit family's land except the one who doesn't born males and the unmarried females who are living with their parents for a long time. Therefore this enables males to have a power to inherit, conserve and preserve resources on family land. People of the district use and classify their land through their functional categorization as grazing land, agricultural land, browsing land and forest land. Of the total area 30172.8ha under crop production, 282.739ha forest land, 6656.20ha grazing land, 1024.032hr arable land and 4968.232hr stony land.

3.1.7.1 Agriculture

The most agricultural crop production dominantly practiced in highland and midland areas and also livestock rearing is more practiced in lowland areas. The District has two major cropping season such as Belg season and Maher season for short and long rainy seasons respectively. The Belg season land preparation for crop cultivating usually starts in February and planting in March with short season crop and short maturing barley, maize and potato while Maher season land preparation begins in April and planting in July (DDANRDO, 2018) .The major crops grown in the study area are cereals, pulses, oilseeds, vegetables, fruits and spices(Table.1)

Table 1 Major food crops grown in the study area

Types of crops	Scientific name	Common name	Local name
Cereal crops	<i>Triticum aestivum</i> L.	Wheat	Aresa
	<i>Hordeum vulgare</i> L.	Barely	So`o
	<i>Zea mays</i> L.	Maize	Bokolla
	<i>Sorghum bicolor</i> Lr	Sorghum	Sarata
	<i>Eragrostis tef</i> (zucc.)Troteer.	Teff	Xaaffe`e
Pulse crops	<i>Vicia faba</i> L.	Horse beans	Baaqeela
	<i>Pisum sativum</i> L.	Field pea	Atara
	<i>Phaseolus vulgaris</i> L.	Haricot beans	Otongora
Root crops	<i>Solenum tuberosa</i> L.	Potato	Dinicho
	<i>Ipomoea patatus</i> (L)Lam	Sweet potato	Sukar dinicho
	<i>Daucus carota</i> L.	Carrot	Kaaroota
Vegetables	<i>Capsicum annum</i> L.	Chili	Baribaro`o
	<i>Allium cepa</i> L.	Onion	Shunkuruta
	<i>Lycopersicon esculentum</i> Mill	Tomato	Timaatima
	<i>Allium sativum</i> L.	Garlic	Tumma
	<i>Brassica integrifolia</i> Var.	Cabbage	Shaana
Fruits	<i>Cetrus sinensis</i> (L.)Osb	Orange	Burtukaana
	<i>Cetrus aurantifolia</i> (L.)Burm.f	Limon	Lome`e
	<i>Persea americana</i> Mill.	Avocado	Abokaato`o
	<i>Mangifera indica</i> L.	Mango	Mango`o
	<i>Carica papaya</i> L.	Papaya	Paapaayya
	<i>Musa paradisiacal</i> L.	Banana	Muuze`e
Oil crops	<i>Linum usitatissimum</i> L	Linseed	Talba
	<i>Guizotia abyssinica</i> (L.f.)	Niger seed	Nuuga
	<i>Brassica napus</i> L.	Kale seed	Wonge`e

Source (DDANRDO, 2018).

3.1.7.2 Livestock

There are 68987 cattle, 24343 sheep, 4664 goats, 7091 donkeys, 5984 horses, 166 mules, 844296 poultry (DDLFRDO, 2018). As the office of the District explained that, the product of livestock (milk, egg, butter, cheese, meat and honey production) and contribution to the District, regional and national level economy is very low because of inadequate management, low genetic potential reason of inbreeding, low quality food supply, shortage of grazing and browsing land and inadequate health services and facilities (DDLFRDO, 2018). The District has one central veterinary clinic and four health posts. However, people of the study area's directly or indirectly depends on the substantial contribution of livestock for their rural economy, such as farming system, transport purposes and income generation and likes (DDLFRDO, 2018).

3.1.7.3 veterinary services

The District has one central veterinary clinic and four health posts. The main outbreak diseases of the district are avian cholera, ectoparasite, respiratory problems, anthrax, blackleg and others are the diseases that largely affect the livestock in the District (DDHO, 2018). Veterinary health service coverage is less than 50%. The underlined reasons reported by Duna District Livestock and Fish resources development office is that there is shortage of materials, skilled human power, medicine and logistic supports. Therefore about 955531 livestock population of the study area are supported by one central veterinary clinic and four health posts and six health workers i.e. one veterinary medical doctor and five veterinary technicians (DDHO, 2018).

3.2 Materials to be used

Plant press, plastic bag, note book, GPS, glove, plant cutter, specimen holder, digital camera and markers were used during collection of plant specimen data in the study area.

3.3 Reconnaissance survey and site selection

The reconnaissance survey to the study area was conducted from November 21-31/2018. Among 32 kebeles in the study district eleven (Dunmera, Ha Wagabata, Mish-duna, Koladensa, Hagedage, Sengiye, Somicho, La Kufana, Semen Otoro, Kankicho and Bure-bulshana) kebeles were selected purposively based on agro ecology, accessibility, vegetation cover, altitudinal variation and availability of traditional medicine practitioners. The study area is found within the range of 1000 - 2970 masl. This variation in altitude resulted in variability in climate, vegetation types, life systems and life constraints. One among the variation seen was diseases prevalence, as

reported by informants in Mish-Duna and half of sengiye areas at which there is repeated occurrence of malaria that caused death of certain people in the area (DDHO, 2018).

3.4 Sampling of informants

From the selected sites, a total of 110 informants (85 males and 25 females) above the age of 20 were selected and used for the study. These limited informants were used from the population of the study sites is because of time, resources, accessibility/availability and other constraints. So that, 10 informants from each selected sites were chosen and used. Among the selected informants 88 of them were selected randomly from the local people of the study area. This was done by tossing a coin and using him/her as informants whenever head of the coin was up if he/she was volunteered to involve. The remaining 22 key informants (knowledgeable) of the sample were selected purposively for key information with the help of local administrators, local community elders, development agents, health office of the district and experts in agriculture and natural resource development office of the study area.

3.5 Data collection

3.5.1 Semi-structured interviews

All of the interviews were held based on check list of questions prepared in English and translated to Hadyisa (local) language of Duna district. The questions included the following components such as personal data of the informants, like name, address, sex, age and educational status; information on plant resources, plant parts used, time, date and season of collecting plant materials, preparation, dosage, administration, side effects and antidote.

3.5.2 Focus group discussion

Group discussion was held during data collection with the informants and knowledgeable members of the local people on specified time in each site (each group consists of four informants). The discussion was focused on using traditional medicine obtained from plant species to treat human and livestock ailments, indigenous knowledge transfer by the indigenous people, threats towards the medicinal plant species and conservation mechanisms. After the group discussions had been completed the contribution of each informant was appreciated and indicated value of their indigenous knowledge in traditional use of plant resources and biodiversity conservation.

3.5.3 Field observation

Guided field observation was made with the informants. While walking through the study site with them the relevant data was collected including habit, habitat, parts used, altitude, major threats, conservation of indigenous knowledge on traditional use of plant resources and full not about mode of collection. Subsequently, a number of field observations was performed with guidance and interviewed informants to collect plant specimens.

3.5.4 Plant specimen identification

The sample specimens were collected from various habitats of the study area, pressed and dried for identification. The task of collecting plant specimen was done during guided field observation with the informants. Preliminary identification was employed in the field and then further identification was carried out after the sample specimens had been brought to Jimma herbarium by comparing it with authentic specimen illustration, taxonomic keys and various volumes of the flora of Ethiopia and Eritrea.

3.6 Data Analysis

The collected ethnobotanical data were analyzed using descriptive statistics, preference ranking, direct matrix ranking, paired comparisons, fidelity level and informant consensus factors.

3.6.1 Descriptive statistics

Descriptive statistical methods, such as percentage and frequency was employed to analyze and summarize the data on useful plant resources, associated knowledge, management methods, use and conservation. The most useful information gathered on medicinal plants reported by local inhabitants: medicinal value, habit and parts used, method of preparation, route of administration, ways of application, diseases treated, dosage of administration and extra use value of the plant species. Ms Excel Sheet 2007 was used to draw graphs and to determine proportions as well as to summarize the ethnobotanical information gathered from sampled informants.

3.6.2 Informant consensus factor (ICF)

In order to evaluate the reliability and validity of information recorded during the interviews, informants were visited two to three times and then similar responses were proved and recorded. Consequently, the response of the informants those disagreed with each other was

rejected, since it was considered irrelevant information. Only the relevant ones were taken into account and statistically analyzed (Alexiades 1996). Informant consensus factor was quantitatively calculated and analyzed by using the formula as used in (Tilahun Teklehaymanot and Mirutse Giday, 2007), as follows

$$ICF = \frac{nur - nt}{nur - 1}$$

Where; ICF – is informant consensus factor

nur – is the number of use citations for each ailment

nt – is the number of species used for that ailment categories

3.6.3 Preference Ranking

Preference ranking was computed according to Martin (1995) for six most important medicinal plants used in treating fibril illness as traditional healers treat it usually. Ten informants were selected to identify the best-preferred medicinal plant species for treatment of fibril illness. Each informant was provided with six medicinal plant species reported to cure this disease with each leaf of medicinal plants used being paper tagged name and asked to assign the highest value (6) for plant species most preferred against this illness and the lowest value (1) for the least preferred plant and in accordance of their order for the remaining ones. These values were summed up and ranks given to each plant species by asking the informants to rank plant species according to their use values. When there are different species prescribed for the same health problem, people can show preference of one over the other. In this study among key informants about ten of them will be randomly selected to assess the degree of effectiveness of certain selected medicinal plant species to treat particular disease.

3.6.4 Direct matrix ranking

Direct matrix ranking was calculated to compare multipurpose uses of a given plant species following Martin (1995) by taking the responses of informants. In order to relate this to the extent of its utilization versus its dominances .Based on the information gathered from informants, six multi-purposed medicinal plant species were selected out of the total medicinal plants in the study district and eight use diversities of these plant species were listed. Then eight key informants were chosen in order to assign use value to each attribute (5=best, 4=very good, 3=good, 2=less used, 1=least used and 0=not used). These eight use values include food, firewood, fodder, construction, spices, Medicine, fencing and furniture. Based on the information

that was gathered from informants, average values of each use diversity for a species was taken and the values of each species were summed up and ranked.

3.6.5 Paired comparison

Paired comparison can be used for evaluating the degree of preferences or level of importance of certain selected plants /parts of plants (Nemarundwe and Richard, 2002). In here it was used to indicate the efficacy and popularity of six medicinal plant species which were used to treat fibril illness were employed as Martin (1995). In such a way that six respondents among key informants were randomly selected by flipping coins and were allowed to show their responses independently for pairs of six traditional medicinal plants that were noted for treating fibril illness. A list of the pairs of selected items with all possible combinations was made and sequence of the pairs and order within each pair was randomized before every pair was presented to selected informants and their responses were recorded and summarized and rank was made based on the information obtained from the informants.

3.6.6 Fidelity level (FL)

This analytical tool was employed to quantify the importance of a given species for a particular purpose in a given cultural group as described by Friedman *et al.* (1986). The fidelity level (FL), the percentage of informants claiming the use of a certain plant for the same major purpose, was calculated for the most frequently reported diseases or ailments. Conformation or consensus can't be taken as a single measure of the potential efficacy of any medicinal plant. Thus, efficacy is not the only factor that influences the informant choice but abundance of a given plant and prevalence of disease in the area can affect informant's choices. In this investigation two sites with different altitude and the disease called malaria prevalence were chosen to indicate the fidelity level of *Allium sativum* for treatment of malaria which is one of the more frequently reported disease in lowland (Kola) area like Mish-Duna and Lower part of Sangiye and less frequently reported in highland (Dega) areas like Kankicho and Duinmera. Thus the total use and particular use reports of *Allium sativum* by informants for malaria treatment were recorded and its fidelity level index for the two areas was calculated and summarized by using the following equation (Friedman *et al.*, 1986).

$$FL (\%) = NP/N$$

Where, NP- is the number of informants that claim the use of species to treat a particular disease

N- is the number of informants that use the plants as a medicine to treat any given disease.

3.7 Ethical Considerations

The researcher was took letter for a research permit from Jimma University. Permission was sought to Ethnobotanical investigation on traditional use of medicinal plant species in Duna district, Hadya zone, SNNPRs, Southern Ethiopia. The researcher was explained to the respondents the purpose and the importance of the study. And the researcher was assured them confidentiality of any information given. Clarifications of various concept in the research instrument was done prior to filling of the questionnaire.

4. RESULT AND DISCUSSION

4.1 Summary of information about informants in the study area

4.1.1 Age of the informants

The age level of informants indicated that the most knowledgeable members are found under the age of 51-61 (Table.2)

Table 2 Age of informants in the study area

Informant`s age	No. of informants	Percentage (%)
21-30	2	1.8
31-40	8	7.27
41-50	27	24.54
51-60	46	41.8
61-70	19	17.27
Above 70	8	7.27
Total	110	100

4.1.2 Occupation of the informants

As information gathered from the informants showed that, the majority of knowledgeable members are farmers (Table.3)

Table 3 Occupation of the informants

Informant`s occupation	No. of informants	Percentage (%)
Farmers	79	71.8
Merchants	11	10
Government workers	6	5.45
Non government workers	8	7.27
Students	4	3.63
Other	2	1.8
Total	110	100

4.1.3 Religion

The information obtained from the informants indicated that, majority of knowledgeable members were protestant religion followers (Table.4)

Table 4 Religion of the informants

Informant`s religion	No. of informants	Percentage (%)
Protestant	81	73.63
Catholic	14	12.72
Orthodox	9	8.18
Muslim	4	3.63
Other	2	1.81
Total	110	100

4.1.4 Marital status

Of the total informants 94.54% were married which was high proportion in marital status (Table.5)

Table 5 Marital status of informants

Marital status	Sex		Total	Percent (%)
	Male	Female		
Married	81	23	104	94.54
Single	2	-	2	1.81
Divorced	2	2	4	3.63
Total	85	25	110	100

4.1.5 Educational level of informants

According to the information obtained from the respondents 47(42.72%) were low (not educated at all), 44(39.99%) were middle (1th -8th) and 19(17.27%) were high (above grade 8th) (Table.6). This result showed that the educational level and Ethnobotanical knowledge of the informants were inversely proportional.

Table 6 Educational levels of informants

Educational level of informants	No. of informants		Total	Percentage (%)		Total
	Male	Female		Male	Female	
Low(not educated at all)	36	11	47	32.72	10	42.72
Middle (grade 1 th -8 th)	32	12	44	29.09	10.9	39.99
High (above grade 8 th)	17	2	19	15.45	1.81	17.27
Total	110		100			

4.2 Knowledge of local people on health

People of the study area give great value for their health. In that during the discussion with the informants, they expressed the value of their health by using different proverbs, among them:

“Orachi tumine inkale erane” meaning kolo is better with healthy body. This is to say that wealth is nothing without health.

“Foorine yookkoki fooshaamo itookko” meaning alive feeds fresh. This is to say that alive can fulfill his wish.

4.3 Taxonomic diversity of medicinal plants in the study area

A total of 116 medicinal plant species belonging to 102 genera and 49 families were recorded from the study area (Table.7). Of these, 50(43.10%) species were collected from the vegetation in the wild and 38(32.75%) species were obtained from homegarden and the remaining 28(24.13%) Species were found in both habitats (Appendice.3). This finding is a good indicator for the presence of considerable diversity of plant species both in the wild as well as in the homegarden of the study area.

Regarding to their use 63 (54.3%) plant species were reported to be used for only human ailments, 43 (37.06%) species were used to treat both human and livestock ailments and the remaining 10 (8.62%) species were used to treat only livestock ailments (Figuer. 2). This result revealed that the existence of diverse sources of medicinal plants in the study area. This finding is relatively similar with the finding reported by Mersha Ashagre *et al* (2016), who reported 106 species of medicinal plants from Bulehora district area. In terms of family distribution,

Solanaceae stood first contributing 12 (10.3%) species, followed by Lamiaceae 11 (9.46%) species, Asteraceae 10 (8.62%) species, Fabaceae 7(6.03%) species, Poaceae 5(4.31%) Species, Rutaceae, Myrtaceae and Euphorbiaceae were represented by 4species each and likes (Table.8). This finding is different from the finding of Endalew Amenu (2007) in which family Asteraceae is the dominant family followed by Fabaceae.

Table 7 Medicinal plant species in different families

No.	Family	No. of genera	%	No. of Species	%
1	Solanaceae	8	7.84	12	10.34
2	Lamiaceae	10	9.80	11	9.48
3	Asteraceae	8	7.84	11	9.48
4	Fabaceae	7	6.86	7	6.03
5	Poaceae	5	4.9	5	4.31
6	Rutaceae	4	3.92	4	3.44
7	Myrtaceae	3	2.94	4	3.44
8	Euphorbiaceae	3	2.94	4	3.44
9	Brassicaceae	1	0.98	3	2.58
10	Apiaceae	3	2.94	3	2.58
11	Cucurbitaceae	3	2.94	3	2.58
12	Rosaceae	3	2.94	3	2.58
13	Rubiaceae	2	1.96	2	1.72
14	Urticaceae	2	1.96	2	1.72
15	Acanthaceae	2	1.96	2	1.72
16	Polygonaceae	1	0.98	2	1.72
17	Oleaceae	2	1.96	2	1.72

18	Malvaceae	2	1.96	2	1.72
19	Alliaceae	1	0.98	2	1.72
20	Amaranthaceae	2	1.96	2	1.72
21	.Musaceae	2	1.96	2	1.72
22	The remaining 28 were one species each	28	27.45	28	24.13

Proportional number of medicinal plants used for human, livestock and both human and livestock ailments in the study area

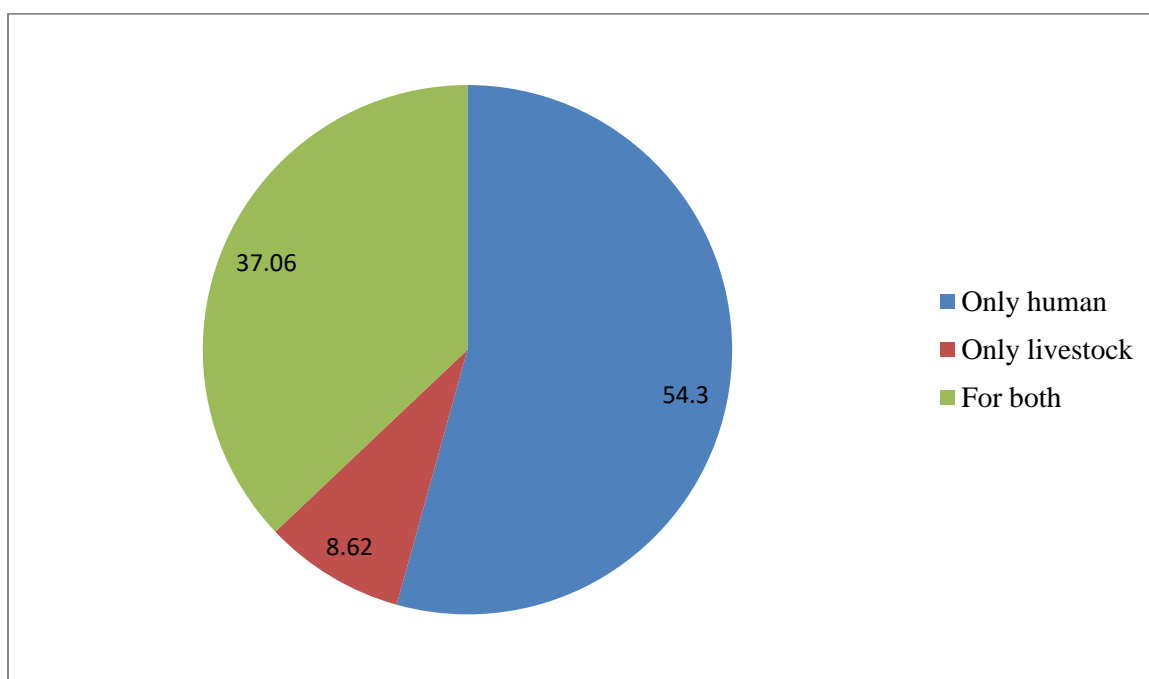


Figure 2 Proportional numbers of medicinal plants use in the study area.

Regarding to the source of the plant species in this study, of the total 116 medicinal plant species recorded 50(43.10%) species were collected from the wild and 38 (32.75%) species were collected from the home gardens and the remaining 28(24.13%) species were found in both habitat (Figure.3). This result indicated that greater proportion of medicinal plant species were obtained from wild habitat (forest, reverie, road side, rocky area, agricultural field, grazing land etc). But less proportion of medicinal plant species were collected from home

gardens. In similar study, Tesfaye Hailemariam et al. (2009) reported 124 of medicinal plant species from wild habitat in Konta special Worada but 32 medicinal plant species were reported from home garden, in my study by far greater than that of Tesfaye Hailemariam *et al.* (2009) indicating there is something promising regarding the culture of planting such useful plants near homesteads in the area.

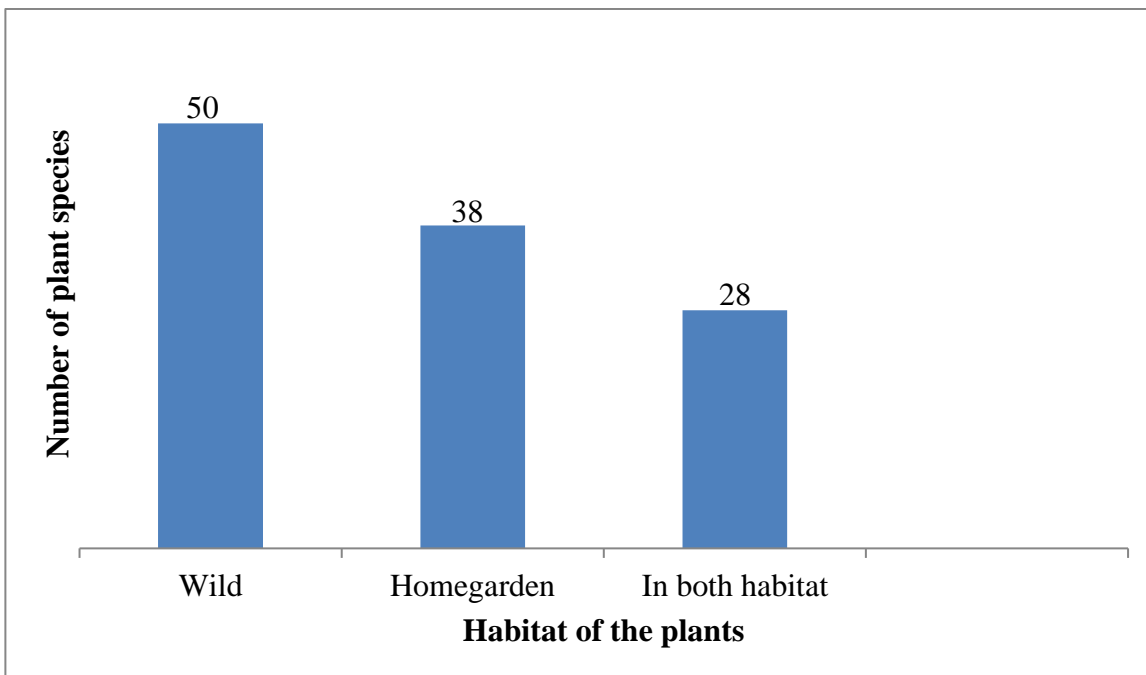
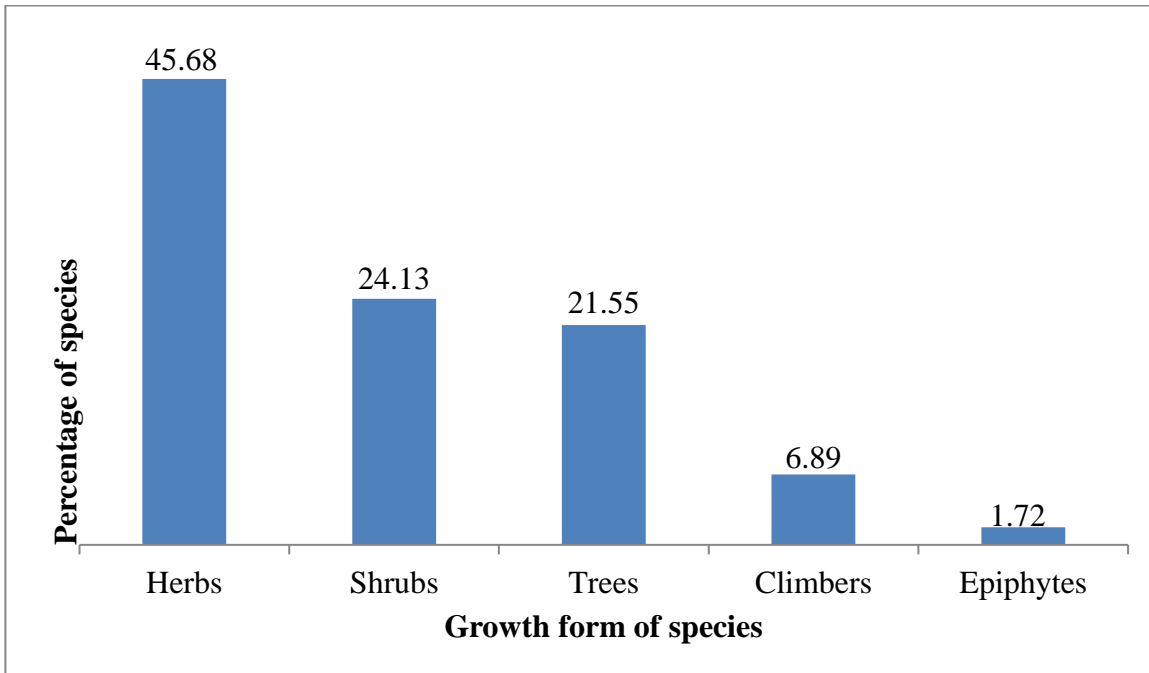


Figure 3 Proportional numbers of medicinal plants collected from different habitats

4.4 Growth form of the plant species in the study area

The result in growth form analysis of medicinal plant species in the study area indicated that herbs were accounted the major proportion which is represented by 53(45.68%) species, followed by shrubs which is accounted for 28 (24.13%) species, trees 25(21.55%), climbers 8(6.89%) and epiphytes 2(1.72%) species (Figure.4). The finding of present investigation is closely related with different studies carried out elsewhere in Ethiopia such as Mirutse Giday (2001); Tilahun Teklehaymanot and Mirutse Giday (2007); Seyoum Getaneh (2009); Moad Megersa et al., (2013) and others findings in which herbs constitute highest proportion of medicinal plants. The appearance of herbs in highest proportion as a medicinal plants might attribute to the fact that herbs can grow everywhere; like in roadside, farmland, grazing land, reverie, home garden and other habitats as long as proper amount of moistures where available. Therefore, present finding of higher proportion of medicinal plants as herbs might be related to

relatively appropriate climatic condition for herbaceous plant growth in the study area. In contrast to the present finding, Haile Yinger and Delenesew Yewalew (2007) and Kebu Balemie (2004) reported that shrubs constitute more proportion of medicinal plant species in Fantale District of east shoa and Sokoru district Jimma, Oromia, Ethiopia respectively



Figurer 4 Growth form of the plant species in the study area

4.5 Plant parts used

The different parts of medicinal plant species used in study area is shown in (Figure.5). The result revealed that leaves were the most commonly used plant part accounting for 47(40.5%), followed by fruit 13(11.2%), aboveground 12 (10.34%), seed 11(9.48%), root 9 (7.75%), whole plant 7 (6.03%) and others. Many Studies conducted in different areas of Ethiopia and in many parts of the world also indicated that leaves are used more than other parts of plants, as Mirutse Giday et al. (2001), Kebu Balemie (2004) and Tesfaye Hailemariam et al. (2009). On the other hand as Tilahun Taklehaimanot and Mirutse Giday (2007) and Fisseha Mesfin et al. (2009) finding indicated that roots were frequently utilized parts of the plant species. In conservation sense, using leave parts of the plant is believed to minimize the rate of threat on plant species or supports for sustainable harvesting of plant species; which is relatively better than harvesting

root parts of the plants since removal of an appreciable leaf is tolerated by the plant species (Tesfaye Hailemariam et al., 2009).

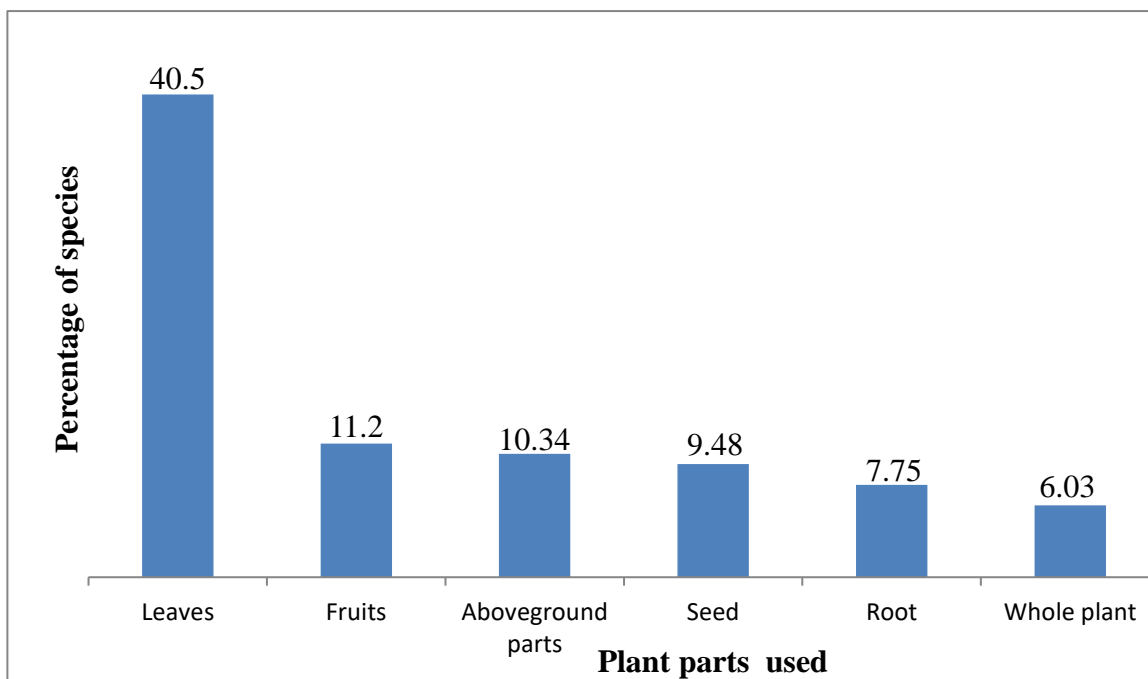


Figure 5 Plant parts used

4.6 The condition of plant materials to prepare herbal remedies

As the finding of the study showed that the majority of the medicinal plants were prepared from fresh material of the plants which account for about 91 (78.44%) of plant species, followed by fresh/dry species 17 (14.65%) and dry species 8 (6.89%) (Figure.6). The present study finding is similar with the finding studied by Teshale Sori et al., (2004). As the finding revealed that the importance of using fresh materials for various health problems is better than that of dry/fresh materials or dry materials. The reason why people of the study area preferred fresh plant parts than dried one might be related to the efficiency of remedies prepared from fresh materials in curing diseases compared with the dried ones. Reasonably, local people of the study area were claimed that most important chemicals in plant species might be changed during drying process and then that weakens its strength. Therefore, they preferred to use fresh parts of the plants than dried parts of the plant species. However, from conservation point of view that frequent utilization of fresh plant materials might be disadvantageous since such practice of using fresh plant materials might threaten the plant species through the frequent utilization without seasonal exception. Because of less preference of people to prepare remedies from dried plant parts, local

people made minimal efforts in sorting dried plant materials for later use (Moa Megersa et al., 2011). Therefore, using both forms in the preparation of remedies in a given community creates a better opportunity for people to have access to materials used in medicine preparation across different season of the year (Teklay Abreha et al., 2001).

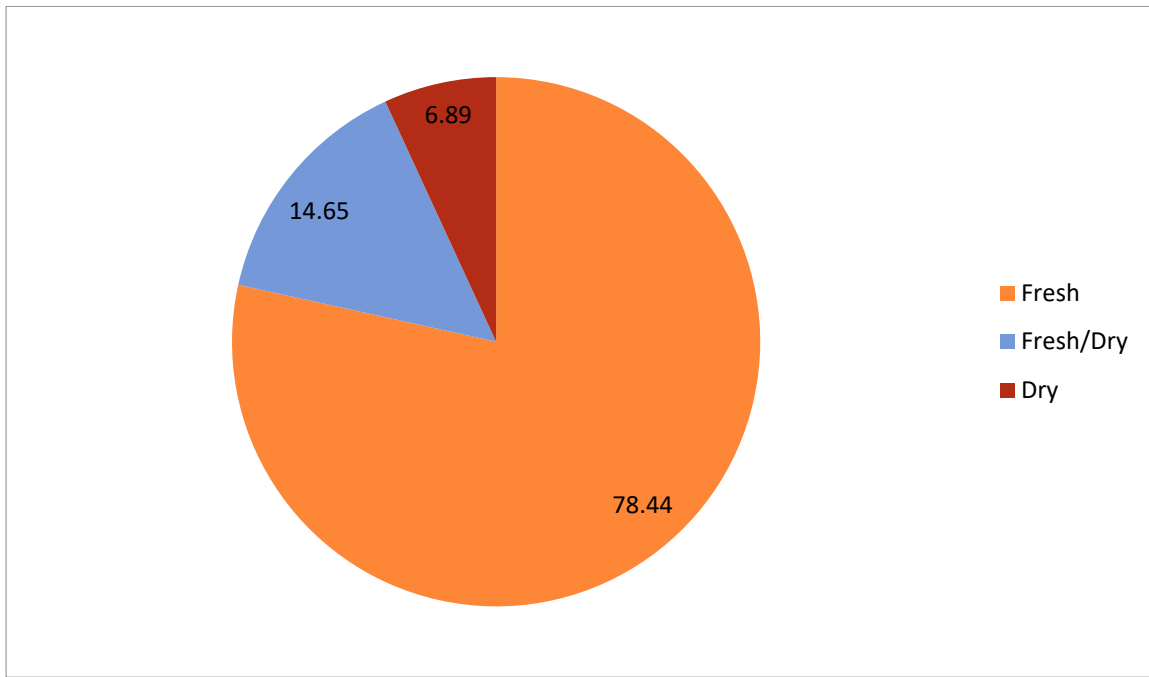


Figure 6 Conditions of remedies preparation from plant materials

4.7 Method of preparation

The present study indicated that, local people of the study area were employed different methods for preparation of remedies. The variation is mainly depending on the type of disease treated and the actual site of the ailments. In that the most frequently applied method of herbal remedies preparation was crushing which accounts about 34.48 %, followed by chewing 15.51%, squeezing 12.93%, concoction 6.89 %, cooking 6.03%, heating 4.31% powdering 2.58%, decoction 2.58% and the remaining ones involved more than one method (Figure.7). This result agrees with the findings of Moa Megersa et al., (2013), Haile Yineger and Delenesew Yehuwalaw (2007), Seyoum Getaneh (2009). However, the present finding contradicts with that of Fisseha Mesfin et al., (2009) who reported that powdering and pounding were the common method of remedies preparation in Wonago district of Gedeo Zone. SNNPR, Ethiopia.

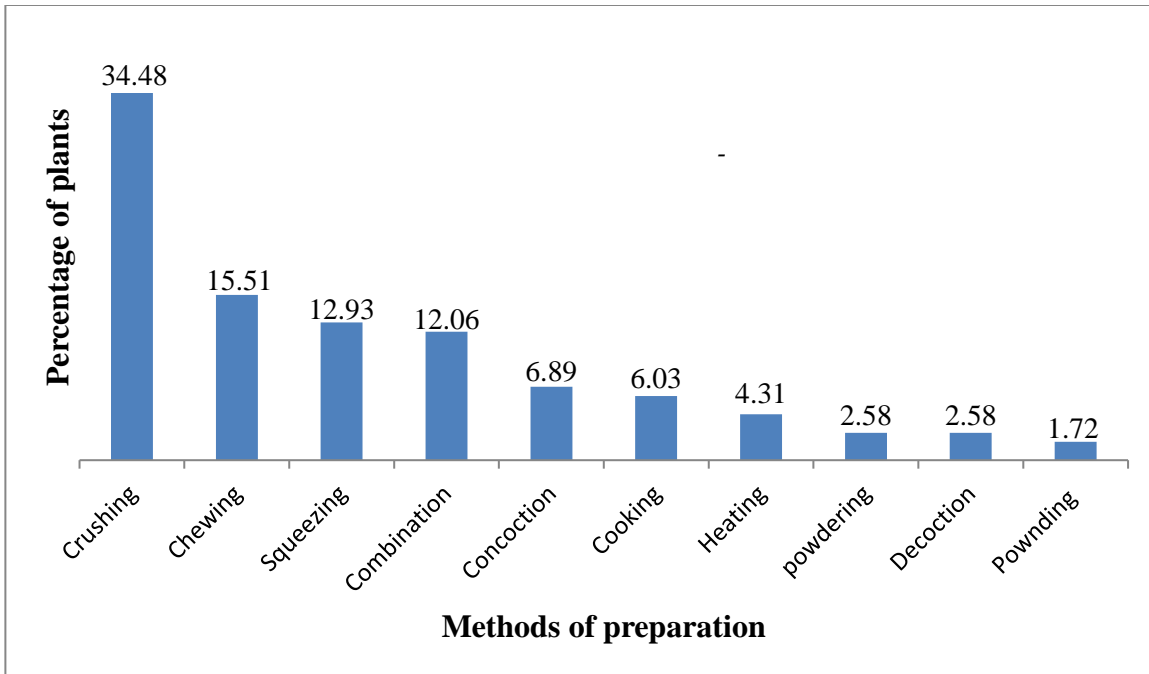


Figure 7 Mode of remedy preparation in the study area

4.8 Route of administration

The result showed that people of the study area are followed different route in order to apply traditional medicinal plant remedies in the study area. As the finding indicated that, the major route of administration in the study area was oral which was accounted for 65 (56.03 %), followed Oral/dermal 23(19.82%), dermal 9 (97.75%), nasal 3 (2.58%) anal 1(0.86%), optical 1(0.86%) and others (Figure.8). This result is relatively similar with the results reported by others in other study areas, like Haile Yineger et al., (2008): Abadi Birhanu and Feto Haji (2017).

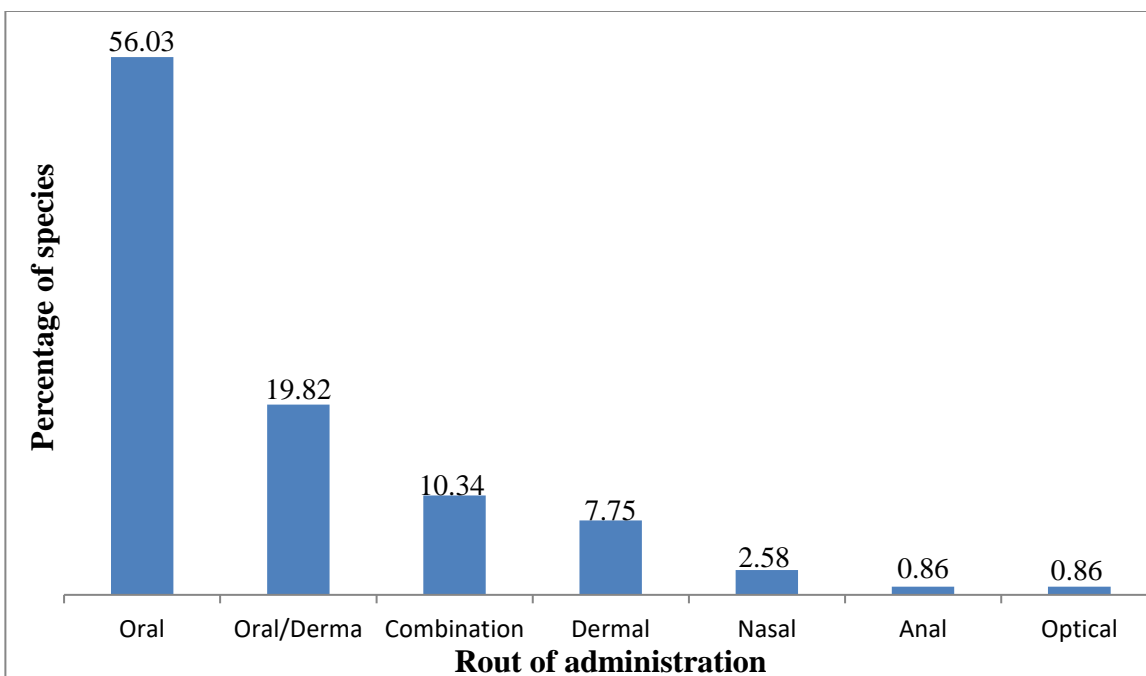


Figure 8 Route of administration of medicinal plant remedies

4.9 Method of application of herbal medicine

As the result indicated that, the prepared traditional medicinal plant remedies were applied in a number of methods such as drinking accounted the largest one which is about 44 (37.93%) species, followed by eating 18(15.51%), painting/creaming 9(7.75%), washing 8(6.89%) rubbing 5(4.31%) and others (Figure.9). The informant response indicated that, internal ailments were commonly treated by making the patient drinks medication preparation, tooth infection were treated by crushing and putting the remedies on the tooth surface, skin infection such as ringworm were treated by painting herbal remedies on the infected part of the body. Certain plants do have various methods of application for different ailments. These divers methods of application techniques need different methods of preparation for different types of diseases fore example, chewing the Rhizomes of *Zinger officinal* is used to treat tonsillitis.

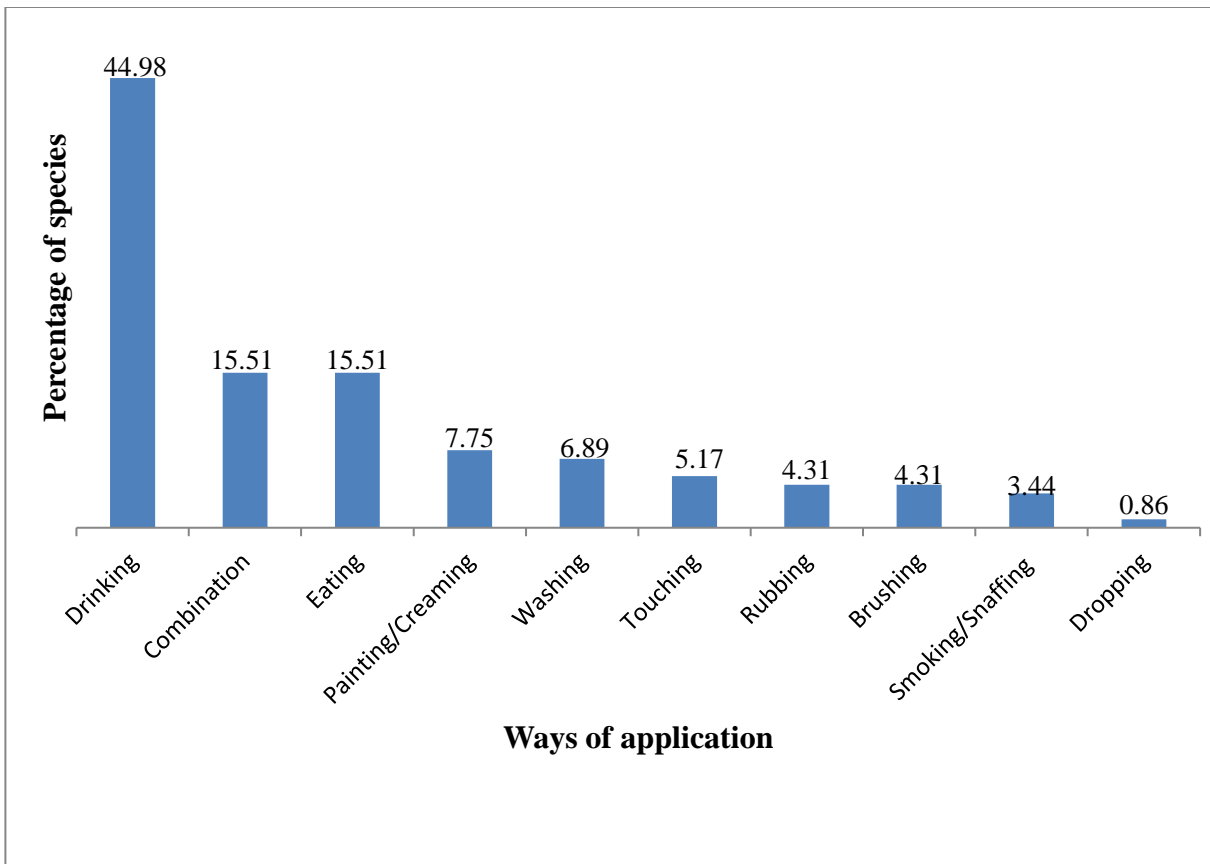


Figure 9 Application ways of medicinal plants in the study area

4.10 Medicinal plants used to treat only human ailments.

As the result showed that, in the study area 63(54.3%) plant species were recorded to treat human ailments, Regarding to the habitat from where the medicinal plants collected 19(30.15%) species of medicinal plants were collected from wild habitat, 25(39.68%) species from homegarden and 19(30.15%) were collected from both (Figure.10). Therefore, this result indicated that people of the study area collected major proportion of medicinal plants from the homegarden. The present finding is disagreed with the study of Haile Yineger et al., (2008) which showed that, more medicinal plants were collected from wild habitat.

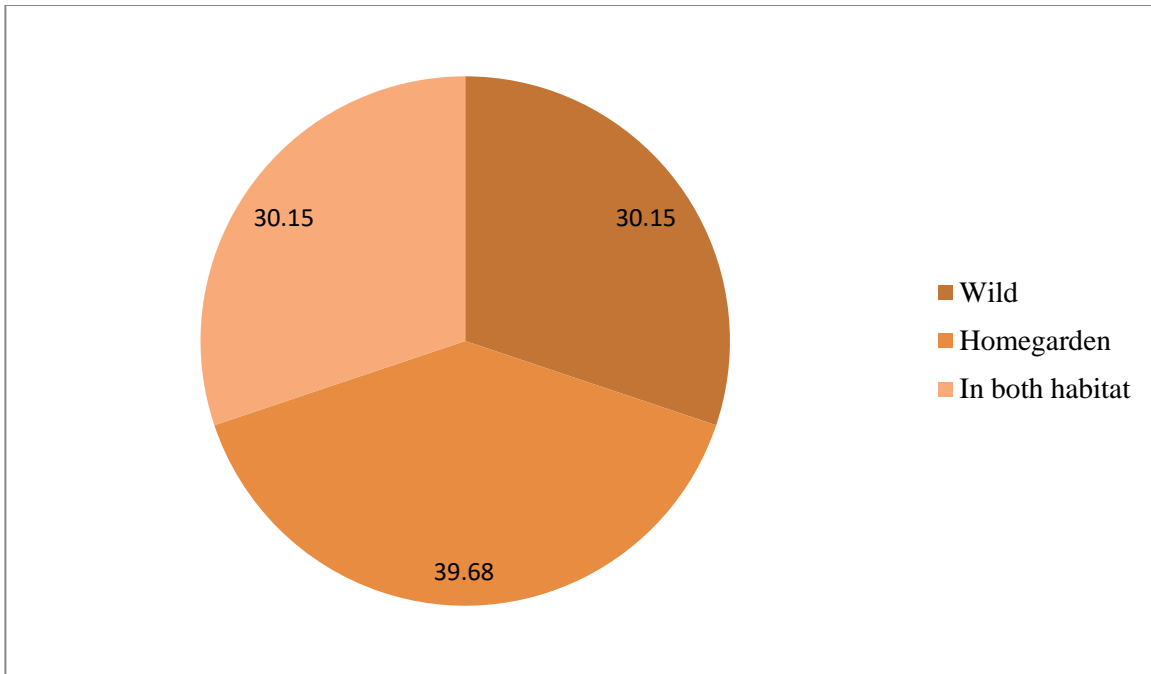


Figure 10 Habitat of medicinal plants used for only human being

4.10.1 Growth form

The growth form of medicinal plant species used to treat human ailments in the study area included herbs 36(57.14%) species, trees 13(20.63%) species, shrubs 10(15.85%) species, climbers 3(4.76%) species and Epyphyte 1(1.58%) species (Figure.11).

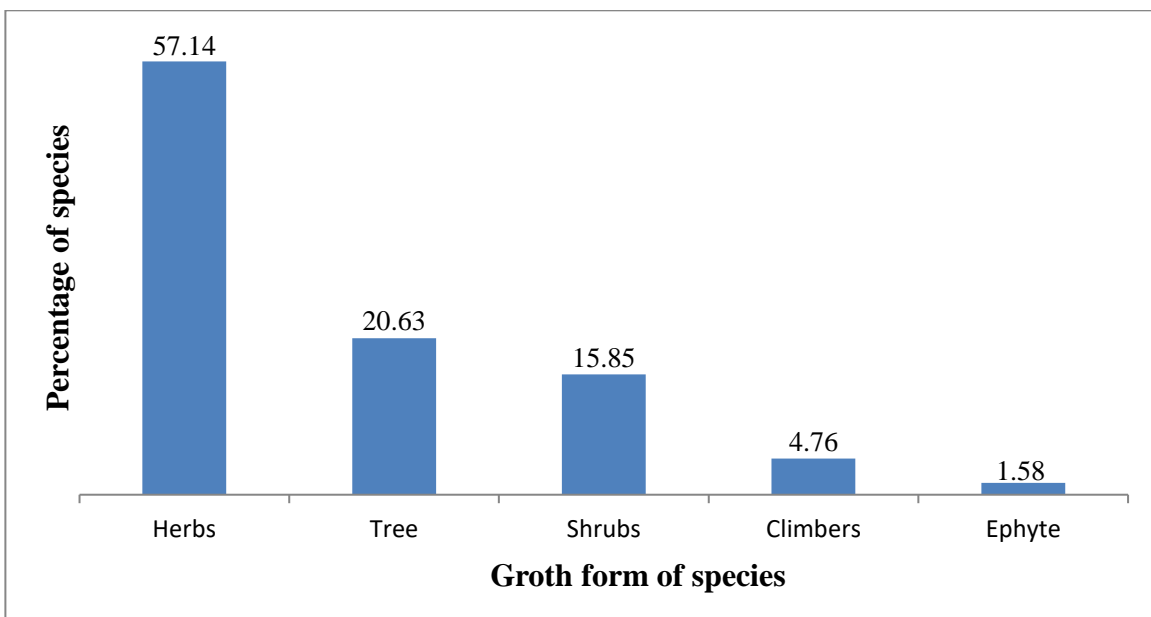


Figure 11 Growth form of medicinal plants used to treat human ailments

4.10.2 Plant parts used

The most widely utilized parts of the plant in the study area for the preparation of herbal medicine were leaves which is accounted about 24(38.09%) species, followed by fruit 11 (17.46%) species, seed 10(15.67%) species, root 6(9.5%) species, aboveground 5(7.9%) species, whole plant 1(1.58%) species and others (Figure.12). As the result showed that, leaves were most preferred part than other parts of the plant which might be its easiness for treatment of different diseases and considerably of minimal effect on threats of medicinal plant species. This finding is agreed with the finding of Haile Yineger et al., (2008).

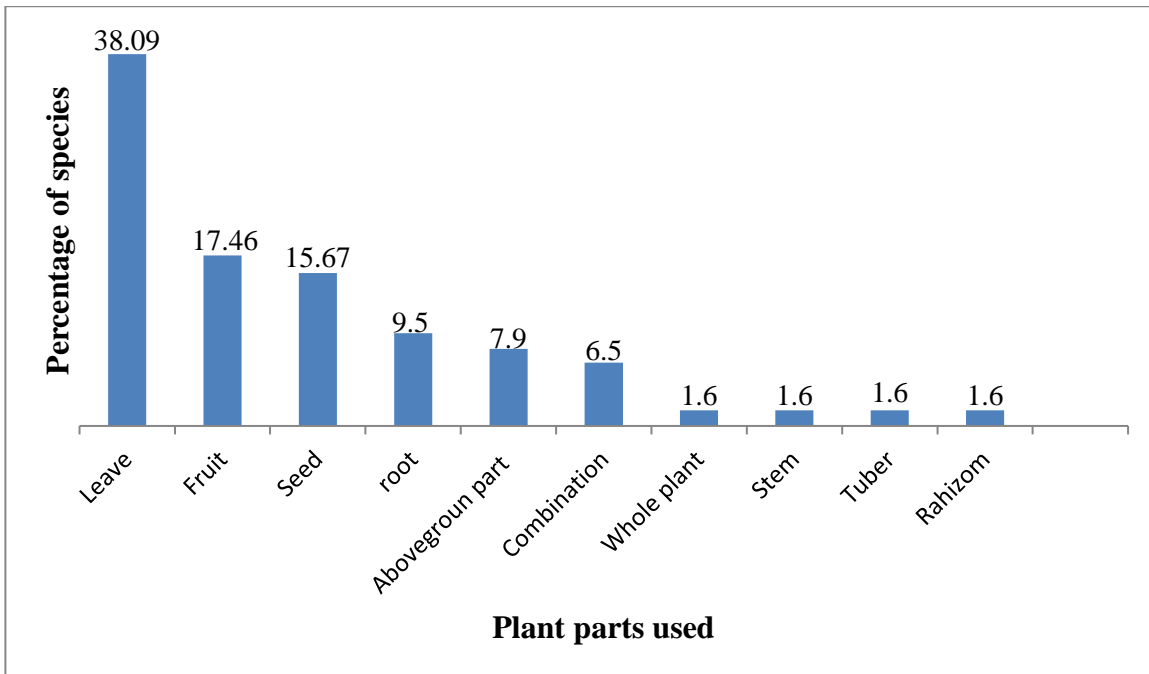


Figure 12 Plant part used only for Human ailments

4.10.3 Method of preparation of remedies

Regarding to methods of preparation of herbal remedies, the result indicated that the most frequently used method of preparation for human ailments were crushing accounted for about 21(33.3%) species followed by chewing 18(28.57%), cooking 5(7.9%), squeezing 4(6.34%) species, concoction 4(6.34%), powdering 3(4.76%) species, heating 3(4.76%), decoction 1(1.57%) species and combination 4(6.34%) (Figure.13). The responses gathered from the informants of the study area indicated that, the preparation of herbal remedies was based on the actual site of ailments the types of diseases.

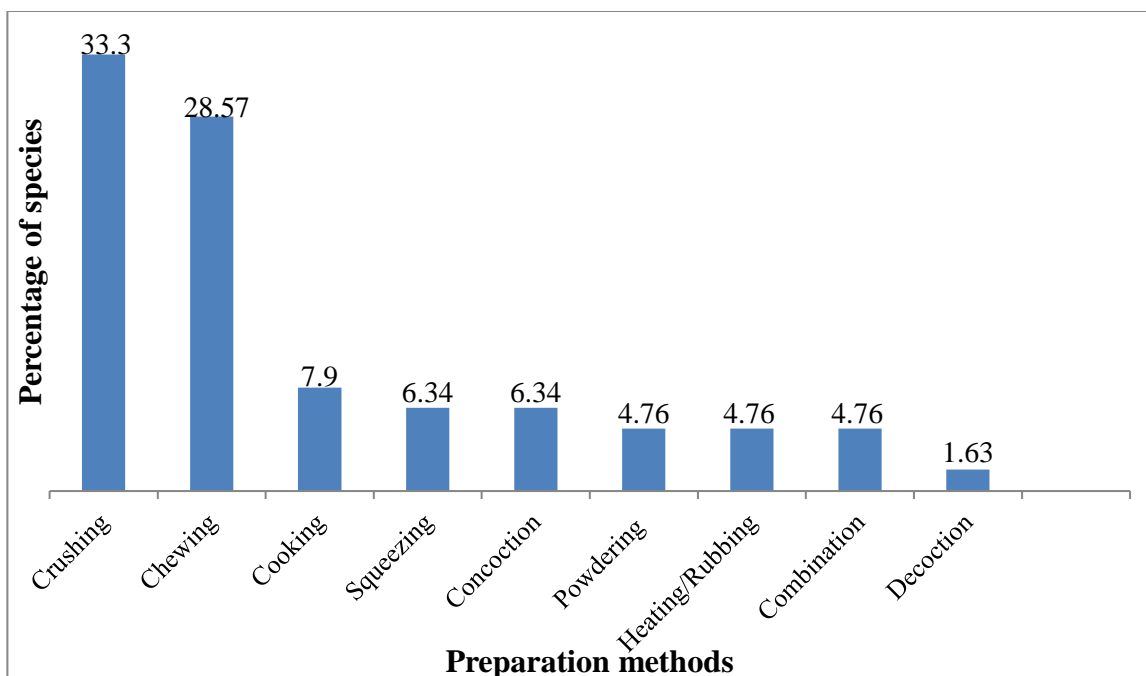


Figure 13 Methods of preparation of remedies to treat human ailments.

4.10.4 Rout of administration of species used to treat human ailments.

Present study of the area regarding to rout of administration of traditional medicinal plant remedies for human ailments revealed that, oral is the largest one which was accounted for 41(65.07%) species, followed by oral/dermal 10(15.87%), dermal 5(7.93%) species, nasal 2(3.17%), anal 1(1.58%) species, optical 1(1.58%) species, auricular 1(1.58%) and the remaining were in combination. As the result showed that, oral administration was the most widely employed rout of administration over the others practiced by local people of the study area (Figure.14).

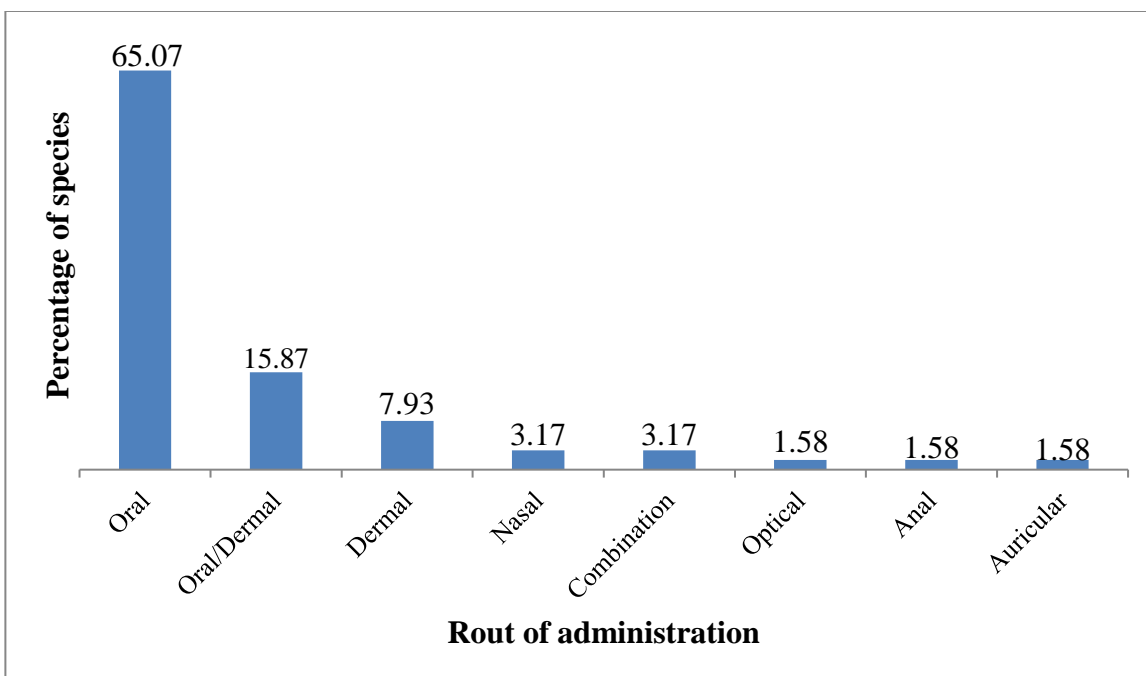


Figure 14 Rout of administration of plant remedies

4.10.5 Method of application

According to present study finding regarding to application of traditional medicinal plant remedies, the most widely utilized method of application by local people in the study area was drinking accounted for 27(42.85%) species, followed by eating 12(19.04%) species, and others (Figure.15). Drinking herbal remedies for a patient was to treat internal diseases while infection such as ring worm was treated by painting herbal remedies on actual site of infected skin.

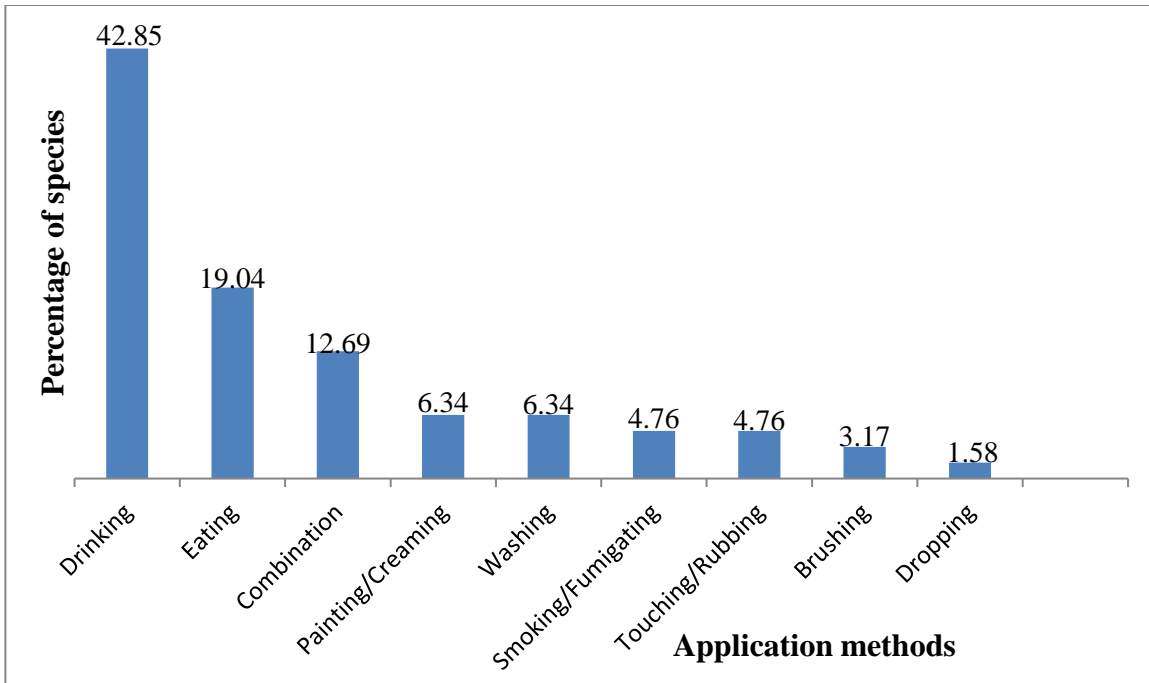


Figure 15 Methods of application

4.11 Medicinal plant species used to treat live stock health problems

4.11.1 Habitat of the plant species

Regarding to the treatment of livestock ailments a total of 10(8.62%) medicinal plant species were collected and recorded in the study area to treat only livestock ailments. As the result revealed that, the majorities of plant species or about 8(80%) species were collected from the wild (Figure.16)

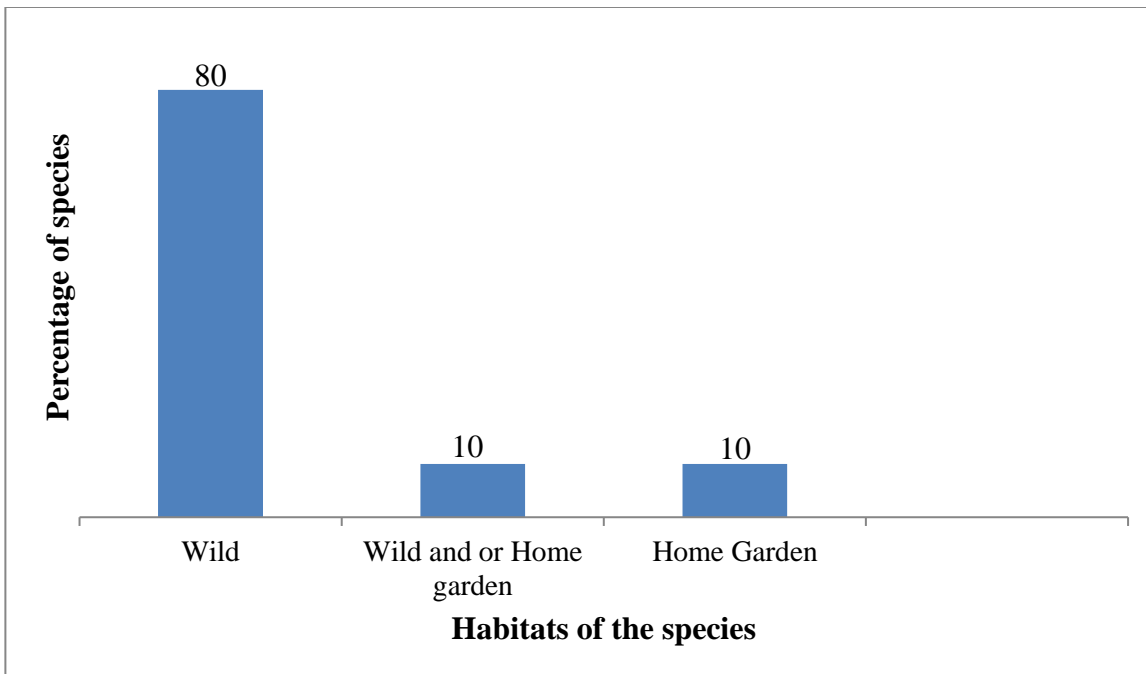


Figure 16 Habitat of the medicinal plants for livestock ailments

4.11.2 Growth form of the plant species

Regarding to the form of plant growth (habit), the result indicated that most of the plant species employed for veterinary use in the area were Shrubs which was accounted for 5(50%) species followed by trees which was accounted for 3(30%) and equal proportions of climber and herbs 1(10%) species each (Table.8).

Table 8 Habit of medicinal plant species used to treat livestock ailments

Habit	Number of species	Percentage
Shrubs	5	50
Trees	3	30
Herbs	1	10
Climbers	1	10
Total	9	100

4.11.3 Plant parts used for preparation

Analysis on the plant parts used showed that, leaves are the most widely used plant parts for herbal remedies which was accounted for 7(70%) species followed by roots 1(10%), seed 1(10%) and others (Figure.17).

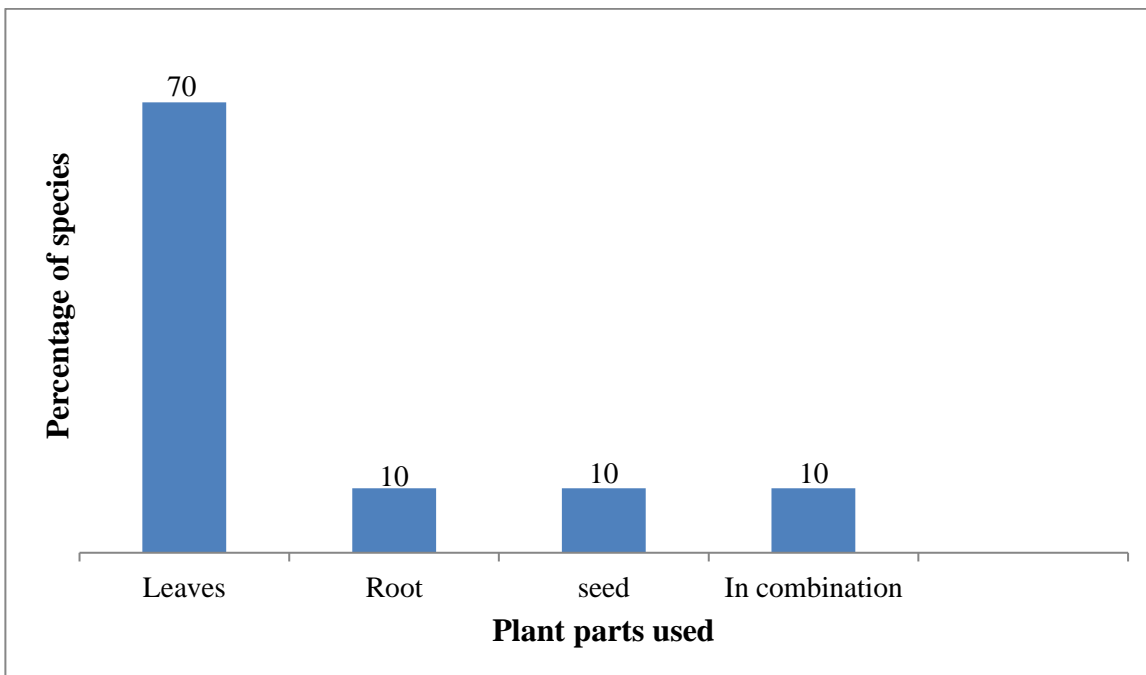


Figure 17 Plant parts used for treatment of livestock ailments

4.11.4 Methods of preparation of herbal remedies

The local people of the study area use different methods of preparation to treat livestock ailments. As the result indicated that, the most widely used method of remedy preparation in the study area were crashing, which were accounted for 5(50%) followed by squeezing 3 (30%) and concoction 1(10%) and cooking 1(10%) (Figure18).

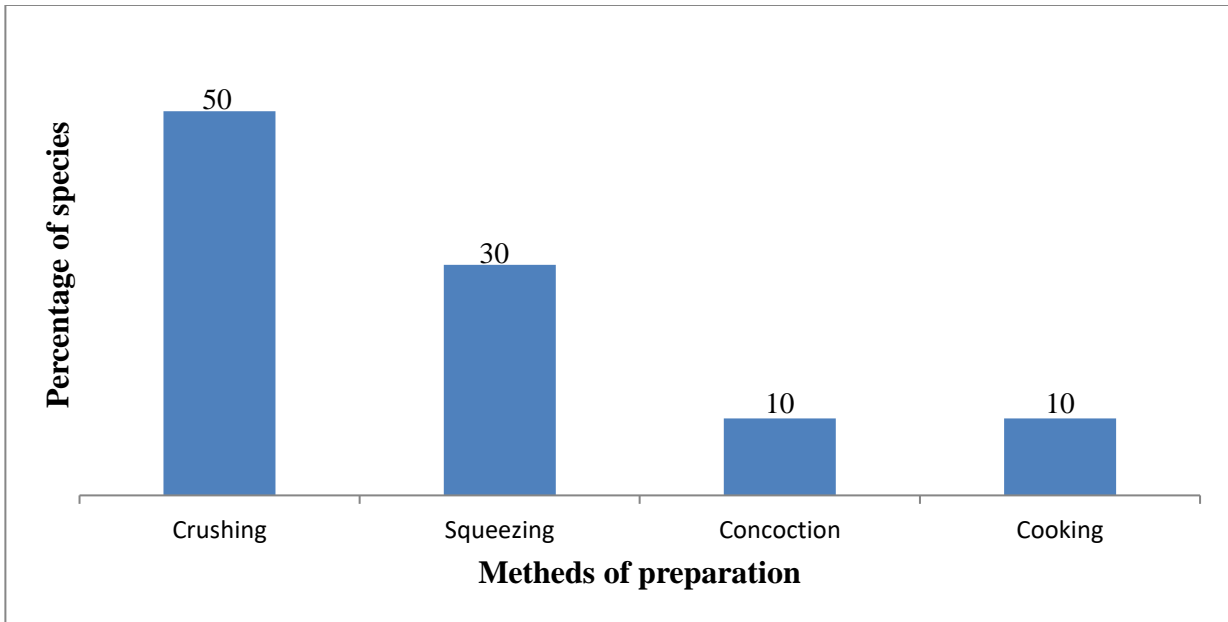


Figure 18 Methods of preparation

4.11.5 Rout of administration

Regarding to rout of administration of remedies oral application was found to be the highest, which was accounted for about 8(80%) followed by equal proportions of dermal and dermal/oral 1(10%)species each (Figure.19). Similar findings were reported by Teshale Sori et al., (2004) and Endalew Amenu (2007) who reported that oral administration was the most common rout of administration.

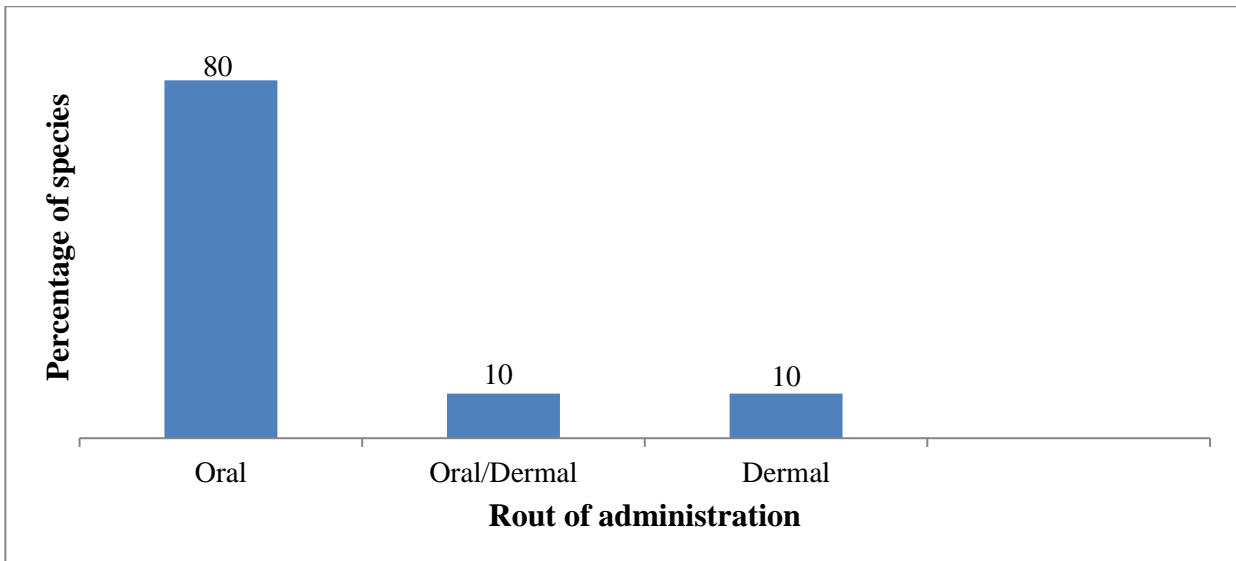


Figure 19 Rout of administration used to treat livesock ailments.

4.11.6 Methods of application

As the result indicated that, application of medicinal plant remedies used by livestock in the study area drinking was widely used method which is accounted for 4(40%) followed by eating 2(20%) and likes (Figure.20).

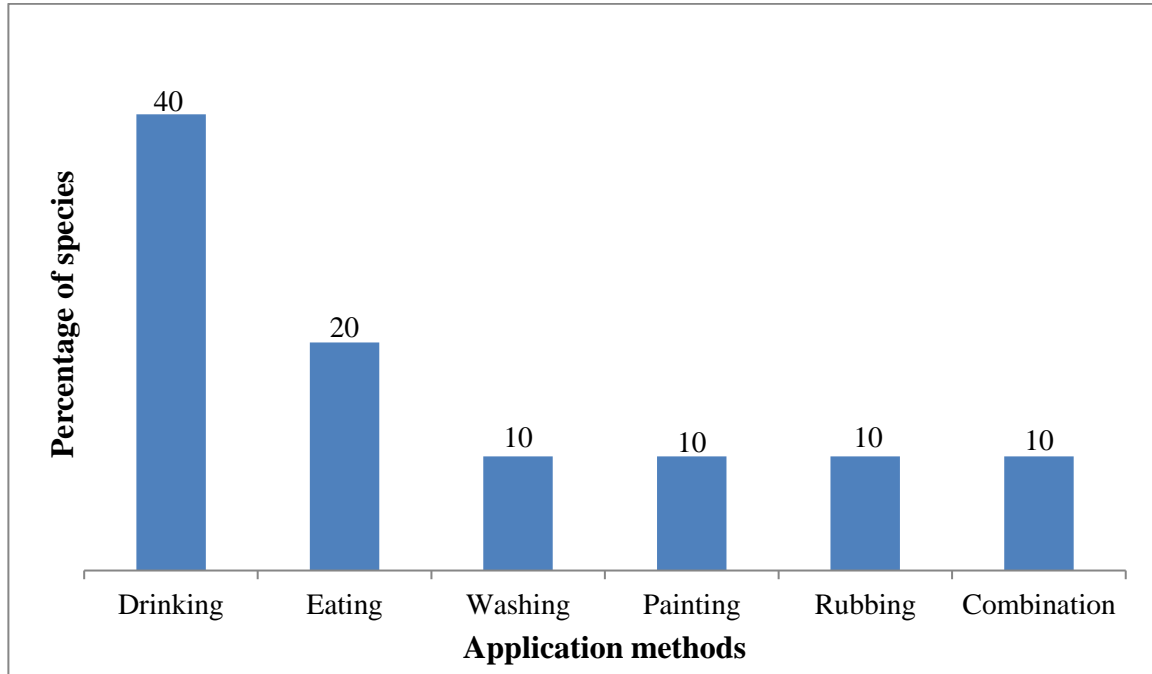


Figure 20 Methods of application of remedies for livestock ailments

4.12 Medicinal plants used to treat both human and livestock ailments

The result showed that, the total of 43(37.06%) medicinal plant species were collected and recorded to treat both human and livestock ailments in the study area. Regarding to the source of the plant species the largest proportion was gathered from wild habitat which is accounted for about 24(55.81%) species followed by home garden 12(27.90%) and wild/homegarden 7(16.27%).

4.12.1 Growth form and parts of the plants used for both human and livestock ailments

The growth form of medicinal plants that were collected for treatment of both human and livestock ailments in the study area herbs were the largest proportion which is accounted for about 16(37.2%) followed by shrubs 13(30.23%), tree 9(20.93%)species, climber 4(9.30%) species and epiphytes 1(2.32%) species (Figure.21). This result is unagreed with the finding

reported by Endalew Amenu (2007) in which shrubs was the major growth form of medicinal plants in Chelya district area used for treatment of both human and livestock ailments.

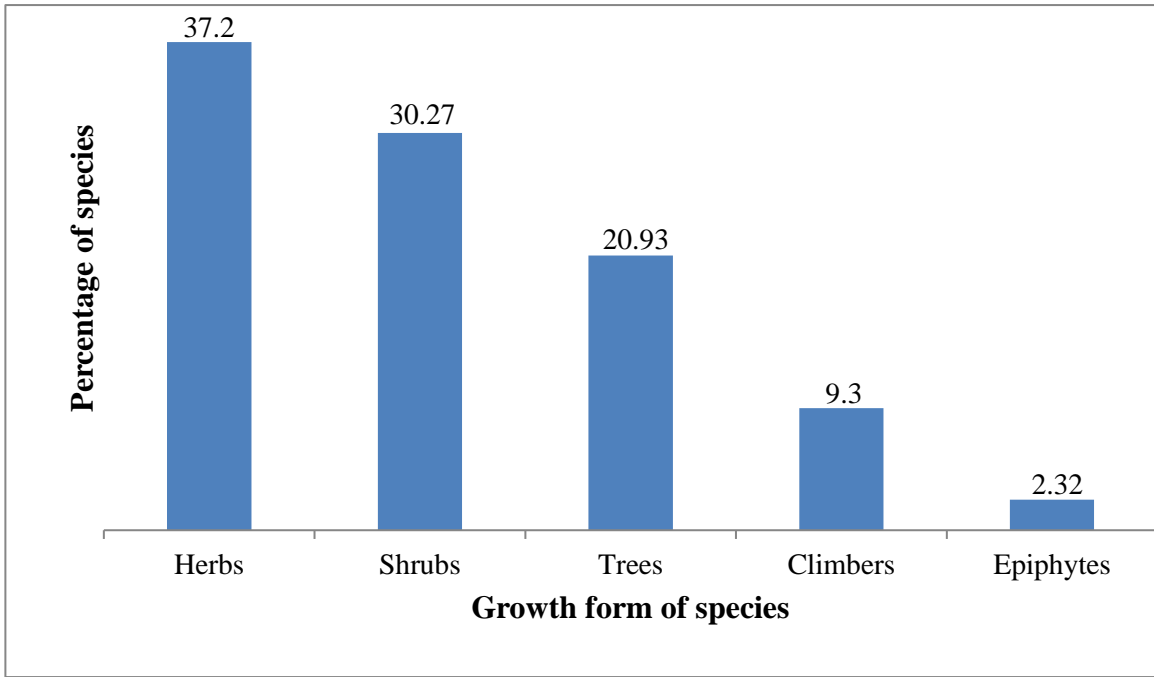


Figure 21 Growth form of the plants used for both human and livestock ailments

Regarding to plant parts used for treatment of human and livestock ailments, leaves were the most widely used part in the study area which is accounted for 16(37.2%) Species followed by equal proportions of whole plant and above ground parts 6(13.95) species each, root and fruit 2(4.3%) species each, seed 1(2.32%) and others (Figure.22).This finding were revealed that, leaves were widely used parts of the plants for human and livestock ailments in the study area.

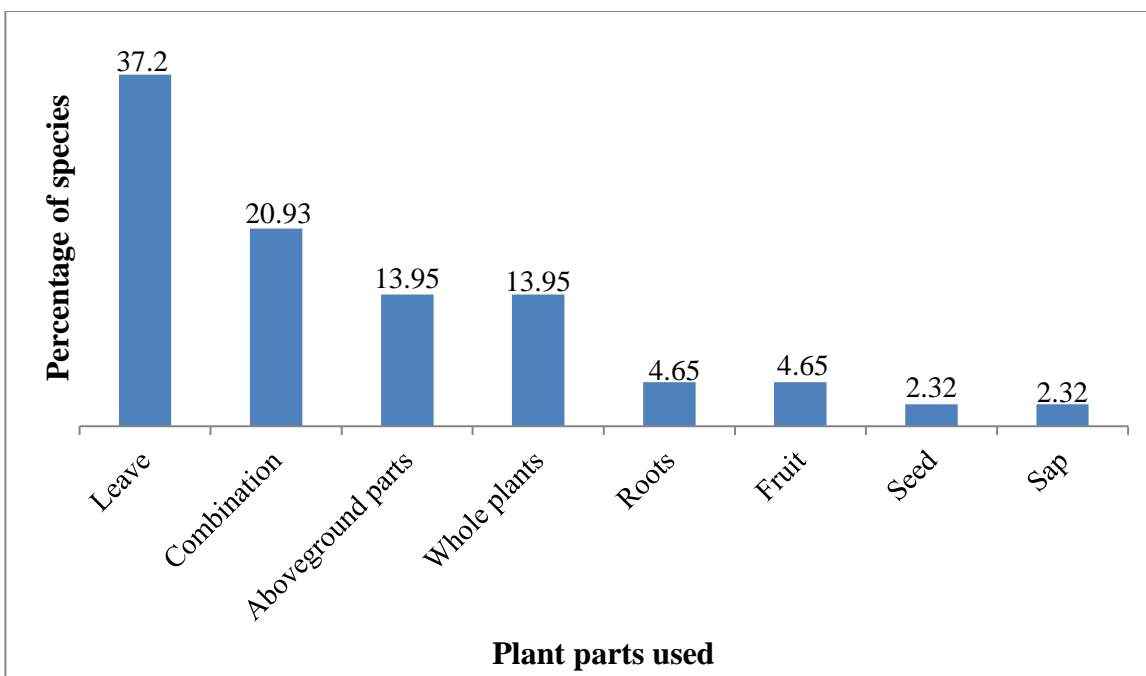


Figure 22 Plant parts used to treat both human and livestock ailments

4.12.2 Methods of preparation, Rout of administration and application

The local community use different form of remedy preparation and application to treat human and livestock diseases. The common form of preparation were crushing 14(32.55) species followed by squeezing 8(18.60%), concoction 3(6.97%) and others (Figure.23).The result indicated that, local people of the study area used different methods (forms) for preparation of herbal remedies and for the treatment of various health problems of human and livestock.

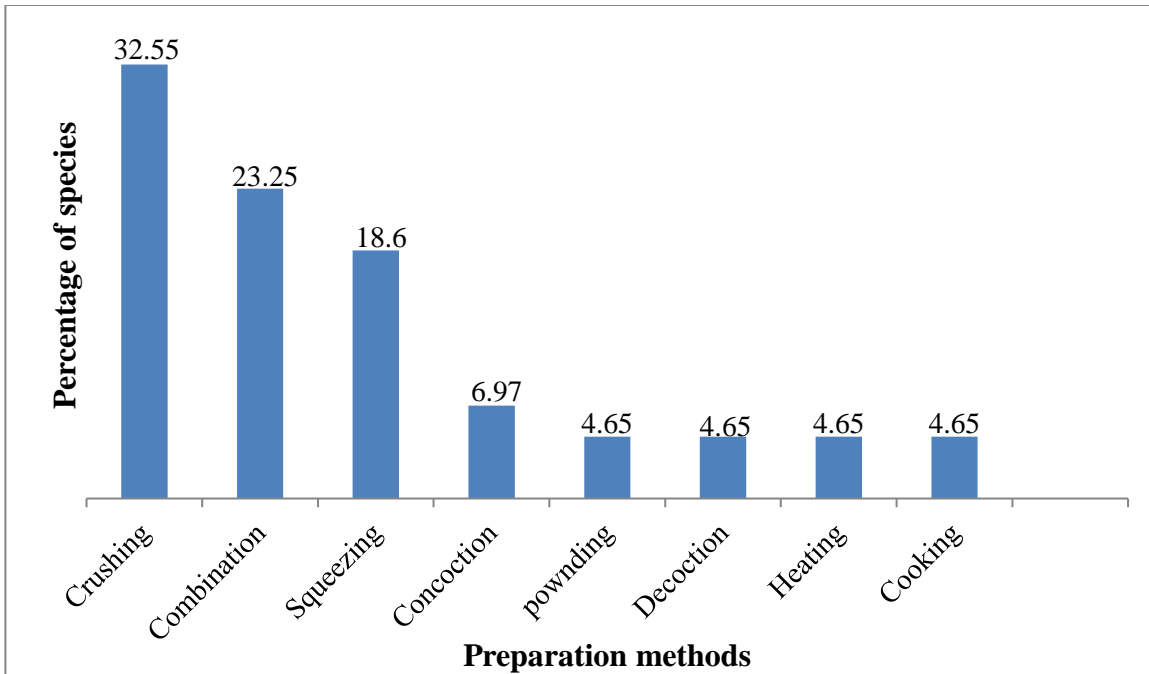


Figure 23 Methods of preparation of remedies for human and livestock ailments

According to the information obtained from the informants, the most common rout of administration for human and livestock ailments were oral which is accounted for 16(37.20%) followed by dermal/oral 12(27.90%), dermal 4(9.30%) and others (Figure.24). Similar report were seen in Teshale Sori et al., (2004) in which oral is the most common rout of administration in the study area.

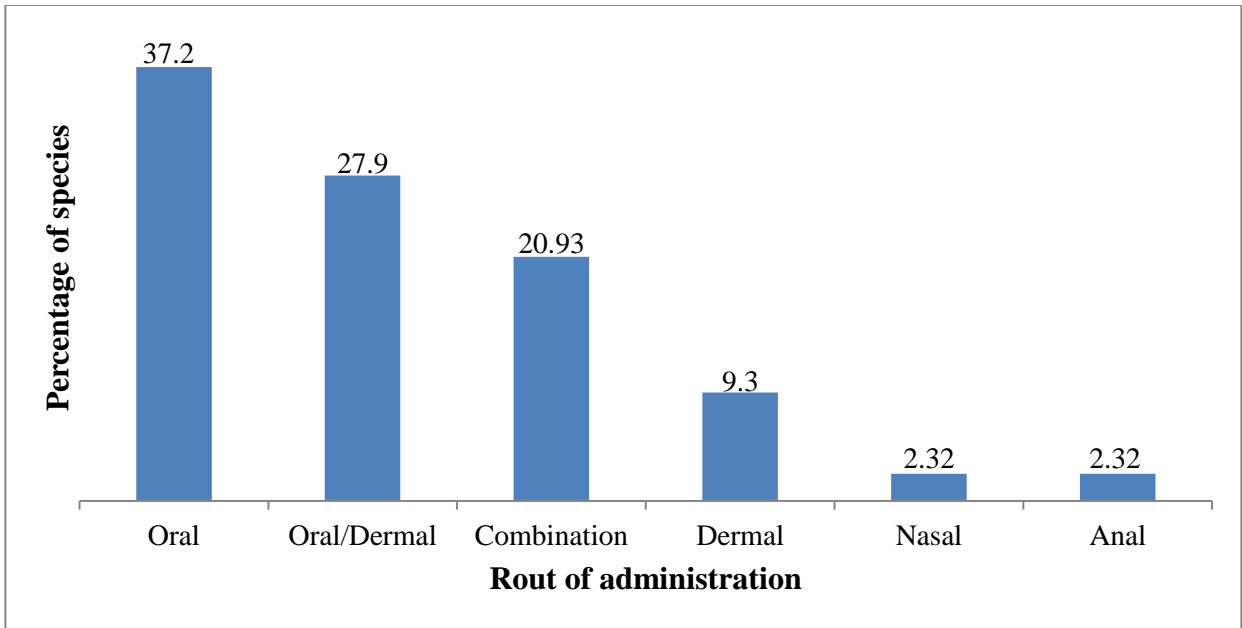


Figure 24 Rout of administration

Regarding to application of medicinal plant remedies for human and plant remedies in the study area, drinking were the most common and it was accounted for 13(30.23%) followed by combining different ways which was accounted for 12(27.90%), equal proportions of painting/creaming and eating accounted about 4(9.30%) species each and others (Figure.25).

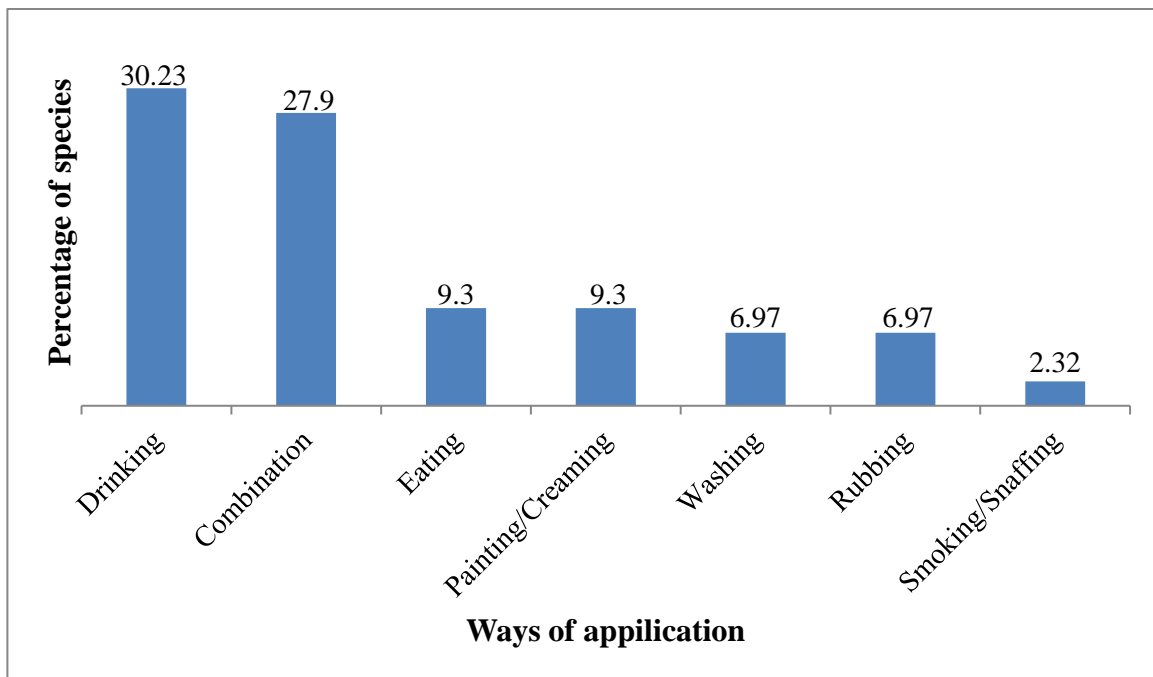


Figure 25 Ways of application of remedies for both human and livestock ailments

4.13 Informant Consensus

As the result, some medicinal plant species are popular than others, in here the informant consensus which is calculated to identify the most effective and well known medicinal plant species by the local people of the study area in treating different ailments in that the highest informant consensus goes to *Ocimum lamiifolium* Hochst.ex Benth. among 19 medicinal plants listed followed by *Hypoestes forskalii* (Vahl) R. Br. (Table.9) which was cited by 89 informants. The popularity of this medicinal plant is due to the preference of the species in treating fibril illness in the community rather than going to modern medication for the disease and its easy access in the homegarden of many households. This result is agreed with the finding by Moa Megersa et al. (2013) in that medicinal plant species with higher informant consensus need to be critically considered for further Ethnopharmacological studies, since they are widely applied by many people and they have been utilized for a long time.

Table 9 The result informant consensus on 19 medicinal plants in the study area

No.	Scientific name	Local name	No. of informants	% of informants
1	<i>Allium sativum L.</i>	Tumma	71	64.5
2	<i>Ocimum lamiifolium Hochst. ex Benth</i>	Minaantoofa	89	80.9
3	<i>Eucalyptus globulus Labill</i>	Qadaali baarizaafa	45	40.9
4	<i>Vernonia amygdalina Del</i>	Heeba	59	53.6
5	<i>Ruta chalepensis L.</i>	Qantalaama	73	66.36
6	<i>Zingiber officinal Roscoe</i>	Jaanjibeela	48	43.63
7	<i>Echinops kerebicho Mesfin.</i>	Toosa	56	50.9
8	<i>Carduus schimperi Sch. Bip.ex A. Rich.</i>	Hali uta	60	54.54
9	<i>Rumex nervosus Valhi.</i>	Bahixi haqa	50	45.45
10	<i>Croton macrostachyus Del.</i>	Masana	70	63.6
11	<i>Calpurnia aurea (Aiti) Benth</i>	Senna	16	14.54
12	<i>Nicotiana tobaccum L.</i>	Tambaa`a	40	36.36
13	<i>Hypoestes forskaolii (Vahl) R. Br.</i>	Omoro`o	84	76.36
14	<i>Satureja abyssinica (Benth.) Briq.</i>	Ishina	36	32.72
15	<i>Cymbopogon citrates (DC.)</i>	Hixaana	68	61.8
16	<i>Coriandrum sativum L.</i>	Wordimaama	33	30
17	<i>Amaranthus caudatus L.</i>	Haliba	55	50
18	<i>Asparagus africanus Lam</i>	Hundufaancho	42	38.18
19	<i>Artemisia afra Jacq.ex Willd</i>	Aguffa	58	52.7

4.14 Informant Consensus Factor (ICF)

In this study, all cited human and livestock diseases were grouped into 11 categories (Table.10) Febrile illness, Gastric, sudden Sickness, Stomachache, Blotting category had highest ICF value (0.81) followed by Rabies, Jaundice, Scabies, Cellulites Swelling, Wound, and Fire burn (0.79). Those disease categories having high ICF value were the ones that commonly occur in the study area so that more number of people communicates on their remedies. According to Tilahun Teklehaymanot and Mirutse Giday (2007), medicinal plants that are presumed to be effective in treating a certain disease have higher ICF values. A high ICF value (value close to 1) indicates that the informants rely most on the same species to manage specific disease conditions, while a low value (close to 0) indicates that the informants disagree on the species to be used in the treatment of a given ailments

Table 10 Informant consensus factor (ICF)

No.	Diseases categories	Nt	Nur	ICF	%ICF
1	Febrile illness, Gastric, Acute sickness, Blotting and Stomach ache	21	109	0.81	81.4
2	Common cold, cough, headache, fever, Asthma, Epilepsy,	17	64	0.746	74.6
3	Swelling, Skin rash hemorrhoid, STDs and hepatitis	18	77	0.77	77.6
4	Snake bite, Spider poison, Insect allergies, Ecto-parasite, Riningworm and Dandruff	7	29	0.785	78.5
5	Tape worms Ascariasis and internal parasite	16	57	0.73	73.2
6	Rabies, Jaundice, Scabies, Cellulites, Swelling, Wound, and Fire burn,	15	68	0.79	79.1
7	Diarrhea, Amoeba, Placental retention and Faces retention	11	36	0.71	71
8	Evil eye, evil sprit	14	31	0.56	56
9	Toothache, Tonsillitis	14	36	0.628	62.8
10	Eye disease, blood pressure, heart problem, Ear problems, Kidney Problem, Liver problem	12	35	0.676	67.6
11	Rheumatism and Arthritis	12	53	0.78	78.8

4.15 Fidelity level index

A total of 13, 18 specific and general use for *Allium sativum* L. were reported by informants from Kankicho and Duinmera while 18, 19 specific and general uses for *Allium sativum* L. were reported by informants from Mish-Duna and Sangiye. Then the use reports of informants from Kankicho and Duinmera were compared with informants from Mish-duna and Sangiye to calculate the fidelity level of *Allium sativum* L. (FL (%) = N_p/N). From the comparison, it was found that the fidelity level of *Allium sativum* for malaria treatment by Kankicho and Duinmera informants was 72.2%, while for Mish-duna and Sangiye was 94.7%. Thus, the medicinal value of *Allium sativum* is high in low land areas compared to high land areas.

4.16 Preference ranking

As the preference ranking analysis was employed on selected six medicinal plants by ten informants (Table.11) that were reported for treating fibrillness, the *Ocimum lamiifolium* Hochst. ex Benth found to be the most preferred medicinal plants followed by *Hypoestes forskalii*(Vahl) R. B.. Whereas the least preferred medicinal plants compared to the other five medicinal plant species in treating fibrillness was *Eucalyptus globules* labill in the study area as indicated by informants result (Table.11).

Table 11 Preference ranking of six selected medicinal plants used to treat Fibrillness ten informants.

No.		R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈	R ₉	R ₁₀	Total	Rank
1	<i>Ocimum lamiifolium</i> Hochst. ex Benth	6	6	6	5	6	6	6	5	6	5	57	1 st
2	<i>Hypoestes forskalii</i> (Vahl) R. B.	5	5	4	6	5	5	5	4	5	6	50	2 nd
3	<i>Eucalyptus globules</i> labill	2	1	1	3	1	1	3	1	1	3	17	6 th
4	<i>Allium sativum</i> L.	3	3	3	6	3	4	2	2	2	2	30	4 th
5	<i>Ruta chalepensis</i> L.	4	4	5	2	4	3	4	6	4	4	40	3 rd
6	<i>Rumex nepalensis</i> Spreng.	1	2	2	4	2	2	1	3	3	1	21	5 th

4.17 Direct matrix ranking

In present investigation the majority of the community relies on wild plants species for various purposes such as food, firewood, fodder, construction, medicine, charcoal, etc. In order to assess the relative importance and to determine the major treats on such plant species direct matrix ranking exercise was done (Table.12). Based on information gathered from the informants, six commonly used multipurpose plant species and eight use (divers use) categories were involved in direct matrix ranking with eight informants. The eight use values reported by informants in the study area which were employed in ranking included as food, firewood, fodder, construction, medicinals, fencing, furniture making, spice. Accordingly: the result of direct matrix ranking indicated that *Eucalyptus globules* ranked the most multipurpose medicinal plant species followed by *Olea europea* L., *Hagenia abyssinica*, *croton macrostachyus*, *Solanum tuberosum* L, and *Ocimum basilicum* L. (Table.12)

Table 12 Direct matrix ranking of six plant species by eight informants based on eight use criteria (5 = best; 4 = Very good; 3 = good; 2 = less used; 1 = least used and 0 = no value)

Medicinal plants	Informants (I ₁ -I ₈)	Use categories									
		Food	Fodder	Firewood	Fencing	Furniture	Medicinal	Construction	Spices	Total	Rank
<i>Hagenia abyssinica</i> (Brace) J. F. Gmel.	1	0	0	3	3	4	5	2	0	17	
	2	1	0	2	3	4	4	4	1	19	
	3	0	1	2	3	3	5	2	0	16	
	4	0	0	2	2	3	4	3	1	15	
	5	0	1	3	3	2	3	4	1	17	
	6	1	0	3	3	3	3	2	0	15	
	7	0	0	3	2	2	2	2	0	11	
	8	1	1	2	3	2	3	3	1	15	
	Total	3	3	20	22	21	29	22	4	124	3 rd
<i>Ocimum basilicum</i> L.	1	1	1	0	0	0	3	0	5	10	
	2	0	1	1	0	0	2	0	4	9	
	3	1	0	0	1	0	3	0	2	7	
	4	2	1	0	0	0	1	0	3	7	
	5	0	2	1	0	0	2	0	2	7	
	6	0	1	0	1	0	2	0	4	8	
	7	1	0	0	0	0	3	0	3	7	
	8	1	0	1	1	0	2	0	3	8	
	Total	6	6	3	3	0	18	0	26	62	6 th
<i>Croton macrostachyus</i> Del.	1	0	0	4	3	3	3	1	0	14	
	2	0	0	3	2	4	2	2	1	14	
	3	0	0	3	3	3	3	2	0	14	
	4	0	0	3	3	2	3	1	0	12	
	5	0	0	4	2	2	3	2	1	14	

Medicinal plants	Informants (I ₁ -I ₂)	Use categories									
		Food	Foder	Firewood	Fencing	Furniture	Medicinal	Construction	Spirits	Total	Rank
	6	1	0	3	2	2	2	2	0	12	
	7	0	0	2	1	2	2	1	0	8	
	8	0	0	3	2	3	3	1	0	12	
	Total	1	0	25	18	21	23	12	2	102	4 th
<i>Solanum tuberosum</i> L.	1	5	3	0	0	0	3	0	0	11	
	2	4	2	1	0	0	1	0	0	8	
	3	4	3	1	0	0	3	0	0	11	
	4	5	3	1	0	0	3	0	0	12	
	5	5	3	0	0	0	2	0	0	10	
	6	5	3	1	0	0	2	0	0	11	
	7	4	2	0	0	0	2	0	0	8	
	8	5	3	0	0	0	3	0	0	11	
	Total	37	22	4	0	0	19	0	0	78	5 th
<i>Olea europaea</i> sub spp L.	1	0	1	4	3	1	3	2	3	17	
	2	0	1	3	2	2	3	3	2	16	
	3	0	1	4	2	3	2	2	3	16	
	4	0	0	3	1	2	2	3	2	13	
	5	0	1	5	2	2	3	2	2	17	
	6	0	0	3	2	1	2	3	2	13	
	7	0	1	4	3	2	2	4	3	19	
	8	0	1	3	2	2	2	3	3	16	
	Total	0	6	29	17	15	19	22	20	128	2 nd

Medicinal plants	Informants (I ₁ -I ₂)	Use categories									
		Food	Fooder	Firewood	Fencing	Furniture	Medicinal	Construction	Spices	Total	Rank
<i>Eucalyptus globules</i> Labill.	1	0	0	5	5	3	3	3	2	21	
	2	0	1	5	5	2	4	3	3	22	
	3	0	0	4	4	3	3	4	2	20	
	4	0	0	5	5	4	3	4	2	23	
	5	0	0	4	4	3	2	4	3	20	
	6	0	1	4	5	3	3	3	3	22	
	7	0	1	4	5	4	4	3	2	23	
	8	0	0	5	4	3	3	4	2	21	
	Total	0	3	36	37	25	25	28	19	173	1 st
Total		47	40	117	97	82	133	84	71	671	
Rank		7 th	8 th	2 nd	3 rd	5 th	1 st	4 th	6 th		

4.18 Paired comparison

A paired comparison was made to determine the most preferred medicinal plants among six medicinal plant species that were reported to be effective in treating acute sickness in the study area. Accordingly, the ranking exercise that has been performed by six key informants showed that, *Echinops kebericho* Mesfin ranked first followed by *Allium sativum* L. (Table.13). Therefore, this result indicated that *Echinops kebericho* Mesfin. is the most preferred while *Brucea antidysentrica* J. F. Miller. is the least favored over the other plant species cited in treating Acute sickness in the study area.

Table 13 Paired comparisons of six selected popular medicinal plant species used to treat acute sickness based on the perceptions' of respondents in the study area. The preferred one over the other indicated by taking the first letter of their specific epithet name

Medicinal plant species	<i>Echinops kebericho</i> Mesfin.	<i>Allium sativum</i> L.	<i>Artemisia afra</i> Jacq.ex Willd	<i>. Ruta Chalepensis</i> L.	<i>Coriandrum sativum</i> L	<i>Brucea antidysentrica</i> J. F. Miller	Rank
<i>Echinops kebericho</i> Mesfin		Ek	Ek	Ek	Ek	Ek	1 st
<i>Allium sativum</i> L.			As	As	As	As	2 nd
<i>Artemisia afra</i> Jacq.ex Willd				Aa	Aa	Aa	3 th
<i>. Ruta Chalepensis</i> L.					Rc	Rc	4 th
<i>Coriandrum sativum</i> L						Cs	5 th
<i>Brucea antidysentrica</i> J. F. Miller							6 rd

4.19 Dosage use, antidotes and side effect of medicinal plant

In fact the local communities believed on the effectiveness of traditional medicine but there is a great fear about the amount taken particularly for human medicines which are taken internally. As in various parts of Ethiopia, the knowledge of traditional healers in Duna District, the use of measurement of dosage to treat various diseases was poor. The traditional healers use different measurements for dosage, mostly they use their finger lines and finger nails for the measurement of the amount to be taken and different measuring materials like Jog, cup of coffee, tea cup, glass

cups, spoon, half of hand, one hand, two hands and likes and as number of plant part (leaves, rhizomes, bulb, seed and fruit) are common for those remedies which are taken orally. But, these measurements are not accurate enough to determine the precise amount. Sofowora (1982) and Dawit Abebe (1986) have also discussed lack of precision and standardization as one drawback for the recognition of the traditional healthcare system. The measurements used to determine the dosages are not standardized. For that matter doses given depend on the age, physical appearances, type of disease and health conditions; that is, children are given less dose than adults, physically strong individual take more dose than weak individual. Though such prescription difference was practiced, still the amount prescribed by healers for both children and adults might not conform to the standard prescriptions as in modern medical literature. As the focus group discussion revealed that the traditional healers of Duna District never administer treatments that are taken internally to pregnant women, for children below six months of age and people under coma.

The absence of any adverse effects of traditional medicines after administration were also more frequently mentioned by the traditional healers but some of the preparations were reported to have some adverse effects like diarrhea, unconsciousness, lack of appetite, vomiting, severe headache, gastric, burning of wound, temporary irritation and others. As the FGD result showed that, the common reason of side effect for medicinal plants was lack of precision on the dosage of plant remedies prescribed for patients in the study area. As they responded that, over dose administration are associated with serious side effects and even death. Lack of precision is one of shortcoming for the credit of the traditional healthcare system (Sofowora, 1982). The traditional healers indicated that they use antidotes for the adverse effects of some traditional medicines like porridge of barley, milk, coffee, aja powder *atemit*, red Teff porridge, yogurt and bath after taking the medicine. For instance, the use of *Croton macrostachyus* for the treatment of gonorrhoea, leaves are powdered, placed on water overnight, filtered and 1 tea glass is taken for two days. During that diarrhea follows, as an antidote the local healers administer the patient to eat cooked teff flour to stop.

4.20 Local beliefs and taboos for gathering and application of plant remedies

According to the FGD result of study area and local informant individual interview made each other, they confirmed that certain beliefs and taboos during collection, preparation and

application of plant remedies observed in the study area. The act of sexual intercourse not allowed and it could be washed before collection and application of medicinal plant species prescribed for patient. As result of some informants awareness the time of medicinal plants collection is vary among healers and locations. Therefore, there is no fixed time for plant remedies collection and differ from individual to individual and highly reliant on healer beliefs. Some medicinal plants collection depended on types of ailments, for instance, majority of local healers revealed that the plant materials collection, preparation and application could be done for evil eye and evil spirit at early morning (12:00am-1:00am local time) on Wednesday and Friday. The indigenous people of the study area have indigenous knowledge on medicinal plants to treat evil eye and evil spirit which is not provided for treatment of modern medicine. This result is in line with the finding reported by Endalew Amenu (2007). As result, a medicinal plant is not only cure diseases but also evil eye and evil spirit that associated with medicinal plants. Some other medicinal plants also preferred morning time were collected for diseases like fibrillness from 1:00am-2:30am. According to FGD result most collection of medicinal plants in the study area confirmed that morning times could be preferable for other diseases and after 4:00pm herbal remedies harvesting was not advisable. And also date of herbal remedies collection in the study area varies among individual to individual or healer to healer or place to place. This finding is also agreed with the finding of Haile Yineger *et al.* (2008). The informants of the study area stated that Wednesday and Friday are the most preferable days to harvest herbal remedies for any sort of ailments in general and for evil eye or evil spirit in particular. After collection and preparation; and before application of herbal remedies the whole body part of the patient could be washed and praying *God* particularly for evil eye and evil spirit. As their general truth, traditional medicinal plants collection and application without any indigenous knowledge could be impossible for medication (treatment) purposes in the study area. As a result, anybody would not be assigned to harvest medicinal plants for medication purposes. Therefore, they believed that the healing influences of the medicinal plants during collection might be lost for evil eye and evil spirit unless keeping the prospects. As the FGD result revealed that these beliefs provided indirect contribution for the conservation of medicinal plants by limiting extreme collecting of medicinal plants in the study area.

4.21 Threats on medicinal plants and indigenous knowledge transfer

4.21.1 Major threats of medicinal plant

As the result obtained from FGD and individually interviewed informants in the study area, nowadays quite large number of medicinal plants under significant threats by manmade and natural factors. Some of the major threats of the study area were agricultural expansion, fire wood, fence, construction, medicine, charcoal and others. But as informants reported that Agricultural expansion 30.7% the leading of extensively wheat, bean and barley cultivation followed by fire wood 17.27%, fence 12.72%, construction 18.18%, medicine 6.36%, charcoal 8.18% and others are the major threats in the study area (Table 14). As result, currently local healers move long distance in searching of medicinal plants. This outcome is in line with Bahilu Itana`s (2010) finding.

Table14 Ranking of factors threatening medicinal plants species in the study area

No.		R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈	Tot al	Rank
1	Agricultural expansion	6	5	6	6	6	6	5	6	46	1 st
2	Medicine	2	1	1	1	1	1	2	2	11	6 th
3	Construction	5	4	5	5	5	5	6	5	40	2 nd
4	Fencing	3	3	2	2	4	3	3	3	23	4 th
5	Firewood	4	6	4	4	3	4	4	4	33	3 rd
6	Charcoal	1	2	3	3	2	2	1	1	15	5 th

Key R= key respondent

4.21.2 Threatened medicinal plants

The result obtained from nine key informants revealed that seven medicinal plant species were considered to be threatened in the study area. Based on the perception of the community *Hagenia abyssinica* is the most threatened plant species followed by *Olea europea sb spp. L.*, *Podocarpus falcatus* (Thunb) Mirb., *Prunus africana* (Hook. f.) Kalkm., *Olinia rochetiana* A. juss., *Ficus sycomorus* L., *Syzygium guineens* (Wild.) DC. was least threatened plant species in the study area (Table 15).

Table15 Ranking of threatened medicinal plants species in the study area

No.		R ₁	R ₂	R ₃	R ₄	R ₅	R ₅	R ₆	R ₇	R ₈	Total	Rank
1	<i>Hagenia abyssinica</i> (Brace) J.F.Gmel.	7	7	6	7	6	7	6	7	7	60	1 st
2	<i>Olea europea</i> L	5	6	7	5	5	6	7	6	5	52	2 nd
3	<i>Podocarpus falcatus</i> (Thunb) Mirb.	4	5	5	6	7	4	5	5	4	45	3 rd
4	<i>Prunus africana</i> (Hook. f.) Kalkm.	3	4	4	4	3	5	4	3	4	34	4 th
5	<i>Olinia rochetiana</i> A. juss.	6	3	3	2	4	2	3	4	2	29	5 th
6	<i>Ficus sycomorus</i> L.	2	1	2	3	2	3	1	2	3	19	6 th
7	<i>Syzygium guineense</i> (Wild.) DC.	1	2	1	1	1	1	2	1	1	11	7 th

Key R= key respondent

4.21.3 Indigenous knowledge of medicinal plant Transfer

The result of FGD and individually interviewed informants in the study area showed that indigenous knowledge transfer on collecting and using medicinal plant materials undergo with a great secrecy and with no possibility for anyone to look at while the traditional healers collecting and preparing the remedies. Therefore, indigenous knowledge on traditional uses of some medicinal plants is transferred from one generation to next by orally with a great secrecy. As their result indicated that, this indigenous knowledge of medicinal plants transferred orally from father or mother to honesty son or daughter within the family or to very honesty close relatives by great secrecy which is relied on his/her tremendous carry out and capability of custody for the secrecy to use indigenous knowledge. As the result revealed that some traditional healers might have given great concern to the ethnobotanical knowledge transfer while others have given little attention regarding the indigenous medicinal plant knowledge transfer. According to Sofowora (1982) the loss of medicinal plants associates with the missing advantages gained from medicinal plants and indigenous knowledge associated with plants. In general, the knowledge on medicinal

plants become lesser and lesser due to its secrecy, unwillingness of young generation to gain the knowledge, oral based knowledge transfer, unavailability of the species, influence of modern education, religious prospect and lack of awareness which all results in gradual loss of indigenous knowledge on medicinal plants in the study area. More over the young generation assume that following indigenous knowledge uses of medicinal plants considered as back warded culture. These all could be a threaten factor for the ethnobotanical knowledge transfer and its sustainability throughout generation.

4.21.4 Conservation of medicinal plants

People of the study area manage the local vegetation to not only meet their, food, fodder, fruits, spices, construction, fuel wood, commercial values, aesthetic value, cultural value and spiritual needs but also for their medicinal attributes, as the knowledge is within them. Regarding of effort to conserve medicinal plant species, 38.18% of informants practice conservation by planting and cultivating some medicinal plants in their home garden in the study area. The most common medicinal plant species found under cultivation and plantation includes *Echinops kebericho Mesfin*, *Eucalyptus globulus Labull.*, *Ocimum lamiifolium Hochst. ex Benth.*, *Allium sativum L.*, *Kalancheo petitian A.Rich.*, *Hypoestes forskaolii (Vahl) R. B.*, *Foeniculum vulgare Mill.* and *Ruta chalepensis*. Some of these species are usually planted for other purposes. For example *Eucalyptus globulus* widely grown for firewood and house construction as same time could be used for treatment of both human and livestock ailments. On the other hand, some plants species are deliberately cultivated at home garden for medicinal purpose only. For instance: *Ocimum lamiifolium Hochst. ex Benth.*, *Allium sativum L.* and *Foeniculum vulgare Mill.* As the informants result 61.82% of informants were not practicing conservation of medicinal plant species and they were harvesting from wild habitat (roadside, farmland, river side, grazing land and streams) and home gardens at whatever time want to medicinal value for treatment of ailments and did not care for survival of those resources. As the studies of local people result indicated that most of medicinal plants were easily accessible and no required to endeavor conserve medicinal plants as (Haile Yineger et al. 2008) finding.

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The result of the study showed that the study area is relatively diverse in medicinal plant species and the related indigenous knowledge. A total of 116 medicinal plant species were recorded. Of these, 63 species (54.31%) were used to treat human ailments while 10 species (8.6%) were used to treat livestock ailments and 43 species (37.06%) were used to treat both livestock and human ailments. Of these, 50(43.10%) from wild and 38(32.75%) species were collected from the home gardens and the remaining 28(24.13%) species were found in both habitats. Herbs were highly utilized for medicinal purpose in the study area followed by shrubs, Trees, Climbers and Epiphytes respectively. Leaves were the most frequently used plant parts followed by fruits, aboveground part, seed and others for preparation of medicinal plant remedies respectively. The finding of this study revealed that majority of the medicinal plants were prepared from fresh material of the plants which was accounted for 91(78.444%), followed by dry/fresh 17(14.65%) and dry 8(6.89%). The highest informant consensus value was given to *Ocimum lamiifolium* which was independently cited by 89 informants for treatment of different ailments followed by *Ruta chalepensis* which was cited by 73 informants. The highest informants' consensus factors value was 0.81 for fibrillness category in the study area. The main threats of medicinal plant species in the study area arises from agricultural expansion, construction, firewood, deforestation, drought and others. Whereas, the major loss of indigenous knowledge originated from secrecy, unwillingness of young generation to gain the knowledge, oral centered and the likes. Therefore awareness creating campaigns are timely needed to improve local community's knowledge on the importance and management of medicinal plants and awareness rising should be made among the healers so as to avoid loss of the indigenous knowledge and to ensure its sustainable use.

5.2 Recommendation

Based on the results of the study area, the following recommendations are forwarded:

- ❖ The local people need to be trained, encouraged and supported on how to conserve and manage the plant resources in general and medicinal plant species in particular.
- ❖ Local community must be aware of preserving indigenous knowledge on medicinal plants
- ❖ Local people must be thought of growing medicinal plants in home gardens mixing with crops in the farm lands and live fences.
- ❖ Since some of the traditional healers might have given much attention to the indigenous knowledge transfer while others have little concern regarding the value of indigenous knowledge, any concerned body should participate in awareness creation for healers to minimize the loss of indigenous knowledge.
- ❖ Raising awareness of the young generation to avoid negative attitude on the medicinal plants and associated knowledge in the area, hence, documentation of the medicinal plants of the area needs to continue.
- ❖ Attention should be given to standardization of measurement and hygiene of the medicines made from plants by training both the healers and other members of the local community.

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APPENDICES

Appendice 1 List of human and livestock disease in the study area

No	Local name of disease	English name
1	Amoeba	Amoeba case
2	Kachisa	Malaria
3	Xafanna	Epilepsy
4	Ku`aasa/Qurata	Diarrhea
5	Gii`li mada	Fire burn
6	Loome`e	Goiter
7	Xiiqi Hofecha	Anemia
8	Soriphopha	Tonsillitis
9	Waadamuunchcho	Liver problem/rainbow disease
10	Leela`iluwa	Uvilaitis
11	Julle`e	Cellulites
12	Dibino	Tape worm
13	Godabii fisimma	Abortion
14	Gorimota	Evil eye
15	Qosha	Scabies
16	Chophixo`o	Gonorrhea
17	Cii`i Xisso/Shuma	Urine of Bat/Jaundice
18	Anu`ini Jabbo	Breast ulcerate
19	Haabidasha	Swelling
20	Inqi Jabbo	Teeth infection
21	Illi Jabbo	Eye infection
22	Mu`ili Jabbo	Kidney problem
23	Wishi xisso	Rabies
24	Siinxi beqeeqa	Foot crack
25	Sanguuga	Nasal bleeding
26	Godaphi Xisso	Stomachache
27	Maci Jabbo	Ear infection

28	Tiitaanoosa	Tetanus
29	Horo`ili Damuuma	Head ache
30	Micha	Fibril illness
31	Hensheesha	Ascaris
32	Kuxichcha	Cough
33	Oracho muransimma	Rheumatism
34	Hileeni Xanqo`o	Internal parasites
35	Bacaro`o	Ring worm
36	Wiciiba	Skin rash
37	Idoxi qasa	Spider poison
38	Mada	Wound
39	Seexaa`inisa	Evil sprit
40	Iiqamima	Dislocated bone
41	Caancera	Cancer
42	Cabala	Syphilis
43	Laasame	Insect bit
44	Godaphi duubima	Blotting
45	Xiigi lophimi xisso	Hyper tension
46	Qasaa xisima/Dingaxisa	Acute sickness
47	Gansha	Common Cold
48	Sukaa`li Jabbo	Diabetes
49	Gansha	Pneumonia
50	Gansha	Influenza
51	Iicaa xisima	Arthritis
52	Kintaaroota	Hemorrhoids/Wart
53	Hamashi qasa	Snake bite
54	Cogaa`ili xisso	Gastritis
55	Forifora	Dandruff
56	Woda`ini Hoonge	Heart failure
57	Maqe`ili dasooma	Retained placenta

58	Ciro hoora	Retained faces
59	Kembesha	Avian cholera
60	Hafachchisa	Blackleg
61	Anjichcho	Anthrax
62	Diinaxi Orachi xisso	Skin infection
63	Cinne`e	Ectoparasite
64	Siniqa	Respiratory problem
65	Urula	Leeches
66	Shiinqqa	Asthma

Appendice 2; List of medicinal plants used for both human and/or livestock diseases, scientific name; family ; local name; habit; parts used; disease treated; mode of preparation with dosage used and route of administration. For voucher numbers see Appendix 4 and 5. Key: Habit (Ha.): Herb (H); Shrub (Sh); Tree (T); Climber (Cl). Parts used (Pu) (Bark, B; Latex, La; Root, R; Leaf, L; Fruit, Fu.; Flower, F.; Seed, Se.; Stem, St.; Bulb, Bu ;Rhizome, Rz.; Tuber, Tu; Above ground, Ag; Whole plant, Wp.). Use (Hu-Human, Ls-Livestock).

Scientific name	Family name	local name	Ha	Use	Pu	Disease treated	Mode of preparation	Route
1. <i>Achyranthes aspera</i> L	Amaranthaceae	Qaccaba	H	Hu and Ls	Wp	Excessive menstrual bleeding Nasal bleeding Eye problem	The bark; tied on the foot/leg of female Root; crushed, mixed with leaves of <i>Solanum incanum</i> and then sniffed Leaf; chewed and added a few drops on the eye	Dermal Nasal Optical
2. <i>Acmella caulirhiza</i> Del.	Asteraceae	Bishibisha	H	Hu	Ag	Tonsil Toothache Headache	Crushed the aboveground parts of plant filter and take the liquid part in a drop for tonsil and creamed the tooth surfaces Crushing the leaf and snuffing	Oral
3. <i>Aframomum corrorima</i> (Braunl.) Jansen	Zingiberaceae	Wokaasha	H	Hu	Se	Sudden sickness Blotting Stomachache	Chewing the dry seed and then swallowing	Oral
4. <i>Agave sisalana</i> Perr.ex.Eng	Agavaceae	Alge`e	Sh	Ls and Ha	L/Sap	Avian cholera Skin rash Dandruff	Crushing the fresh leaf mix with water then drunk the avian Squeeze the fresh leafs creamed the affected part	Oral Dermal
5. <i>Ajuga integrifolia</i>	Lamiaceae	Anaamuchcho	H	Ls and	L	Black leg	Crushed with powdered <i>Echinops kebericho</i>	Oral

<i>Hami. Buch.</i>				Hu		Rheumatism	<i>Mesfin.</i> and 1 L is given to cattle Until recovery Squeezed and 1 glass cup is taken per day for 3 consecutive days by adding salt for human	
6. <i>Albizia schimperiana Oliv.</i>	Fabaceae	Maande `cilaala	T	Hu and Ls	L and R	Evil eye Blackleg	Leaf should be crushed mix with water drink half of water glass per day for two selective days (Wednesday and Friday) in a week until recovery Its root is powdered and mixed with water a glass of the concoction is given to cattle	Oral
7. <i>Allium sativum L.</i>	Alliaceae	Tumma	H	Hu and Ls	Wp	Lung cancer, Wound, Dandruff Common Cold Stomachache Blackleg Fibrillness Snake bit Toothache Diarrhea Malaria	Fresh or dried bulb is crushed mixed with honey then given to eat Bulb of <i>Allium sativum</i> is crushed concoct with <i>Ruta chalepensis</i> leaves and mix with salt and water and then drunk Bulb of <i>Allium sativum</i> is crushed with <i>Ruta chalepensis</i> leaves mix with salt and water and then drink the concoction/ rubbing body Bulb of <i>Allium sativum</i> and rhizome of <i>Zinger officinal</i> are pounded and eaten with honey Fnresh/Dry Bulb of <i>Allium sativum</i> should be chewed and then spited on affected parts of the	Oral Dermal

						Blotting	body.	
8. <i>Allium porrum</i> L	Alliaceae	Shunku ruta	H	Hu and Ls	Wp	Hypertension	The Tuber of <i>Allium porrum</i> is crushed and immersed in little water for 1 day and then filtrated by clean cloth and drunk before food	Oral
9. <i>Amaranthus caudatus</i> L.	Amaranthaceae	Haliba	H	Hu	Se	Fibrillness Cough	One spoon of its dried seed is added on one cup of tea then drunk	Oral
10. <i>Artemisia absinthium</i> L.	Asteraceae	Naatira	H	Hu and Ls	Ag	Syphilis Common cold	The whole parts of <i>Artemisia absinthium</i> is crushed, mixed with little water and drunk	Oral
11. <i>Artemisia afra</i> Jacq.ex Willd	Asteraceae	Agufa	H	Hu and Ls	Wp	Sudden sickness Blotting Stabbing pain	Fresh leaf crushed mix with water and squeezed then drink half of a cup while feeling pain for human and Full of one glass for cattle The whole parts of <i>Artemisia absinthium</i> is crushed, mixed with little water and drunk	Oral
12. <i>Arundinaria alpina</i> K.Schum.	Poaceae	Leema	Sh	Hu	L	Skin rash	Burning the leaves mix its ash with butter then cream the parts	Dermal
13. <i>Arundo donax</i> L.	Poaceae	Shomb oqo'o	Sh	H	R	Rh factors "shotelay"	the root of <i>Arundo donax</i> is tie on neck part of the body	Derma

						Skin rash	Burning the leaves mix its ash with butter then cream the parts	
14. <i>Asparagus africanus Lam.</i>	Asteraceae	Hundufaancho	H	Hu and Ls	Wp	Evil eye Stabbing pain Fibrillness Sudden sickness Hemorrhoids Spider poison Diabetes	Crushed the whole part mix with water then drunk one glass per day for three consecutive days Wash and creamed the affected parts by its crushed and squeezed Powdered the leaf and taken it with honey	Oral Dermal
15. <i>Asplenium monathes L.</i>	Aspleniaceae	Massa'ni Xanqqo'o	Ep h	Hu and Ls	L	Cough Malaria Rheumatism	Crushing and powdering the dried leafs of the plant species and mix one spoon of its powder with one glass of water then drink at morning time	Oral
16. <i>Bersama abyssinica Fresen.</i>	Meliantaceae	Korhaqqa	Sh	Ls	L	Stomachache	Leaf, crushed mix with water filter then drink Half of a water glass while feeling pain	Oral
17. <i>Beta vulgaris L.</i>	Chenopodiaceae	Kashari lugumo	H	Hu	R	Anemia	Cooking(concoction) the fresh root and then eating	Oral
18. <i>Bidens pilosa L</i>	Asteraceae	Horoor aamo	H	L and R	Hu	Ear problem Gonorrhoea Spider poison	Squeezed and added Squeezed and drinking 1 glass cup Burned on fire and put on the area	Auricular Oral Dermal
19. <i>Brassica carinata A. Br.</i>	Brassicaceae	Wong'e`	H	Hu	Se	Malaria	The seed of <i>Brassica carinata</i> is crushed,	Oral Dermal

	ae	e		and Ls		Cancer	powdered and mixed with milk/ honey and then drunk for malaria and creamed affected part for cancer	
20. <i>Brassica integrifolia</i> Var.	Brassicaceae	Abashi chi Shaana	H	Hu and Ls	L	Retained faces	Crush cook and eat with <i>Allium sativum</i> by adding salt	Oral
21. <i>Brassica oleracea</i> L.	Brassicaceae	Xaxo`I Shaana	H	Hu	Ag	Gastritis	Aboveground part; concocted and then eaten	Oral
22. <i>Brucea antidysentrica</i> J. F. Miller	Simarouba ceae	Ciiron ta	Sh	Hu and Ls	L and Fu	Rabies Swelling Stomachache Skin rash Blotting	Squeezed and baked with Teff flour and given for 3 days Boiled the leaves and washed the affected parts for 3 consecutive days. Pounding the leaf mix with water filter then add butter to a filtered liquid part drink to cattle Chewing the leaf and swallowing a few drops Fruit, crushed then creamed the infected part of the body	Oral Dermal
23. <i>Buddleja polystachya</i> <i>fresen.</i>	Loganiaceae	Bulisha ana	T	Ls	L	Wound	The leaf of <i>Buddleja Polystachya</i> is pounded, powdered and applied on wound	Dermal
24. <i>Calipurnia aurea</i> (Ait.) <i>Benth</i>	Fabaceae	Senna	Sh	Ls	L	Skin infection Amoeba Ectoparasite	Fresh leaf crushed and painted on infected part of the Skin Fresh leaf crushed mix with salt and painting	Dermal Oral

						Rabies Snake Bite	on the body part of cattle Fresh root of <i>Calpurnia aurea</i> is crushed mix with water then drunk the cattle Fresh root of <i>Calpurnia aurea</i> crushed mix with <i>Allium sativum</i> then drunk cattle	
25. <i>Capsicum anum</i> L.	Solanaceae	Miximi xo`o	H	Hu	Fu	Internal Parasite Blotting Blackleg Diarrhea Tonsillitis	Dried fruit is powdered then mixed with <i>Lepidium sativum</i> add salt then drunk as solution Dried powdered mixed with salt pounded and drunk cattle The seed of <i>Capsicum anum</i> is pounded, powdered, mixed oil and roasted and drunk	Oral
26. <i>Carduus schimperi</i> Sch. Bip. ex A. Rich.	Asteraceae	Hali uta	H	Hu	R	Fibrillness Stomachache	Crushing the root mix with water then drink a glass at a time in the morning for three days	Oral
27. <i>Carica papaya</i> L.	Caricaceae	Paapaya	T	Hu	Fu	Gastritis Malaria	Crushed, squeezed and drunk 1 glass cup in the morning Yellow leaves are squeezed and drunk	Oral
28. <i>Catha edulis</i> (Vahl) Forssk. ex Endl.	Celastraceae	Caata	Sh	Hu and Ls	L	Amoeba Headache Blotting	Dry/fresh leafs, crushed, boiled, filtered, cooled and then drunk until recovery	Oral

29. <i>Celtis africana</i>	Ulmaceae	Qama`i l haqa	T	Ls	L	Blotting Internal parasite Stomachache	Feeding fresh leaves to cattle Crush its fresh leafs mix with water and add salt then drunk the cattle	Oral
30. <i>Citrus aurantifolia</i> (L.) Burm.f.	Rutaceae	Loome`e	SH	Hu	Fu	Common cold Hypertsion Toothache Athletes foot Cough Eye cataract	Squeeze the fruit of <i>Citrus aurantifolia</i> then taken in to the mouth The fruit of <i>Citrus limon</i> is squeezed and creamed on affected for continuous days The leaf of <i>Citrus limon</i> is pounded, powdered, mixed with milk and boiled and added sugar then drink pure liquid during feeling pain Squeezed and added on eye	Oral Dermal Optical
31. <i>Clausena anisata</i> (Wild.) Benth.	Rutaceae	Bahixih aqqa	T	Hu	L	Toothache Evil eye Fibrillness Stomachache Typhoid Malaria Arthritis	1/3 of finger length stem is chewed on affected teeth for certain minutes and brushing regularly Squeezed with leaves of <i>Ruta chalepensis</i> and mix with water then drunk one water glass per day for two selective days (Wednesday and Friday) in a week for three weeks at morning time Boiling the fresh leaf mixed with water and washing the whole body Squeezed with leaves of <i>Artemisia abyssinica</i> and 1 glass cup is taken	Oral Dermal

32. <i>Clerodendrum myricoides</i> (Hochst) Vatke.	Lamiaceae	Haniga	Sh	Hu and Ls	L and B	Tonsillitis Respiratory problems Acute sickness	The leafs and stem bark crushed together and squeezed then 2-3 drops of its fluid is applied on the left ear and nose Three twigs chewed and spit a drop of it in the mouth Its leafs with the leafs of <i>Brucea antidysentrica</i> and <i>Croton macrostachyus</i> are grounded together mixed with water, filtered then 2 to 3 liters of the infusion is given for cattle	Optical Nasal Oral
33. <i>Coffea Arabica</i> L.	Rubiaceae	Buna	Sh	Hu	L and Se	Asthma Diarrhea Fire burn	Seed: Powder of roasted coffee seed will be boiled mixed with juice of lemon and ginger and drunk Seed; is roasted, crushed, powdered, boiled and the filtered then it`s one cup is mixed with one cup of tea and a few drop of oil then drunk Its seed is roasted, crushed, powdered and applied on wounded	Oral Dermal
34. <i>Commelina benghalensis</i> L.	Commelinaceae	Luxuun xa	H	Ls	Ag	Internal parasites Ascaris	Ag; crushed mix with butter then swallow the concoction to livestock	Oral
35. <i>Coriandrum sativum</i> L.	Apiaceae	Wordi maama	H	Hu and	Ag	Blotting Sudden sickness	Dried powder of Coriander sativum is crushed with <i>Allium sativum</i> added salt and	Oral

				Ls		Stabbing pain Internal parasite Fibrillness	drunk cattle Crushing the fresh leafs and fruits squeezing then drunk	
36. <i>Croton macrostachyus Del.</i>	Euphorbia ceae	Masana	T	Hu and Ls	L and B	Skin rash Ringworm evil eye Blotting Stomach Ache Fibrillness Tetanus	Fresh bark is crushed and applied to rubbed on the skin affected area The leaf sap painted the affected body Part Dried leaf crushing and smoking inhaled Leaf crushing with salt added water and drunk cattle Chewing leaf and feeling ache Leaf is crushing with salt and boiling and fumigate vapor droplet water inhaled The upper part of the plant leaf is crushed and added to the area	Dermal Nasal Oral
37. <i>Cucurbita pepo L.</i>	Cucurbita ceae	Dabaaq ula	H	Hu	Se Fu	Tape worm Gastritis	Seed: Seed will be roasted and eaten Fruit; Dissecting it in to pieces cooked then eating	Oral
38. <i>Cymbopogon citrates (DC.)</i>	Poaceae	Hixaan a	H	Ls and Hu	L and R	Evil eye Stabbing pain Fibrillness Ss	Dried root smoking covered with clothes or closed room applied fumigated Fresh root crushed with <i>Allium sativum</i> added salt making solution to drink cattle	Nasal Oral

						Tonsillitis S Stomach Ache Blotting	Fresh root chewed with salt to get relief from stomach ache	
39. <i>Datura stramonium L.</i>	Solanaceae	Machaa a`l haqa	H	Hu	Se and L	Toothache Dandruff Gonorrhea Wound	Seed; roasted and held on to the teeth squeezed and painted on bare head Crushed, mixed with butter, taken Crushed the leafs and then and put on the affected area	Oral Dermal
40. <i>Daucus carota L.</i>	Apiaceae	Kaaroot a	H	Hu	R	Eye problems	Eating fresh root without cooking/cooking	Oral
41. <i>Discopodium penninervum Hochst.</i>	Solanaceae	Maraar a	Sh	Hu and Ls	L	Swelling Acute sickness	Its fresh leaves heated in fire then touching the parts Its leaves along with any part of <i>Allium sativum</i> grounded, mixed with water and then 1-2 liters infusion is given to cattle	Dermal Oral
42. <i>Dovyalis abyssinica</i>	Flacourtiaceae	Kooshi ma	Sh	Hu	Fu Tho rn	Intestinal parasite Tetanus	Its fruit is eaten as food for the case of intestinal parasite before breakfast every morning Burning the affected part by strongly heated thorn of <i>Dovyalis abyssinica</i>	Oral Dermal
43. <i>Echinops kebericho</i>	Asteraceae	Toosa	H	Hu	R	Fibrillness	Root of <i>Echinops kerebicho</i> is dried powdered	Oral

<i>Mesfin.</i>	e			and Ls		Internal parasite Stabbing pain Gonorrhea Sudden sickness Snake repellent	and mixed with water. half of tea cup is given to human Root of <i>Echinops kerebicho</i> and bark of <i>Croton macrostachyus</i> are pounded together mixed with honey. One cup of tea is taken by human Dried Root of <i>Echinops kerebicho</i> is fumigated Root of <i>Echinops kerebicho</i> is dried and smoked in house.	
44. <i>Enset ventericosum</i> (Welw.) Cheesman	Musaceae	Weesa	Sh	Ls	R	Retained placenta Dislocated bone	Root; chopping and then feeding the cattle	Oral
45. <i>Erythrina brucei</i> Schweinf.	Fabaceae	Wora`a	T	Hu	L and Fu	Tonsil Skin rash	Chewing tip of the leaf Crushing the fruit then creaming on affected part	Oral Dermal
46. <i>Eucalyptua camaldulensis</i> Dehnh	Myrtaceae	Kashari baariza afa	T	Hu	L	Epilepsy Headache Stomach problem	Crush the fresh leaf and sniff Squeeze the leaf the drink a few drops	Nasal Oral
47. <i>Eucalyptus globulus</i> Labill.	Myrtaceae	Qadaali baarzaa fa	T	Hu and Ls		Fibril illness bronchitis Common cold	The leaf of <i>Eucalyptus globulus</i> is chopped and boil with water and inhale repeatedly the vapor, while boiling steam bath is taken by human in	Nasal

						Avian cholera	closed door and window Leaf of <i>Eucalyptus globulus</i> pounded, boiled and the solution is added to soup of wheat powder and given to hen.	Oral
48. <i>Euphorbia abyssinica</i> Gmel.	Euphorbiaceae	Adaama	T	Hu and Ls	La	Wound dandruff Breast Ulcer Ringworms Skin rash Hemorrhoids Rabies STDs	The fresh latex of <i>Euphorbia amliphylla</i> is creamed on affected part Stem of <i>Euphorbia amliphylla</i> is chopped and fumigated to ulcerated breast The fresh leaf of <i>Euphorbia amliphylla</i> is applied on the infected part The drop of latex is collected mixed with “Teff” powdered and backed and then eaten in morning time for 3 consecutive The drop of latex is collected, mixed with “Teff” powdered and backed and then eaten 1/3 of it	Dermal Oral
49. <i>Euphorbia dumalis</i> S. Carter	Euphorbiaceae	Gendele`la	H	Hu	L	Hemorrhoids Spider poison Cellulites	Mix its leaf with the leaf of <i>Rumex nepalensis</i> plant species crush then creamed the affected part	Dermal
50. <i>Ficus sycomorus</i> L	Moraceae	Oda`a	T	Hu	L, Fu	Malaria, Wound Acute bleeding	Dry fruits pounded, powdered and then mixed with honey and taken orally twice a day	Oral

					and Ba	and Vomiting	Dry fruits pounded, powdered and then parted on wound Fresh stem barks crushed, pounded, boiled, and cooled, then drunk twice per day as tea	Dermal
51. <i>Foeniculum vulgare</i> Mill.	Apiaceae	Wolaan ga	H	Hu	Wp	Kidney problem Stomachache Urine retention/burnin g sensation	Its root will be crushed in water filter then drink a cup of tea for one time The whole part will be pounded mixed with water and drunk	Oral
52. <i>Guizotia abyssinica</i> (L.f.)	Asteraceae	Nuuga	H	Hu	Se	Cough Asthma Fibrillness Tonsil	Seed roasted, powdered boiled and drunk with honey/tea/coffee	Oral
53. <i>Guizotia scab</i> (Vis.) Chiov.	Asteraceae	Ajaari Jeela	H	Hu	L	Blood clot	The leaves crushed, squeezed and then dropped on the wound or cut area	Dermal
54. <i>Hagenia abyssinica</i>	Rosaceae	Suuxo	T	Hu	F	Tapeworm Ascaris	Dried fruit crushed and mixed in water making solution drink morning before break fast	Oral
55. <i>Hibiscus flavifolius</i> Ulbr.	Malvaceae	Lagaan a	H	Hu	R	Tape worm Ascaris	Root, crushed mixed with the dried and powdered flower of <i>Hagenia abyssinica</i> then drink	Oral
56. <i>Hordeum vulgare</i> L.	Poaceae	So`o	H	Hu	Se	Gastritis	Powderize the dry seed mix with water and add sugar then drink one glass at a time until	Oral Dermal

							recovery	
57. <i>Hypoestes forskalii</i> (Vahl) R. B.	Acanthaceae	Omoroto	H	Hu	L	Eye infection Stomach Ache Fibrillness	Chopping the leaves, squeezing it to get droplets of sap and put one droplets in each aye Leafs; crushed boil in water (decoct the leafs) then inhale a few drops through nostrils, drink one glass at a time and wash the whole body parts	Dermal Nasal Oral
58. <i>Junipers procera</i> Hochst. ex Endl.	Cupperesaceae	Abashi chi Hooma	T	Ls and Hu	L	Stomach Ache Tonsil	Fresh leafs crushed, mixed with salt and water Squeeze then drunk cattle Mix its fresh leafs with the leafs of <i>Erythrin abyssinica</i> and then drink a few droplets	Oral
59. <i>Justicia schimperiana</i> (Hochst.ex Nees) T.Anders	Acanthaceae	Xumunga	Sh	Hu and Ls	L	Tuberculoses Malaria Urinary Problem Blotting Rheumatism Arthritis	Fresh leaf crushed Mix with water then drink a cup of tea per day for three days at morning time Leaf of <i>Justicia schimperiana</i> is crushed with added salt water given to livestock. Leaf and root of <i>Justicia schimperiana</i> is crushed with dried leaf of <i>Nicotiana tabaccum</i> to drink cattle Leaf of <i>Justicia schimperiana</i> is heated in fire then touching the pained part of the body while feeling pain	Oral Dermal

60. <i>Kalancheo petitiana A.Rich</i>	Crassulace ae	Hancuu ra	H	Hu	L	Body swelling Rheumatism Wound Arthritis	Touching the painful part of the body by its Heated fresh leafs Leaf will be heated on fire and put on the wound	Dermal
61. <i>Kniphofia foliosa Hochst.</i>	Asphodela ceae	Onsoos ira	H	Hu	R	Tapeworm Ascaris Internal parasite	Crushing its root mix with dried and crushed fruit of <i>Hagenia abyssinica</i> and drink one glass before breakfast	Oral
62. <i>Lippia adoensis Hochst.ex Walp var.adoensis</i>	Verbenace ae	Axxada	Sh	Ls	L	Stomachache	Its leafs is powdered and half of a glass of powder is dissolved in water and then given to a cattle	Oral
63. <i>Lycopersicon esculentum Mill</i>	Solanacea e	Timaati ma	H	Hu	L	Urinary Problem	Fresh leaf of <i>Lycopersicon esculentum</i> crushed and drunk cattle	Oral
64. <i>Maesa lanceolata Forssk.</i>	Myrreaen uceae	Kowaa da	T	Hu and Ls	L	Toothache	Fresh leaf of <i>Maesa lanceolata</i> chewed with <i>Zinger officinale</i> and salt put on surface of teeth ache for few minute	Oral
65. <i>Mangifera indica L.</i>	Anacardac eae	Mango` o	T	Hu	Fu	Gastritis	Drunk fresh fruit juice of mango	Oral
66. <i>Millettia ferruginea Hochst.</i>	Fabaceae	Billawi haqqa	T	Hu and Ls	Sap and Ba	Skin rash Respiratory problems	The sap from the fruit is extracted and then creamed on the affected parts of the body Its inner bark of the stem and leaves crushed, pounded and mixed with water the one liter of	Dermal Oral

							its infusion is given for a cattle	
67. <i>Momordica foedita</i> . Schuumach.	Cucurbitaceae	Hamas hi waasa	Cl	Hu and Ls	Wp	Wound Foot crack Stomachache	The root and leaf of <i>Clematis simensis</i> is pounded, powdered and mixed with butter and creamed affected part until recovery Fruit, heated in fire as hot as possible and dissect the fruit as it is then touch the affected part Fresh root is crushed mix with water then drunk cattle	Dermal Oral
68. <i>Monopsis stellariodes</i> (Presl) Urb.	Lobeliaceae	Duqush a	H	Hu and Ls	L	Ear disease	The fresh leaves of <i>Monopsis stellariodes</i> is crushed and squeezed and then add few drops through ear until recovery	Auricular
69. <i>Musa paradisiaca</i> L.	Musaceae	Muuzee	Sh	Hu	Fu	Cough Pneumonia Diabetes	Eating the fruit of <i>Musa acuminata</i> as much as possible	Oral
70. <i>Nicotiana tabacum</i> L.	Solanaceae	Tambaa `a	H	Hu and Ls	Ag	Blotting Stomach Ache Blackleg Leech	Leaf of <i>Nicotiana tabacum</i> is dried, powdered, mixed with salt and water given to cattle. Dried powder of leaf mixed with salt added with water given to cattle Leaf <i>Nicotiana tabacum</i> of Crushed together with <i>Allium sativum</i> given to livestock	Oral

							Crushed and backed leaf of <i>Nicotiana tabacum</i> is dried, powdered and mixed with water. Half of glass given to cattle	
71. <i>Ocimum basilicum</i> . var. <i>basilicum</i>	Lamiaceae	Gimme nja	H	Hu	L	Sudden sickness Breast ulcerate Tonsil	The fresh leaf of <i>Ocimum basilicum</i> is chewing and swallowing during feeling pain The affected part of the Breast is rubbed by its fresh leaf	Oral Dermal
72. <i>Ocimum lamiifolium</i> Hochst. ex Benth.	Lamiaceae	Minaan toofa	H	Hu	L	Fibrillness Headache Stomachache Swelling Blotting Cough Evil eye Tonsil	Fresh leaf of <i>Ocimum lamiifolium</i> is crushed and the solution applied through inhaled nose Fresh leaf are crushed mixed with water and drunk Fresh of leaf <i>Ocimum lamiifolium</i> chewed during ache feeling as Fresh leaf rubbed on swelling body of affected area Dried powder of <i>Ocimum lamiifolium</i> crushed with <i>Linum usitatissimum</i> and added salt with water solution given to drink cattle Fresh Leaf crushed mixed with water and drunk.	Nasal Oral Dermal

							Dried seed of <i>Ocimum lamiifolium</i> fumigating/smoking to patient closed room	
73. <i>Olea europea</i> <i>L. subsp.</i> <i>cuspidata</i> (Wall. ex <i>G.Don</i>) Cif.	Oleaceae	Weera	T	Hu	L	Skin rash Evil eye	Fresh leaf crushed with dried leaf of <i>Croton macrostachyus</i> is boiled in water and steam the vapor while wash the affect area of skin A fresh stem crushed produced oil liquid and small amount is drunk	Dermal Oral
74. <i>Olinia rochetiana</i> A. <i>Juss.</i>	Oleaceae	Gunna	T	Hu	L	Toothache	Chewing the leaves by affected teeth surface for a few minutes and spit it out	Oral
75. <i>Persea americana</i> <i>Mill.</i>	Lauraceae	Abokaa to`o	T	Hu	Fu	Gastritis	Fruit of peeled avocado juice drunk and eaten	Oral
76. <i>Peponium vogeli</i> (Hook.f.) Engl.	Cucurbitaceae	Humbu sha	Cl	Hu and Ls		Abortion Blotting Foot crack	The inner fleshy portion of its fruit boiled with water and drink the filtrate in one cup of tea at a time Its inner fleshy part of a fruit insert through anus of cattle Fruit, heated in fire as hot as possible and dissect the fruit as it is and then held on the affected area	Oral Anal Dermal
77. <i>Phaseolus vulgaris</i> L.	Fabaceae	Otongo ra	H	Hu	Se	Dislocated bone	Cooking it by mixing <i>Allium sativum</i> , <i>Allium cepa</i> and <i>Zingiber officinal</i> and adding butter	Oral

							and salt then eating	
78. <i>Physalis peruviana L.</i>	Solanaceae	Daaxe`e	H	Hu	R	Acute sickness Blotting	Its root and fruit is chewed and swallowed the juice/ liquid parts Root, crushed mix with water filtered then drink one cup for human and one glass for livestock	Oral
79. <i>Phytolacca Dodecandra L.</i>	Phytolaccaceae	Haraanja	Sh	Hu and Ls	L	Skinrash Eye infection Rabies Gonorrhoea	Its leaf is crushed squeezed then creamed Leaf will be chewing and spit a drop to eye Leaf; crushed mix with water and then drink livestock Root will be crushed with bulb of <i>Allium sativum</i> in water and given to human	Dermal Optical Oral
80. <i>Pisum sativum L.</i>	Fabaceae	Atara	H	Hu	Se	Skin rash Dislocated bone	Dried powdered crushed with <i>Allium sativum</i> rubbing the affected parts Seed, grinding, cooking and Mix with butter then eating	Dermal Oral
81. <i>Plantago lanceolata L.</i>	Plantaginaceae	Feceqe	H	Hu	R	Stomach ache Evil eye Fibrillness Hemorrhoids	Crush the root mix with water and squeeze then drink Wash the whole body part by its crushed and squeezed root and also creamed the affected part for Hemorrhoids	Oral Dermal
82. <i>Platostoma africanum P.Beauv.</i>	Lamiaceae	Heedo`li maaxa	H	Hu and Ls	L	Nasal bleeding Headache	Crushing the fresh leaf then inhale its droplet	Nasal

				Ls		Eye infection Malaria Uvilaitis	glass for human and from one glass up to half of a liter for livestock Touching external surrounding of eye by its fresh leaves	
89. <i>Rhamnus prinoides</i> L. Herit.	Rhamaceae	Geesho`o	Sh	Hu and Ls	L and Fu	Liver problem Skin rash Leech Toothache	The leaf of <i>Rhamnus Prinoides</i> is pounded, powdered, mixed with honey and then eaten for 3 days before food Fruit, Pounding the fruit and cream the rash part of skin The fresh leaf of <i>Rhamnus Prinoides</i> is pounded, squeezed and added few solution through nose The leaf of <i>Rhamnus Prinoides</i> is hold by the infected teeth during the feeling of ache	Oral Dermal Nasal
90. <i>Ricinas communis</i> L.	Euphorbia ceae	Qobo`o	Sh	Hu and Ls	Fu	Cattle tape worm Skin rash Leech Skin rash	Crushed the leaf with water then drink to Cattle Seed, is pounded and mixed with water and then drunk the solution only The leaf of <i>Ricinus communis</i> with leaf of <i>Lycopersicon esculentum</i> is pounded, squeezed and added though nose Seed, is pounded alone and creamed on the spot of skin rash	Oral Nasal Dermal
91. <i>Rosmarinus officinalis</i> L	Lamiaceae	Maa`l	H	Hu	L	Rheumatism	Squeezing the fresh leaf mixed with water filter	Oral

		Enja				Blood pressure	then drink one cup while feeling pain The leaf is crushed, boiled and taken as a tea	
92. <i>Rumex abyssinicus</i> Jacq.	Polygonaceae	Shiisho `o	H	Hu and Ls	Wp	Gonorrhea Urinary problems Liver disease	Chopping the leaves and drinking one coffee cup at once or smelling the chopped leaves Root; crushed and boil with water and mix with whey (milk) then drink it from one coffee up to one water glass in morning time until recovery	Oral/ Nasal
93. <i>Rumex nepalensis</i> Spreng.	Polygonaceae	Go`ich o	H	Hu	Ag	Hemorrhoids Blotting Insect bit Cellulites	Fresh/Dry root crushed then creamed on the affected part and inhale through anal Fresh leaf crushed in water filter then drink one cup for one time Its fresh leaf is mixed with the fresh leaf of <i>Calipurnia aurea</i> , covering it with fresh leaf of <i>Enset ventericosum</i> cooking by dipping in the fire then tyng the concoction on affected part	Dermal Anal Oral
94. <i>Ruta chalepensis</i> L.	Rutaceae	Qantala ama	H	Hu and Ls	Ag	Blackleg Blotting Evil eye Fibrillness Ss Diarrhea Headache	Fresh leaf together with added salt water crushed and drunk cattle Fresh leaf together with garlic and <i>Zingiber officinale</i> chewed Fresh leaf together with <i>Zingiber officinale</i> is chewed and drunk The seed and leaf of <i>Ruta chalepensis</i> is	Oral Nasal

						Nasal bleeding	crushed and sniffed	
95. <i>Rubusa steudneri Schweinf.</i>	Rosaceae	Gora	Sh	Hu	L and Fu	Stomachache	The raw fruits of <i>Rubus steudneri</i> is eaten	Oral
96. <i>Rytigynia neglecta (Hiern.) Robyns</i>	Rubiaceae	Gaarawa	Sh	Hu	L	Urine of Bat Evil eye	Leaves, crushed, pounded and mixed with water and milk(whey) then drink one glass per day at a time in the morning for one week and wash the infected area with residue	Oral Dermal
97. <i>Saccharum officinarum L.</i>	Poaceae	Shonkora	Sh	Hu	St	Diarrhea Blotting Kidney problems	Chewing the stem and then swallowing the liquid part	Oral
98. <i>Salvia nilotica Jacq.</i>	Lamiaceae	Okota	H	Hu	L and R	Acute sickness Fibril illness Asthma Ear problems Epilepsy Headache	Chewing the root then swallowing the fluid Its root crushed, mixed with water then drink a cup of tea before meal Its leaves crushed, squeezed and drop through the infected ear Crushing the fresh leaf the inhale a few drops through nose	Oral Dermal Nasal
99. <i>Satureja abyssinica (Benth.) Briq.</i>	Lamiaceae	Ishina	H	Hu	Wp	Cough Hyper tension	The whole plant of <i>Satureja abyssinica</i> is pounded, powdered, mixed with milk and	Oral

						Fibrillness	boiled and then drink	
100. <i>Sida schimperi</i> Hochst.ex.A.Rich.	Malvaceae	Booraara	Sh	Hu and Ls	L	Evil eye	Crush the leaf mix with water then Drink from few drops up to one water glass for human and from one water glass up to one liter for livestock per day for two selective days (Wednesday and Friday) in a week	Oral
101. <i>Solanum giganteum</i> Jacq.	<i>Solanaceae</i>	Fincca	Sh	Hu	L	Body swelling Rheumatism Arthritis	Touching the painful part of the body by its heated fresh leafs Breast Pain	Dermal
102. <i>Solanum incanum</i> L.	<i>Solanaceae</i>	Acoongara	Sh	Hu and Ls	L and Fu	Stomachache Blotting Skin rash Snake poison	Fresh leaf crushed mix with butter then eaten the cattle Chew the fresh leaf and swallowing the extract Pounded the fresh fruit then creaming the affected part of the skin Snake poisoned goat eats fruit of <i>Solanum incunum</i> against the poison	Oral Dermal
103. <i>Solanum nigrum</i> L.	<i>Solanaceae</i>	Migillo'o	H	Hu	L	Fibrillness Ascaris	Leaves crushed, pounded and mixed with water then infusion is taken Concocting its leaves and then eating	Oral
104. <i>Solanum macracanthum</i> A. Rich	<i>Solanaceae</i>	Daricca	Sh	Hu	L and Fu	Diarrhea Stomach problem	Crush the leaves mix it with water and add butter then drink one cup of tea before a meal for human and one water glass for cattle in	Oral Dermal

						Skin rash	morning time Fruit of the plant crushed alone and creamed on the skin until recovery	
105. <i>Solanum tuberosum</i> L	Solanaceae	Dinicho	H	Hu	Tu	Kidney problems	Fresh tuber is cooked then eaten	Oral
106. <i>Stephania Abyssinica</i> (Dolly and A.Rich.) Walp.	Menispermaceae	Humma	Cl	Hu and Ls	R, L and Fu	Cough Skin rash External parasite Cellulites Gonorrhoea Blackleg	Root; Crushed Mix with water then 1-2 liters of the solution is given to cattle Rubbing the external part of cattle body by fresh leaf Crush the fruit and squeeze then creamed the affected part of the body Its leaves crushed and tied on the infected area Its leaves and leaves of <i>Phytolaca dodecandra</i> are crushed and boiled together then drink the filtrate in 2-3 tea cup	Oral Dermal
107. <i>Syzygium guinees</i> (Wild.) DC.	Myrtaceae	Duubana	T	Ls	Ba	Ascaris, stomach ache; abdominal pain	Crushed or powdered its fresh bark and mixed with water decoct then drunk the cattle	Oral
108. <i>Teclea nobilis</i> Del.	Rutaceae	Xaa`a	T	Hu	L	Amoeba Stomach problem Diarrhea	Crushed the leaf mix with water filter then drink the infusion from a few drops up to one water glass for tow selective days in a week	Oral

						Evil eye		
109. <i>Thalictrum rhyncho carpum</i> Dillon & A.Rich	Ranunculaceae	Illi Hooru/ Manni Illi Qaraare	H	Hu and Ls	R	Evil eye Febrile Jaundice	Its root crushed mix with water drink a cup at a time and wash the whole part of the body daily in morning time until recovery	Oral Dermal
110. <i>Urera hypselodendron</i> (A.Rich.) Wild	Urticaceae	Harrira	Cl	Ls	L	Ascaris Stomachache Internal parasite	Crushing its fresh leafs mix with water squeeze and filter the drink the livestock	Oral
111. <i>Verbena officinalis</i> L.	Lamiaceae	Moddolle`e	H	Hu	Ag	Stomachache Blotting	Crushing its above ground part mix with a few water drink one cup at a time until recovery	Oral
112. <i>Vernonia amygdalina</i> Del.	Asteraceae	Heeba	Sh	Hu and Ls	L	Malaria Intestinal parasites Stomach problems	Leaf should be crushed mix with water drink one glass per day thee selective days in a week until recovery	Oral
113. <i>Vernonia auriculifera</i> Hiern.	Asteraceae	Baarawa	Sh	Hu and Ls	L	Body swelling, Wound Head infection	Fresh leaf chewed and sprayed on swollen part Fresh leaves crushed and pounded, then creamed on the wound Dry/fresh leaves pounded and mixed with butter and pasted	Oral Dermal

114.	<i>Vicia faba L.</i>	Fabaceae	Baqeela	H	Hu	Se	Dislocated bone	Dried seed of <i>Vicia faba</i> is grinded mixed with butter then eat for the days.	Oral
115.	<i>Withania somnifera (L.) Dunal in DC.</i>	Solanaceae	Zamma	H	Hu	L	Evil eye Internal Parasite Fibrillness	Fresh leaf crushed/ chewed dropped to eye disease closed room Fresh root crushed with salt and drunk Dried root will be crushed and smoke/boiling vapor water inhaled through nostrils	Optical Oral Nasal
116.	<i>Zingiber officinale Roscoe.</i>	Gingibraceae	Jaanjibeela	H	Hu and Ls	Rz	Common cold Headache Fibrillness Cough Stomachache Tonsil	Fresh or dry rhizome crushed drunk as <i>qisher</i> and chewing with salt Fresh rhizome crushed and chewed Fresh or dry rhizome crushed and drunk as <i>qisher</i> and chewing with salt	Oral

Appendice 3. Medicinal plant species in the study area with their collection numbers

and geographical locations

No.	<i>Scientific Name</i>	Family	Local name	Grow th form	Sourc es	Altitude	Collection number
1	<i>Achyranthes aspera L</i>	Amarant haceae	Qacca ba	H	W	2574.05	AA010
2	<i>Acmella caulirhiza Del</i>	Asteracea e	Bishib isha	H	W	2296.23	AA016
3	<i>Aframomum corrorima (Braun) Jansen</i>	Zingibera ceae	Wokaa sha	H	Hu		AA003
4	<i>Agave sisalana Perr.ex.Eng</i>	Agavacea e	Alge`e		W	2298.08	AA43
5	<i>Ajuga integtifolia Hami. Buch.</i>	Lamiacea e	Anaa muchc ho	H	W	2617.60	AA76
6	<i>Albizia schimperiana Oliv</i>	Fabaceae	Maand e`I Cilaala	T	W	1999.14	AA33
7	<i>Allium sativum L.</i>	Alliaceae	Tumm a	H	Hg	2298.20	AA116
8	<i>Allium porrum L.</i>	Alliaceae	Shunk uruta	H	Hg	2321.21	AA100
9	<i>Amaranthus caudatus L.</i>	Amarant haceae	Haliba	H	Se	2309.59	AA117
10	<i>Artemisia absinthium L.</i>	Asteracea e	Naatir a	H	Hg	2165.59	AA114
11	<i>Artemisia afra Jacq.ex Willd</i>	Asteracea e	Agufa	H	Hg	2298.21	AA108
12	<i>Arundinaria</i>	Poaceae	Leema	Sh	W/Hg	2783.79	AA72

	<i>alpina</i> K.Schum.						
13	<i>Arundo donax</i> <i>L.</i>	Poaceae	Shomb oqo'o	Sh	W/Hg	2673.38	AA020
14	<i>Asparagus</i> <i>africanus Lam.</i>	Asteracea e	Hundu faanch o	H	W	2157.52	AA87
15	<i>Asplenium</i> <i>monathes L.</i>	Asplenia ceae	Massa 'ni Xanqq o'o	Eph	W	2694.48	AA78
16	<i>Bersama</i> <i>abyssinica</i> <i>Fresen.</i>	Melianth aceae	Korha qqa	Sh	W	2127.707	AA40
17	<i>Beta vulgaris</i> <i>L.</i>	Chenopo diaceae	Kashar i lugum o	H	Hg	2551.82	AA129
18	<i>Bidens pilosa L</i>	Asteracea e	Horoo raamo	H	W/Hg	2428.09	AA015
19	<i>Brassica</i> <i>carinata A. Br.</i>	Brassicac eae	Wong e`e	H	Hg	2451.09	AA65
20	<i>Brassica</i> <i>integrifolia</i> <i>Var.</i>	Brassicac eae	Shaan a	H	Hg	2650.87	AA017
21	<i>Brassica</i> <i>oleracea L.</i>	Brassicac eae	Xaxo`I Shaan a	H	Hg	2198.79	AA30
22	<i>Brucea</i> <i>antidysentrica</i> <i>J. F. Miller</i>	Simaroub aceae	Ciiroo nta	Sh	W	2098.58	AA013

23	<i>Buddleja polystachya fresen.</i>	Loganiaceae	Bulish aana	T	W	2532.42	AA48
24	<i>Calipurnia aurea (Ait.) Benth</i>	Fabaceae	Senna	Sh	W	2341.43	AA73
25	<i>Capsicum anum L.</i>	Solanaceae	Baribaro`o	H	Hg	2018.58	AA018
26	<i>Carduus schimperi Sch. Bip.</i>	Asteraceae	Haliuta	H	W	2189.43	AA112
27	<i>Carica papaya L.</i>	Caricaceae	Paapaya	T	Hg	2451.73	AA47
28	<i>Catha edulis (Vahl) Forssk. ex Endl.</i>	Celastraceae	Caata	Sh	Hg	2184.79	AA68
29	<i>Celtis africana L.</i>	Ulmaceae	Qama`il Haqa	T	W	2135.57	AA93
30	<i>Citrus aurantifolia (L.) Burm.f.</i>	Rutaceae	Loome`e	Sh	W/Hg	2194.90	AA007
31	<i>Clausena anisata (Wild.) Benth.</i>	Rutaceae	Bahixihaqqa	T	W	2513.21	AA56
32	<i>Clerodendrum myricoides (Hochst) Vatke.</i>	Lamiaceae	Haniga	Sh	W	2348.95	AA31
33	<i>Coffea Arabica L.</i>	Rubiaceae	Buna	Sh	W/Hg	2123.23	AA67

34	<i>Commelina benghalensis</i> L.	Commelinaceae	Luxunxa	H	W	2206.94	AA66
35	<i>Coriandrum sativum</i> L.	Apiaceae	Wordimaama	H	Hg	2212.34	AA36
36	<i>Croton macrostachyus</i> Del.	Euphorbiaceae	Masana	T	W	2452.24	AA53
37	<i>Cucurbita pepo</i> L.	Cucurbitaceae	Dabaaqula	Cl	Hg	2641.25	AA025
38	<i>Cymbopogon citrates</i> (DC.)	Poaceae	Hixana	H	Hg	2987.97	AA104
39	<i>Datura stramonium</i> L.	Solanaceae	Machaa`lhaqa	H	W/Hg	2317.53	AA71
40	<i>Daucus carota</i> L.	Apiaceae	Kaaroota	H	Hg	2459.59	AA127
41	<i>Discopodium penninervum</i> Hochst.	Solanaceae	Maraara	Sh	W	2256.21	AA113
42	<i>Dovyalis abyssinica</i>	Flacourtiaceae	Kooshima	Sh	W/Hg	2297.28	AA75
43	<i>Echinops kebericho</i> Mesfin.	Asteraceae	Toosa	H	Hg	2308.74	AA102
44	<i>Enset ventericosum</i> Welw.) Cheesman	Musaceae	Weesa	Sh	Hg	2677.47	AA94

45	<i>Erythrina abyssinica</i> <i>Schweinf.</i>	Fabaceae	Wora`a	T	W	2641.52	AA021
46	<i>Eucalyptua camaldulensis</i> <i>Dehnh</i>	Myrtaceae	Kashari baariz aafa	T	W/Hg	2062.52	AA86
47	<i>Eucalyptus globulus</i> <i>Labill.</i>	Myrtaceae	Qadaali baarza afa	T	W/Hg	2341.26	AA023
48	<i>Euphorbia abyssinica</i> <i>Gmel.</i>	Euphorbiaceae	Adaama	T	W	2437.63	AA58
49	<i>Euphorbia dumalis</i> S. <i>Carter</i>	Euphorbiaceae	Gendele`la	H	W	2134.68	AA85
50	<i>Ficus sycomorus</i> L	Moraceae	Oda`a	T	W	2220.32	AA34
51	<i>Foeniculum vulgare</i> Mill.	Apiaceae	Wolaanga	H	Hg	2416.37	AA92
52	<i>Guizotia abyssinica</i> (L.f.)	Asteraceae	Nuuga	H	Hg	2247.71	AA133
53	<i>Guizotia scabra</i> (Vis.) Chiov.	Asteraceae	Ajaari Jeela	H	W	2438.71	AA39
54	<i>Hagenia abyssinica</i> (Brace) J. F. <i>Gmel.</i>	Rosaceae	Suuxo	T	W	2795.54	AA022
55	<i>Hibiscus</i>	Malvaceae	Lagaa	H	W	2128.48	AA90

	<i>flavifolius</i> <i>Ulbr.</i>	e	na				
56	<i>Hordeum</i> <i>vulgare L.</i>	Poaceae	So`o	H	W/Hg	2642.48	AA81
57	<i>Hypoestes</i> <i>forskaolii</i> <i>(Vahl) R. B.</i>	Acanthac eae	Omoro `o	H	Hg	2331.30	AA62
58	<i>Junipersprocer</i> <i>a Hochst. ex</i> <i>Endl.</i>	Cupperes aceae	Abashi chi Hoom a	T	W	2684.59	AA42
59	<i>Justicia</i> <i>schimperiana</i> <i>(Hochst.ex</i> <i>Nees)</i> <i>T.Anders.</i>	Acanthac eae	Xumu nga	Sh	W	2599.95	AA02
60	<i>Kalancheo</i> <i>petitiana</i> <i>A.Rich</i>	Crassulac eae	Hancu ura	H	Hg	2472.38	AA52
61	<i>Kniphofia</i> <i>foliosa Hochst.</i>	Asphodel aceae	Onsoo sira	H	W	2154.73	AA109
62	<i>Lippia</i> <i>adoensis</i> <i>Hochst.ex</i> <i>Walp</i> <i>var.adoensis</i>	Verbenac eae	Axxad a	Sh	W	2572.59	AA80
63	<i>Lycopersicon</i> <i>esculentum</i> <i>Mill.</i>	Solanace ae	Timaat ima	H	Hg	2087.52	AA128
64	<i>Maesa</i> <i>lanceolata</i> <i>Forssk.</i>	Myrreaen uceae	Kowaa da	T	W	2128.59	AA120

65	<i>Mangifera indica</i> L.	Anacardaceae	Mango `o	T	W	2339.65	AA011
66	<i>Millettia ferruginea</i> Hochst.	Fabaceae	Billaw ihaqqa	T	W	2104.35	AA006
67	<i>Momordica foedita</i> .Schuumach.	Cucurbitaceae	Hamas hi waasa	Cl	W	2173.56	AA44
68	<i>Monopsis stellariodes</i> (Presl) Urb.	Lobeliaceae	Duqus ha	H	Hg	2139.67	AA45
69	<i>Musa acuminata</i> L.	Musaceae	Muuze 'e	Sh	Hg	2347	AA029
70	<i>Nicotiana tabacum</i> L.	Solanaceae	Tamba a`a	H	Hg	2475.70	AA54
71	<i>Ocimum basilicum</i> var. <i>basilicum</i>	Lamiaceae	Gimm enja	H	Hg	2537.27	AA55
72	<i>Ocimum lamiifolium</i> Hochst. ex Benth.	Lamiaceae	Minaa ntoofa	H	Hg	2322.09	AA91
73	<i>Olea europea</i> L. subsp. <i>cuspidata</i> (Wall. ex G.Don) Cif.	Oleaceae	Weera	T	W	2189.51	AA004
74	<i>Olinia rochetiana</i> A. Juss.	Oleaceae	Gunna	T	W	2157.73	AA59
75	<i>Persea</i>	Lauraceae	Aboka	T	Hg	2290.08	AA121

	<i>americana</i> <i>Mill.</i>	e	ato`o				
76	<i>Peponium</i> <i>vogeli</i> <i>(Hook.f.) Engl.</i> <i>(Hook.f.) Engl.</i>	Cucurbita ceae	Humb usha	Cl	W	2341.93	AA27
77	<i>Phaseolus</i> <i>vulgaris L.</i>	Fabaceae	Otong ora	H	Hu	1894.53	AA63
78	<i>Physalis</i> <i>peruviana L.</i>	Solanace ae	Daaxe `e	H	W	2027.23	AA28
79	<i>Phytolacca</i> <i>Dodecandra L.</i>	Phytolacc aceae	Haraa nja	Sh	W	2541.42	AA115
80	<i>Pisum sativum</i> <i>L.</i>	Fabaceae	Atara	H	W/Hg	2129.84	AA008
81	<i>Plantago</i> <i>lanceolata L</i>	Plantagin aceae	Feceqe	H	W	2019.97	AA24
82	<i>Platostoma</i> <i>africanum</i> <i>P.Beauv.</i>	Lamiaceae	Heedo `li maaxa	H	W	1982.49	AA019
83	<i>Podocarpus</i> <i>falcatus(Thunb</i> <i>) Mirb.</i>	Podocarp aceae	Digiba	T	W	2493.45	AA001
84	<i>Pouzolzia</i> <i>guineensis</i> <i>Benth</i>	Urticaceae	Shumx iigeesh o	Sh	W		AA79
85	<i>Premna</i> <i>schimperi</i> <i>Engl.</i>	Lamiaceae	Heebi Xanqq o`o	Eyp hyte	W	1978.59	AA97
86	<i>Prunus</i> <i>africana</i>	Rosaceae	Araara	T	W	2537.40	AA69

87	<i>Psidium guajava L.</i>	Myrtaceae	Zayitona	T	Hg	2317.83	AA51
88	<i>Pycnostachys abyssinica Fresen.</i>	Lamiaceae	Bobaanqa	Sh	W	1782.34	AA60
89	<i>Rhamnus prinoides L. Herit.</i>	Rhamaceae	Geesho`o	Sh	Hg	2537.58	AA99
90	<i>Ricinas communis L.</i>	Euphorbiaceae	Qobo`o	Sh	Hg	2683.81	AA57
91	<i>Rosmarinus officinalis L.</i>	Lamiaceae	Maa`l Enja	H	Hg	2228.709	AA130
92	<i>Rumex abyssinicus Jacq.</i>	Polygonaceae	Shiisho`o	H	W/Hg	2256.20	AA84
93	<i>Rumex nepalensis Spreng.</i>	Polygonaceae	Go`icho	H	W	2316.72	AA111
94	<i>Ruta chalepensis L.</i>	Rutaceae	Qantalama	H	Hg	2439.92	AA106
95	<i>Rubusa steudneri Schweinf.</i>	Rosaceae	Gora	Cl	W	2197.52	AA32
96	<i>Rytigynianeglecta (Hiern.) Robyns</i>	Rubiaceae	Gaarawa	Sh	W	2291.85	AA105
97	<i>Saccharum officinarum L.</i>	Poaceae	Shonkooora	Sh	Hg	1231.301	AA35
98	<i>Salvia nilotica Jacq.</i>	Lamiaceae	Okota	H	W/Hg	2195.76	AA89

99	<i>Satureja abyssinica</i> (Benth.) Briq.	Lamiaceae	Ishina	H	Hg	1855.54	AA014
100	<i>Sida schimperi</i> Hochst.ex.A.Rich.	Malvaceae	Boorara	Sh	W	2435.05	AA009
101	<i>Solanum giganteum</i> Jacq.	Solanaceae	Fincca	Sh	W	2541.35	AA50
102	<i>Solanum incanum</i> L.	Solanaceae	Acoon gara	Sh	W	1987.92	AA82
103	<i>Solanum nigrum</i> L.	Solanaceae	Migill o`o	H	Hg	2336.69	AA88
104	<i>Solanum marginatum</i> L.	Solanaceae	Daricca	Sh	W	2318.34	AA37
105	<i>Solanum tuberosum</i> L.	Solanaceae	Dinicho	H	Hg	1979.92	AA41
106	<i>Stephania Abyssinica</i> (Dolly and A.Rich.) Walp.	Menispermaceae	Humma	Cl	W	2127.204	AA96
107	<i>Syzygium guinees</i> (Wild.) DC.	Myrtaceae	Duubana	T	W	2438.28	AA110
108	<i>Teclea nobilis</i> Del.	Rutaceae	Xaa`a	T	W	2034.57	AA49
109	<i>Thalictrum rhynchocarpum</i> Dillon & A.Rich	Ranunculaceae	Illi Hooraa/ Manni Illi Qaraare	H	W	2345.69	AA103

110	<i>Urera hypselodendron</i> (A.Rich.) Wild	Urticaceae	Harrira	Cl	W	2109.59	AA101
111	<i>Verbena officinalis</i> L.	Lamiaceae	Moddolle`e	H	Hg	2243.06	AA134
112	<i>Vernonia amygdalina</i> Del.	Asteraceae	Heeba	Sh	W	2538.12	AA64
113	<i>Vernonia auriculifera</i> Hiern.	Asteraceae	Baara wa	Sh	W	1983.58	AA38
114	<i>Vicia faba</i> L.	Fabaceae	Baaqela	H	W/Hg	2158.93	AA70
115	<i>Withania somnifera</i> (L.) Dunal in DC.	Solanaceae	Zamma	H	W	2621.22	AA012
116	<i>Zingiber officinale</i> Roscoe.	Gingibraceae	Jaanjibeela	H	Hg	2273.49	AA005

Appedice.4 List of Informants in the Study Area (Notice *: key Informants)

No.	Name of informants	Sex	Age	Marital status	Educational Level	Religion	Occupation	Site/Kebeles
1	Chufo Shamalo	F	49	Ma	Mi	Protestant	Mt	Mish-Duna
2	Tamirat Sabiro	M	58	Ma	Lo	Protestant	Fr	Mish-Duna
3	Ermias Lanjamo	M	45	Ma	Hi	Protestant	GW	Mish-Duna
4	Fito Beyena	F	57	Ma	Mi	Protestant	Fr	Mish-Duna
5	Kesech Ladamo	F	51	Ma	Mi	Orthodox	Fr	Mish-Duna
6	Edris Jamal	M	48	Ma	Mi	Protestant	Fr	Mish-Duna
7	Ayelech Abera	F	52	Ma	Lo	Protestant	Fr	Mish-Duna
8	Sadamo Hegano	M	54	Ma	Mi	Protestant	Mt	Mish-Duna
9	Mishamo abute	M	60	Ma	Mi	Protestant	Fr	Mish-Duna
10	Gormishe Kobiwo	F	54	Ma	Lo	Protestant	Fr	Mish-Duna
11	Sumore Erjabo	M	52	Ma	Hi	Protestant	NGO	Hagedage
12	Handebo Sawore	M	56	Dy	Lo	Protestant	Fr	Hagedage
13	Darsabo Ga`nore	M	79	Ma	Lo	Protestant	Fr	Hagedage
14	Kadir Chafamo	M	57	Ma	Mi	Muslim	Mt	Hagedage
15	Kufame larore	F	51	Ma	Lo	Protestant	Fr	Hagedage
16	Beyene Laramo	M	54	Ma	Mi	Protestant	Fr	Hagedage
17	Kajame wabeto	F	59	Ma	Mi	Protestant	Fr	Hagedage
18	Maso kabore	F	51	Dy	Hi	Protestant	Fr	Hagedage
19	Lombamo Kaltamo	M	58	Ma	Lo	Orthodox	Fr	Hagedage
20	Bonkola Anulo	M	77	Ma	Mi	Muslim	Fr	Hagedage
21	Sayebo Umuro	M	57	Ma	Mi	Protestant	Mt	Somicho
22	Amarech Kasa	F	53	Ma	Lo	Orthodox	Fr	Somicho

23	Dikaso Beyene	M	57	Ma	Lo	Orthodox	Fr	Somicho
24	Lachamo Hegano	M	56	Ma	Mi	Protestant	Fr	Somicho
25	Dabaro Beyokaso	M	56	Ma	Hi	Protestant	NGO	Somicho
26	Mishamo Tirore	M	69	Ma	Lo	Protestant	GW	Somicho
27	Daname Alemu	F	51	Ma	Lo	Orthodox	Fr	Somicho
28	Liranso Ababiya	M	60	Ma	Mi	Catholic	Mt	Somicho
29	Dagna Fikire Mola	M	59	Ma	Lo	Protestant	Fr	Somicho
30	Ayelech Masamo	F	47	Ma	Lo	Protestant	Fr	Somicho
31	Sibo Kabamo	F	53	Ma	Mi	Protestant	Fr	La Kufana
32	Girma Baraso	M	52	Ma	Hi	Catholic	NGO	La Kufana
33	Teshala kebeda	M	69	Ma	Mi	Catholic	Fr	La Kufana
34	Abura Sigebo	M	60	Ma	Lo	Muslim	Fr	La Kufana
35	Ersado Lobango	M	55	Ma	Lo	Orthodox	Fr	La Kufana
36	Daricho Kadiri	F	51	Ma	Mi	Muslim	Fr	La Kufana
37	La`wo Do`laso	F	54	Ma	Lo	Protestant	Fr	La Kufana
38	Alemu Nukuro	M	56	Ma	Mi	Protestant	Fr	La Kufana
39	Abute Dabaro	M	60	Ma	Li	Protestant	Fr	La Kufana
40	Tedese Ayele	M	45	Ma	Lo	Orthodox	Fr	La Kufana
41	Dagna Fikire Wichicho	M	59	Ma	Lo	Protestant	Fr	Bure- Bulshana
42	Misho Tasfaye	F	35	Ma	Mi	Protestant	Fr	Bure- Bulshana
43	La`wo Yanore	F	56	Ma	Lo	Protestant	Fr	Bure- Bulshana
44	Daniele Hibiso	M	54	Ma	Mi	Protestant	Fr	Bure- Bulshana
45	ASegid Aniyo	M	26	UMa	Mi	Protestant	St	Bure- Bulshana

46	Abo Handino	M	67	Ma	Mi	Protestant	Fr	Bure-Bulshana
47	Awoke Fonkamo	M	64	Ma	Hi	Protestant	Fr	Bure-Bulshana
48	Tasfaye Tirore	M	36	Ma	Lo	Protestant	Fr	Bure-Bulshana
49	Seyum Gade	M	44	Ma	Lo	Protestant	Fr	Bure-Bulshana
50	Ayele Beyore	M	29	Ma	Lo	Protestant	Fr	Bure-Bulshana
51	Galchamo Dobo	M	76	Ma	Lo	Protestant	Fr	Sangiye
52	Abere Galba	M	57	Ma	Hi	Protestant	NGO	Sangiye
53	Desale Gabure	M	63	Ma	Hi	Protestant	Mt	Sangiye
54	Masebo Kashamo	M	64	Ma	Mi	Orthodox	Fr	Sangiye
55	Sibamo Wolde	M	55	Ma	Lo	Orthodox	Fr	Sangiye
56	Lakech Sadamo	F	51	Dy	Hi	Catholic	Fr	Sangiye
57	Amerech Anore	F	49	Ma	Mi	Catholic	Fr	Sangiye
58	Elambo Bachore	M	81	Ma	Mi	Catholic	Mt	Sangiye
59	Osamo Sayebo	M	54	Ma	Hi	Catholic	GW	Sangiye
60	Balynesh Anulo	F	37	Ma	Mi	Orthodox	Fr	Sangiye
61	Etoke Arficho	M	39	Ma	Lo	Orthodox	Fr	Kola-Dansa
62	Elias Ayano	M	46	UMa	Mi	Protestant	St	Kola-Dansa
63	Kachamo Sabiro	M	65	Ma	Hi	Protestant	NGO	Kola-Dansa
64	Kashun Ayele	M	69	Ma	Lo	Protestant	Fr	Kola-Dansa
65	Lambore Kabamo	M	65	Ma	Lo	Protestant	Fr	Kola-Dansa
66	Beyene Kabore	M	81	Ma	Mi	Protestant	Fr	Kola-Dansa
67	Eyasu Wajebo	M	34	Ma	Mi	Protestant	Fr	Kola-Dansa
68	Desta Kibamo	M	49	Ma	Hi	Protestant	NGO	Kola-Dansa
69	Abera Beyore	M	44	Ma	Lo	Protestant	Fr	Kola-Dansa

70	Alemitu Basha	F	39	Ma	Mi	Protestant	Fr	Kola-Dansa
71	Abayine Kalbamo	M	37	Ma	Lo	Protestant	Fr	Ha Wagabata
72	Ersumo shishore	M	49	Ma	Mi	Protestant	Mt	Ha Wagabata
73	Tamesgen kabero	M	56	Ma	Hi	Catholic	GW	Ha Wagabata
74	Samuel Madebo	M	52	Ma	Mi	Catholic	Fr	Ha Wagabata
75	Kebabush Beyokaso	F	59	Ma	Mi	Protestant	Fr	Ha Wagabata
76	Araga Kabamo	M	64	Ma	Lo	Protestant	Fr	Ha Wagabata
77	Sawore Jakamo	M	56	Ma	Lo	Protestant	Fr	Ha Wagabata
78	Seyum Lobango	M	68	Ma	Mi	Protestant	Mt	Ha Wagabata
79	Gatiso Bubamo	M	74	Ma	Lo	Protestant	Fr	Ha Wagabata
80	Chakebo Bula	M	49	Ma	Lo	Protestant	Fr	Ha Wagabata
81	Ayele Dalkaso	M	38	Ma	Mi	Protestant	Fr	Kankicho
82	Amanuel Gichamo	M	47	Ma	Mi	Protestant	Fr	Kankicho
83	Estifanos Gabure	M	49	Ma	Lo	Protestant	Fr	Kankicho
84	Lajibe sidamo	F	46	Ma	Hi	Protestant	Fr	Kankicho
85	Abara laramo	M	53	Ma	Mi	Protestant	Mt	Kankicho
86	Anulo Latebo	M	59	Ma	Mi	Catholic	Fr	Kankicho
87	Ertumo Gichamo	M	60	Ma	Hi	Protestant	NGO	Kankicho
88	Asefa Ayano	M	78	Ma	Lo	Protestant	Fr	Kankicho
89	Tirote Gonamo	M	73	Ma	Lo	Protestant	Fr	Kankicho
90	Amarech	F	46	Ma	Lo	Protestant	Fr	Kankicho

	Beyokaso							
91	Ermias Latebo	M	49	Ma	Hi	-	Other	Duinmera
92	Beyamo Ulore	M	44	Ma	Mi	Protestant	Fr	Duinmera
93	Alamayhu Asefa	M	49	Ma	Lo	Protestant	Fr	Duinmera
94	Bachore Lama	M	50	Dy	Mi	Protestant	Fr	Duinmera
95	Landaye Manchore	F	49	Ma	Lo	Protestant	Fr	Duinmera
96	Osamo Konde	M	45	Ma	Lo	Protestant	Fr	Duinmera
97	Ayele Lamore	M	67	Ma	Hi	Protestant	GW	Duinmera
98	Gabure Kalsido	M	58	Ma	Hi	Protestant	NGO	Duinmera
99	Alemu Bonkola	M	69	Ma	Mi	Catholic	Mt	Duinmera
100	Ababora Lajibo	M	65	Ma	Lo	Catholic	Fr	Duinmera
101	Detamo Garikabo	M	68	Ma	Lo	Protestant	Fr	Samen- Otoro
102	Semeon Atiso	M	66	Ma	Hi	Protestant	Fr	Samen- Otoro
103	Alaro Laramo	M	49	Ma	Mi	-	Other	Samen- Otoro
104	Demo wolde	F	48	Ma	Mi	Protestant	Fr	Samen- Otoro
105	Girma Dikaso	M	65	Ma	Lo	Protestant	Fr	Samen- Otoro
106	Damise Olbamo	M	63	Ma	Lo	Protestant	Fr	Samen- Otoro
107	Dagefa Arficho	M	47	Ma	Mi	Protestant	Fr	Samen- Otoro
108	Balachew Sawore	M	69	Ma	Hi	Protestant	GW	Samen- Otoro
109	Bachore Kabiso	M	57	Ma	Lo	Protestant	Fr	Samen- Otoro
110	Kabore Jabamo	M	49	Ma	Lo	Protestant	Fr	Samen- Otoro

Key: F- Female, Fr- Farmer, GW- Government Workers, Hi- High (above grade 8th)

Lo- Low (not educated at all), M- Male, Ma- Married, NGO- Non government workers

Dy- Divorced, UMa- Unmarried, St- Student, Mi- Middle (grade 1th-8th)

Appendice 5. Checklist of Semi-structured Interview Questions for Collecting

Ethnobotanical data

Date _____ village (site) _____

Name of respondent (informant) _____

Sex: Male __; Female __; Age __; Occupation __; Religion __ ; Ethnicity; Marital status

Educational status: High (above grade8th) _____; Middle (grade1th - 8th) _____; Low(not educated at all) _____

1. For what purpose(s) people traditionally use different plant species in their locality?
2. What are the main or most common human health problems or disease in your locality?
3. What are the main or most common livestock (animals) health problems or diseases?
4. How do you prevent those health problems or diseases in your locality?
5. Do you use plant resources to treat those health problems? Yes or no.
6. If yes, list those plant species used to treat a given disease in your area?
7. What is (are) the local name (s) of those plant (s)?
8. Botanical name(s) of the plant (s)?
9. Family name(s) of the plant (s)?
10. Habitat of the plant (s); forest/reverie/home garden/road side/rocky area/agricultural field/grazing land.
11. Habit of the plant (trees, shrubs, herbs, lianas, climbers or epiphytes)
12. Plant parts used; root/stem/root bark/leaves/small twigswithleaves/flowers/fruit/seed/whole.

13. Method of preparation for medicinal uses; crushed/crushed and powdered/crushed pounded/extract with cold water/boiled/ juice/ latex or other.

14. Season/time of collection

15. Preferred maturity level

16. Any taboo/ restrictions in plant collections

17. Dose or amount administered.

18. Any restrictions in taking remedies (pregnancy, age, etc.)?

29. Any noticeable side effect

20. Do you store the medicine? If yes, how and for how long

21. Are medicinal plants easily accessible?

22. Are there any beliefs linked with the utilization of medicinal plants in the study area?

(age, method, time of collection, time of administration, condition like pregnancy).

23. How does modernization interfere with traditional medicine?

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

25. What are the major threats to medicinal plants? As a group or individual species

26. Is there any effort made to conserve the medicinal plants?

27. How do you conserve medicinal plants?