



**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS IN
DOYOGENA WOREDA KEMBATA TEMBARO ZONE SNNPR,
ETHIOPIA**

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Addis Ababa, Ethiopia

August, 2021



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GRADUATE PROGRAMS

This is to certify that the Thesis prepared by Tigist Kassa Wanore, entitled Ethnobotanical study of medicinal plants in Doyogena Woreda, Kembata Tembaro Zone, SNNPR, Ethiopia and submitted to the department of Zoological sciences in partial fulfillment of the requirements for the Degree of Master of Science complies with the regulation of the university and meets the accepted standards with respect to originality and quality.

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ABSTRACT

Ethnobotanical study of medicinal plants in Doyogena Woreda Kembata Tembaro Zone, SNNPR, Ethiopia.

By Tigist Kassa Wanore MSc Thesis

Addis Ababa University, July 2021

An Ethnobotanical study on medicinal plants was conducted in Doyogena woreda, SNNPR, Ethiopia from September 2019 to June 2020. The purpose of the study was to organize and document information on use, management and conservation of medicinal plants by indigenous and local people of Doyogena woreda, SNNPR, Ethiopia. Data were collected from 90 informants from 9 kebeles by using semi-structured interview, participant observation, group discussion and guided field walk. Purposive sampling was employed to select the study site as well as the informants. A total of 67 species of medicinal plants that belong to 57 genera and 29 families were gathered. The family Asteraceae was represented by the highest 11 species, followed by Lamiaceae, 8 species. The majority of Doyogena woreda's medicinal plants were herbs (40) followed by shrubs (15). The studied medicinal plants were those used in traditional health care of humans and livestock. 52.24% of those medicinal plants were collected from home gardens of the area. The medicinal plant preparations were administered through oral, dermal and nasal routes. Plant parts used for remedy preparations were leaves, roots, fruits and barks. The majority of the remedies (82.09%) were prepared in the form of juice from freshly collected plant parts. The study indicated that men, older people and illiterate ones had better knowledge on medicinal plants use as compared to women, younger people and literate ones, respectively. In conclusion the results of the present study showed that *Ruta chalepensis* was the most preferred species for the treatment of abdominal pain and *Eucalyptus globulus* was the most widely used multipurpose species. The major threatening factor of medicinal plants in the study area was agricultural expansion. In order to protect biodiversity and loss of indigenous knowledge, local communities must be trained and involved in conservation and management of plant resources and indigenous knowledge.

Key words: Doyogena, Abdominal pain, Healer, knowledge transfer, Agricultural expansion

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Table of Contents

List of Figures	x
List of Tables	xi
List of Appendices	xii
ACRONYMS	xiii
CHAPTER ONE	1
1. INTRODUCTION	1
1.1. Background of the Study	1
1.2. Statement of the Study	2
1.3. Research Questions	2
1.4. Objective	3
1.4.1. General Objective	3
1.4.2. Specific Objectives	3
CHAPTER TWO	4
2. LITERATURE REVIEW	4
2.1. Plant-people Interaction and Trends of Ethnobotany	4
2.2. Indigenous Knowledge (IK) on Medicinal Plants	4
2.3. Role of Ethnobotany	5
2.4. Traditional Medicinal Plants	5
2.4.1. Traditional Medicinal Plants Used by the Local Community	5
2.4.2. Traditional Medicinal Plants Used in Modern Medicine	6
2.4.3. The Integration of Traditional and Modern Medicine	6
2.4.4. The Global Situation	6
2.5. Traditional Medicinal Plants in Ethiopia	7
2.5.1. Overview of Medicinal Plants Situation in Ethiopia	7
2.5.2. Medicinal Plant Diversity and Distribution in Ethiopia	7
2.5.3. The Use of Traditional Medicinal Plants in Ethiopia	7

2.6. Medicinal Plants as the Base for Development of Modern Drugs	8
2.7. Threats to and Conservation of Medicinal Plants	8
2.7.1. Threats to Medicinal Plants	8
2.7.2. Conservation of Medicinal Plants.....	9
CHAPTER THREE	11
3. MATERIALS AND METHODS.....	11
3.1. Description of the Study Area	11
3.1.1. Geographical Location	11
3.1.2. Climate.....	12
3.1.3. Livestock	13
3.1.4. Soil Type.....	13
3.1.5. Major Crop Cultivation	13
3.1.6. Land Use System of the Study Area.....	13
3.2. Method	14
3.2.1. Reconnaissance Survey	14
3.2.2. Selection of Informants	14
3.2.3. Data Collection	15
3.2.4. Specimen Collection.....	16
3.2.5. Specimen Identification.....	16
3.3. Data Analysis Technique	16
3.3.1. Descriptive Statistics	16
3.3.2. Preference Ranking.....	16
3.3.3. Direct Matrix Ranking.....	17
CHAPTER FOUR.....	18
4. RESULTS	18
4.1. Ethnomedicinal Plant Species Used by People of Doyogena Woreda.....	18
4.1.2. Habits of Medicinal Plants	18

4.1.3. Habitat of Medicinal Plants	19
4.1.4. Plant Part(s) Used for Preparation of Remedies	19
4.1.5. Condition of Preparation of Remedies	19
4.1.6. Preparation Methods of Medicinal Plants	20
4.1.7. Route of Administration and Dosage of Medicinal Plants	21
4.2. Medicinal Plants Used to Treat Human Ailments.....	22
4.2.1. Major Human Diseases and Number of Plant Species Used by Indigenous People.....	22
4.2.2. Habits of Medicinal Plants Used to Treat Human Ailments	22
4.2.3. Habitat of Medicinal Plants Used to Treat Human Ailments	22
4.2.4. Parts Used and Mode of Preparation of Medicinal Plants Used to Treat Human Ailments	23
4.2.5. Route of Administration	24
4.2.6. Application of Medicinal Plants	25
4.2.7. Preference Ranking.....	25
4.2.8. Direct Matrix Ranking.....	26
4.3. Major Livestock Diseases and Number of Plant Species Used by Indigenous People of Study Area.....	27
4.3.1. Habit of Medicinal Plants Used to Treat Livestock Ailments.....	28
4.3.2. Habitat of Medicinal Plants Used to Treat Livestock Ailments	28
4.3.3. Plant Parts Used and Mode of Preparation	29
4.3.4. Application and Route of Administration	30
4.4. Medicinal Plant Species Used to Treat Both Livestock and Human Ailments.	31
4.4.1. Habit of Medicinal Plants Used to Treat Both Livestock and Human Ailments.....	31
4.4.2. Habitat of Medicinal Plants Used to Treat Both Livestock and Human Ailments.....	31
4.4.3. Plant Parts Used and Mode of Preparation	32

4.4.4. Application and Route of Administration for Treating both Human and Livestock Ailments	33
4.5. Sources and Transfer of Indigenous Knowledge on Medicinal Plants	34
4.5.1. Sources of Indigenous Knowledge	34
4.5.2. Transfer of Indigenous Knowledge	34
4.6. Marketed Medicinal Plants in the Study Area	35
4.7. Threats and Conservation of Medicinal Plants of the Study Area	36
4.7.1. Threats to Medicinal Plants	36
4.7.2. Conservation of Medicinal Plants.....	36
CHAPTER FIVE	37
5. DISCUSSION, CONCLUSION AND RECOMMENDATIONS	37
5.1. Discussion	37
5.1.1. Diversity of Medicinal Plant Species Used by People of the Study Area..	37
5.1.2. Habit, Habitat and Parts of Medicinal Plants Used for Preparation of Remedies in Doyogena Woreda.....	37
5.1.3. Dosage, Condition of Preparation and Route of Administration of Medicinal Plants.....	39
5.1.4. Major Human and Livestock Diseases and Corresponding Medicinal Plants Used to Treat.....	40
5.1.5. Preference Ranking and Direct Matrix Ranking	40
5.1.6. Major Livestock Diseases and Medicinal Plants Used by Indigenous People of Doyogena Woreda	41
5.1.7. Marketed Medicinal Plants in Doyogena Woreda.....	41
5.1.8. Traditional Medicinal Plants and Indigenous Knowledge Transfer in the Study Area	42
5.1.9. Threats to and Conservation of Medicinal Plants and Indigenous Knowledge in the Study Area	42
5.2. Conclusion.....	43

5.3. Recommendation.....	44
REFERENCES	46
APPENDICES	54

List of Figures

Figure 1: Map of Ethiopia showing SNNPR and the study district.....	12
Figure 2. Condition of Preparation of Remedies	20
Figure 3. Habits of medicinal plants used for human ailments.....	22
Figure 4. Application Methods of Medicinal Plants for Human Ailments in Doyogena Woreda	25
Figure 5. Habit of medicinal plants used in Doyogena Woreda to treat livestock ailments	28
Figure 6. Habitat of medicinal plants used in Doyogena Woreda to treat livestock ailments	29
Figure 7. Plant parts used to treat livestock ailments used in Doyogena Woreda	29
Figure 8. Mode of preparation of medicinal plants used in Doyogena Woreda to treat only livestock ailments	30
Figure 9. Route of administration of medicinal plants used in Doyogena Woreda for livestock.....	30
Figure 10. Habitat of medicinal plants used to treat both human and livestock ailments in Doyogena Woreda.....	32

List of Tables

Table 1: Profile of the informants in the study area.....	15
Table 2. Habits of Medicinal Plants used in Doyogena Woreda	18
Table 3. Habitat of medicinal plants used in Doyogena woreda	19
Table 4. Plant part(s) used for preparation of remedies.....	19
Table 5. Methods of preparation of remedies in Doyogena woreda.....	20
Table 6. The route of administration of medicinal plants in Doyogena woreda.....	21
Table 7. Habitat of medicinal plants for human ailments.....	23
Table 8. Parts of medicinal plants for preparation of remedies for human ailments in Doyogena woreda	23
Table 9. Mode of preparation of medicinal plants for treating human ailment in Doyogena woreda	24
Table 10. The route of administration of medicinal plants in Doyogena Woreda.....	24
Table 11. Preference ranking of medicinal plants used in Doyogena Woreda to treat abdominal pain.....	26
Table 12. Direct matrix ranking of seven multipurpose medicinal plant species in Doyogena woreda	27
Table 13. Habit of medicinal plants used for treating livestock and human ailments in Doyogena Woreda	31
Table 14. Parts of medicinal plants used for both livestock and human.....	32
Table 15. The preparation methods of remedies for human and livestock.....	33
Table 16. Application of medicinal plants for treating both human and livestock ailments.....	33
Table 17. Route of administration of medicinal plants for both human and livestock ailments.....	34
Table 18. Source of indigenous knowledge	34
Table 19. Way of transferring the knowledge of medicinal plants.....	35
Table 20. Threats and number of respondents who cited the factor	36

List of Appendices

Appendix 1. List of Medicinal Plant Species, Family Name and Local Name of the Species, Parts Used, Habit, Habitat, Disease Treated, Mode of Preparation and Route of Administration for Human and Livestock Ailments in Doyogena Woreda.....	54
Appendix 2. List and percentage of Families, Genera and Species of Medicinal Plants in Doyogena Woreda	74
Appendix 3. List of Multipurpose Uses of Medicinal Plants other than Medicinal Value	76
Appendix 4. List of Informants with Their Age, Sex, Kebele, Marital Status and Occupation	78
Appendix 5. Marketed Medicinal Plants in the Study Area	88
Appendix 6. Format for Collecting Ethnobotanical Information (Semi-structured interview)	89
Appendix 7. Format for Collecting Ethnobotanical Information (Semi-structured interview) (in Kembatigna).....	91
Appendix 8. Photographs Illustrating Field Activities	93

ACRONYMS

AAU	Addis Ababa University
DWAO	Doyogena Woreda Rural and Agricultural development Office
FAO	Food and Agricultural Organization
NGO	Non-Governmental Organization
SNNPR	South Nations and Nationalities People Region
WHO	World Health Organization

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

The direct interrelations between humans and plants are studied under Ethnobotany. The World Health Organization (WHO) (2001) defined traditional medicine as the sum of knowledge and practices that can be regularly explained or used in prevention and elimination of physical, mental or social imbalance. And it also depends on practical experience and observation transferring from generation to generation, whether verbally or in writing. Nowadays many countries are devoted to research on ethnobotanical medicinal plants (Bourdy *et al.*, 2000).

Medicinal plants are plants used as medicine by the society because they play an important role in human health worldwide. Plants continue to provide natural ingredients used in many drugs and it is estimated about 25% of active drug ingredients are extracted from plant materials (Weng *et al.*, 2013). Medicinal plants play an important role in filling in the gaps of today's limited health care resources in Ethiopia and other developing nations. There is a growing demand for herbal remedies both in developed and developing countries (Endashaw Bekele, 2007). For example, in USA about 25% of all prescriptions distributed in public pharmacies in 1973 contained drugs extracted from higher plants and about 64% of the total global populations remain dependent on traditional medicine for their health care needs (Farnsworth and Morris, 1994 and Sindiga, 1979; cited in Cotton, 1996).

In Africa, India and China traditional medicine has become a part of the people's culture even though this form of medicine is not well organized (Sofowora, 1982). More than 80% of Ethiopian people for their health service are dependent on plants but ways of usage and management of medicinal plants in different ethnic groups found in Ethiopia were different (Gebremariam Hadera and Kaleab Asress, 1998). Ethiopians use large numbers of medicinal plants efficiently even though the plants used and the methods of preparation are often closely guarded secrets (Wilson and Geberemariam Wolde, 1979). Therefore, this study aimed at identification and documentation of medicinal plants and associated knowledge of Doyogena Woreda Kembata Tenbaro Zone, SNNPR Ethiopia.

1.2. Statement of the Study

Medicinal plants are plants used by society to prevent and eliminate physical, mental or social health problems. Medicinal plants are not only used for humans but also, they are used for livestock. In Ethiopia many people are dependent on medicinal plants. But because of a number of problems like not identifying the specific type of the plant which is used for a particular disease, lack of knowledge on the dose of the medicine that is taken for each disease and deforestation of natural resources in the country due to urbanization and need of large farm land many medicinal plants are destroyed. The same is true in Doyogenea woreda that existing medicinal plants are subjected to loss without documentation, due to agricultural expansion, construction, urbanization, deforestation, firewood, and over grazing.

Therefore, the present study is then initiated with the intension to document indigenous knowledge about medicinal plants, threat and conservation of the medicinal plant used by the people of Doyogenea woreda, SNNPR Ethiopia.

1.3. Research Questions

- What traditional medicinal plants are used in Doyogenea woreda ?
- Which part of plant is used for medicinal purposes and how it is prepared?
- What are the main threatening factors to medicinal plants and associated indigenous knowledge of the area?
- What kind of medicinal plant conservation practices found in Doyogenea woreda ?
- How is the trend of knowledge transfer from traditional healers to the next generation ?

1.4. Objective

1.4.1. General Objective

To identify and document indigenous knowledge about traditional medicinal plant species, and the traditional medicinal plant species used to treat human and livestock health problems.

1.4.2. Specific Objectives

1. To gather, record and document indigenous knowledge about medicinal plants in Doyogena woreda.
2. To collect and identify traditional medicinal plant species used in Doyogena woreda for treatment of human and livestock health problems.
3. To identify and document the plant parts used for medicinal purposes.
4. To identify and document the threats and available medicinal plant conservation measures practiced in the study area.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Plant-people Interaction and Trends of Ethnobotany

People have depended on plants for their day-to-day requirements. For example, source of food, construction, medicine, flavoring of food and fencing throughout their lives. The interaction between Biodiversity and human society, and how diversity in nature is used and influenced by human activities are studied under Ethnobotany (Martin, 1995). Such studies are useful in documenting, analyzing and disseminating all plant-human interactions. Since ancient times traditional medicinal plant preparations have been essential sources to cure human and livestock diseases.

Indigenous knowledge has developed by each indigenous population through time and has developed its own way of conserving nature. This is because of human interaction with their ecosystem (Martin, 1995). Thus, Ethnobotany focuses on how local people interact with their natural surroundings, including how they analyze, manage, and use native plants in their local environments. (Getaneh, 2019; Limenih et al., 2015).

2.2. Indigenous Knowledge (IK) on Medicinal Plants

Indigenous knowledge is possessed by local people in a particular area by accumulation of knowledge, rule, standard, skills and mental sets through time (Quanash, 1998). This accumulation of knowledge helped people to adapt and survive in the environment in which they live. This is due to the nearest and close dependency of local people on natural resources. According to Martin (1995) indigenous knowledge of local community comes as the result of many generations, long year experience, and careful observation and trial and error experiments. It builds up on the historic experiences of people and adapts to social, economic, environmental, spiritual and political change.

Knowledge of traditional medicinal plants in Ethiopia varies considerably across the population (Zemedu Asfaw, 2001). Since Ethiopians have used traditional medicine for so many centuries, it has emerged as a part of their different cultures. Across the country, indigenous people have developed specialized knowledge of how plants resources are used, managed, and conserved (Pankhurst, 1965).

2.3. Role of Ethnobotany

Ethnobotany focuses on how local people interact with their natural surroundings, including how they analyze, manage, and use native plants in their local environments. (Getaneh, 2019; Limenih et al., 2015). The development of Ethnobotany has challenged the prevailing trend in academic studies of twentieth century of disciplinary specialization. It reflects congruence with our human effort to understand our place in the world. It parallels other interdisciplinary fields such as environmental history, political ecology, cultural ecology, environmental ethics, ecological economics, and ecological restoration. Linked to ethnobotany are taxonomy, nutrition, phytochemistry, palynology, ecology, and conservation biology (Martin, 1995).

Ethnobotany has also been constructed to include studies of those life forms traditionally but no longer considered as plants: algae, lichens, and fungi. On the social sciences and humanities side are anthropology, political science, geography, environmental studies, economics, psychology, linguistics, and philosophy, among others. Ethnobotany can lead to a fascinating and fulfilling career, whether in a university, a community, government, international agencies, or non- government organization. Methods that ethnobotanists employ include: note taking, photography, tape and video recording, statistics, collecting and preparing plant specimens, microscope work, and analysis of nutrient and plant chemicals (Martin, 1995).

2.4. Traditional Medicinal Plants

2.4.1. Traditional Medicinal Plants Used by the Local Community

Traditional medicine is the sum of knowledge and practices that can be formally explained or used in presentation and removal of physical, mental or social imbalance and depends on practical experiences and observation transferring from generation to generation, whether verbally or in writing (Yilma Desta *et al.*, 1996; cited in Fassil Kibebew, 2001).

Ethiopia is a country with a great range of ecological, edaphic and climatic conditions (Dawit Abebe and Ahadu Ayehu, 1993; Dawit Abebe *et al.*, 2003). The number of medicinal plant species in each corner of the country and vegetation type is also varied ranging from arid low land to Afro alpine vegetation (Abebe Demisse, 2001). Similarly, it was reported that the variation in vegetation type of the country is due to countries'

significant geographical diversity. In Ethiopia traditional medicinal plants are used both by rural and urban peoples.

2.4.2. Traditional Medicinal Plants Used in Modern Medicine

WHO estimated that 70-80% of people in developing countries including Africa depend on traditional medicines (Cunningham, 1991). This is because traditional medicines are more acceptable by the society, and meet the psychology needs of the community than modern drugs. In the future to get a better public health service traditional medicinal plants must be integrated with modern health system.

2.4.3. The Integration of Traditional and Modern Medicine

In Ethiopia the integration of modern and traditional medicines is believed to improve health care coverage, management of disease and disorders. According to Kebu Balemie *et al.*, (2004), keeping the efficiency and quality of traditional medicines helps for the development of modern drugs. This paves the way for integration of traditional medicines to the modern health system of the country.

Integration in this case is an increase of health coverage through collaboration, communication, harmonization of the modern system with that of the traditional one while ensuring intellectual property right and protection of traditional medicinal knowledge. Integration of the two systems is believed to be crucial due to the fact that people with different cultures, believes and locality have their own unique knowledge of traditional medicines and this helps for the development of modern health system (Tamene Bekele, 2007).

2.4.4. The Global Situation

According to WHO (2010), 72000 - 77000 (17-18% of world flora) plants are used as medicines worldwide. It is shown in many literature sources that India, Japan, China, and Malaysia are the leading countries in the world using traditional medicines. For example, in India around 7500 medicinal plant species are traditionally used (Rao, 1996). It is reported in Singh *et al.*, (1979) that among about 2000 drugs, 1500 of the drugs that have been used in India and Nepal are of plant origin. The Nicaragua people also obtain most of their medicines (more than 77%) from the forest (Coe and Anderson, 1997). Ethiopia is a home of diversity due to this each ethnic groups have

different ways of utilization and manipulation of medicinal plants (Gebremariam Hadera and Kaleab Asress, 1998).

2.5. Traditional Medicinal Plants in Ethiopia

2.5.1. Overview of Medicinal Plants Situation in Ethiopia

A multitude of medicinal plants are available in the different agro-ecological zones in Ethiopia. Medicinal plants are found in abundance exclusively in woodlands, mountain vegetation including grasslands and forests, and the evergreen scrub and rocky areas, with woodlands containing the highest concentrations. (Endashaw Bekele, 2007). It is estimated that there are over 1000 identified medicinal plants species in Ethiopia, but much more is still unknown. The sequential mention of about 300 of these species is found in many sources (Endashaw Bekele, 2007). The traditional health care in Ethiopia relies on plant-based medicine to the degree that 95 percent of medicines are of plant origin and 75 percent of humans and 90 percent of livestock depend on the primary health care that traditional medicine offers (Endashaw Bekeke and Shigeta, 2008).

2.5.2. Medicinal Plant Diversity and Distribution in Ethiopia

Ethiopia is a country with rich flora, having more than 6,500 species of vascular plants. Out of which an estimated 12% are endemic and about 887 species are used as medicinal plants (Ashenif Tadele, 2017).

As it was reported by Edwards (2001), the wood lands and mountain vegetation of Ethiopia contain more medicinal plants which indicated that traditional medicinal plant species are not equally distributed throughout the country similar to the distribution of the total plant species. According to this report the vegetation types found in the wood lands contain more medicinal plant species while the Afro alpine vegetation consists of the least medicinal plants of all the vegetation types.

2.5.3. The Use of Traditional Medicinal Plants in Ethiopia

Ethiopia is a country having enormous diversity of animal and plant species this is due to a wide range of climatic and ecological conditions (Pankhurst, 2001). The country having varied type of potentially useful medicinal plants, more extensively indeed than available in many other parts of the world (Dawit Abebe, 1986).

The knowledge of plants used by humans is based on thousands of years of experience. By “trial and error”, people learnt how to recognize and use plants, including those with a magic-religious function (Camejo-Rodrigues *et al.*, 2003). It is estimated that 95% of traditional medicinal preparations in Ethiopia are of plant origin (Dawit Abebe, 1986).

2.6. Medicinal Plants as the Base for Development of Modern Drugs

Medicinal plants are important for survival of human kinds and livestock and are the bases for the development of modern drugs. Even through the traditional medicinal practitioners are the best sources of information about the knowledge of the medicinal plants, due to the professional secrecy of their indigenous knowledge it was found very difficult to obtain their traditional medicinal information it is only to be passed orally to their older son, at their older age (Jansen, 1981).

By the integration of modern and traditional medicines health care coverage, management of disease and disorders is believed to be improved in Ethiopia. According to Kebu Balemie *et al.* (2004), by keeping the efficacy, and quality of traditional medicines the adaptability base for the development of modern drug is facilitated. This promotes its combination to the modern health system of the country.

Due to lack of interest by the modern society the way elders transfer their knowledge, there were many misconceptions on the efficiency of medicinal plants (Wilson and Geberemariam Wolde, 1979). In the past educated and modern societies have been neglected traditional medications. Recently, the benefit of traditional medication is being realized by a number of ethnomedicinal and ethnobotanical studies to promote the health care services. The outcomes of these researches are greatly playing role in attitudinal changes. However, these studies are very few in length of the country's biodiversity.

2.7. Threats to and Conservation of Medicinal Plants

2.7.1. Threats to Medicinal Plants

As medicinal plants are part of the total plant of the different ecosystems of the earth, they are affected by anthropogenic and natural forces. Apart from other species of plants, medicinal plant species can also be exploited for their medicinal value and leads to a serious threat to the biodiversity in the area, as a result, several plant species have been exploited to such an extent that they are seldom found in unprotected areas

(Cunningham, 1991). People who have some traditional knowledge of healing in general and those professional healers in particular harvest medicinal plant mainly from the wild habitat (Tesfaye Bekalo and Sebsebe Demissew, 2009).

According to Cunningham (1996); Abebe Demissie (2001) and Kebu Balemie *et al.* (2004), like other countries of Africa, vegetation types where traditional medicinal plant species collected are declined from time to time, due to this Ethiopia face problem of continuity and sustainability of the loss of taxa of medicinal plants and loss of habitats (Ensermu Kelbesa *et al.*, 1992). The threat factors can be elaborated as lose of cultural diversity including traditional knowledge due to, uncontrolled grazing, drought, agricultural expansion, fire wood, charcoal, urbanization and construction (Mirutse Gidey *et al.*, 2003). Throughout the world people use many medicinal wild species of plants for food, medicines, clothing, shelter, fuel, fiber, income generation and the fulfilling of cultural and spiritual needs (Zemedede Asfaw, 2001). It has been reported that medicinal plant species are affected by unsustainable harvesting for export and extraction of pharmaceutical (Farnsworth *et al.*, 1994). Beside to these known factors which threat medicinal plant species, other conditions like the type of the medicinal plant and the part used also affect the medicinal plant.

2.7.2. Conservation of Medicinal Plants

Sustainable use of biological resources is known as conservation. The concept of sustainability, particularly with reference to biological resources is now seen as the guiding principle for economic and social development. According to Zemedede Asfaw (2001), over use and destructive harvesting of roots and barks collection are considered to be the main conservation risk for medicinal plants. Dawit Abebe (2001) and Ahadu Ayehu (1993) found that by effectively killing the plant in harvest many medicinal preparations use roots, stem and bark.

Although various threats have profound effect on medicinal parts, local people attempt to grow medicinal plants in home garden through the effort in minimal. By ex-situ methods, traditional medicinal plant can be conserved in gene banks, botanic gardens and field gene banks. In addition, tissue culture technique is also important in ex-situ conservation of traditional medicinal plants (Abebe Demissie, 2001). Moreover, conservation measures should be taken by government officers and NGOs to reduce the existing medicinal plants on threat (Seyoum Getaneh, 2009).

Today the continued deforestation and environmental degradation of habitats in many parts of the country has brought about the depletion of medicinal plants and the associated knowledge. The parts of the medicinal plants collected also possess a serious threat to the survival of the species (Berhe Tesfu *et al.*, 1995; Fassil Kibebew and Getachew Addis, 1996).

Conservation should be aimed at conserving maximum diversity within each species to ensure that its genetic potential will be available in the future (Abebe Demissie, 2001). Sustainable management of traditional medicinal plant resource is important for their value as a potential source of new drugs build and for their medicinal value but due to their scarcity in a nearby place professional traditional healers move along distance to harvest. In contrast to this problem of scarcity, the demand and recognition for traditional medicine is increased and this is a good opportunity to the medicinal plants conservation (Zemedede Asfaw, 2001). The wise use of medicinal plants species needs the involvement of different sectors and greater public support and for this, awareness creation is recommended.

As it was reported, home gardens have a great contribution to conservation of biodiversity in general and at the same time medicinal plants species can also be conserved (Zemedede Asfaw, 2001). Some traditional medicinal plants are collected on selective days and seasons. An account that has been made by Cunningham (1991) indicated the plant species whether medicinal or non-medicinal plants grown in religious sites like churches, mosques and the like are forbidden to be cut. Moreover, the author reported, harvesting of medicinal plants using pointed wooden digging stick than using metal axes are some of the cultural methods of medicinal plant collection and this has contribution to the conservation strategy.

CHAPTER THREE

3. MATERIALS AND METHODS

3.1. Description of the Study Area

3.1.1. Geographical Location

The research was carried out in Kembata Tenbaro zone, Doyogena wereda (District), SNNPR, Ethiopia. Doyogena has a total area of about 17,663.59 hectares and almost all area is inhabited by people (WARDOR, 2013). Doyogena is bordered on the south by Kacha Bira, on the west and north by Hadiya Zone (Wonjela, Dinka-haisse, Amecho- Marduncho, Murasa-Kosha kebeles), and on the east by Angacha.

The study area lies between latitude 7°18'25"N-7°21'49"N and longitude 37°45'33"E-37°48'51"E. Its elevation ranges from 2,582.7 to 2800 meters above sea level (AARC, 2014). Doyogena woreda is located 260km South West from Addis Ababa, 192 km North West from Hawassa (Administrative city of SNNPR) and 80 km North West from Durame (Administrative city of Kembata Tenbaro zone).

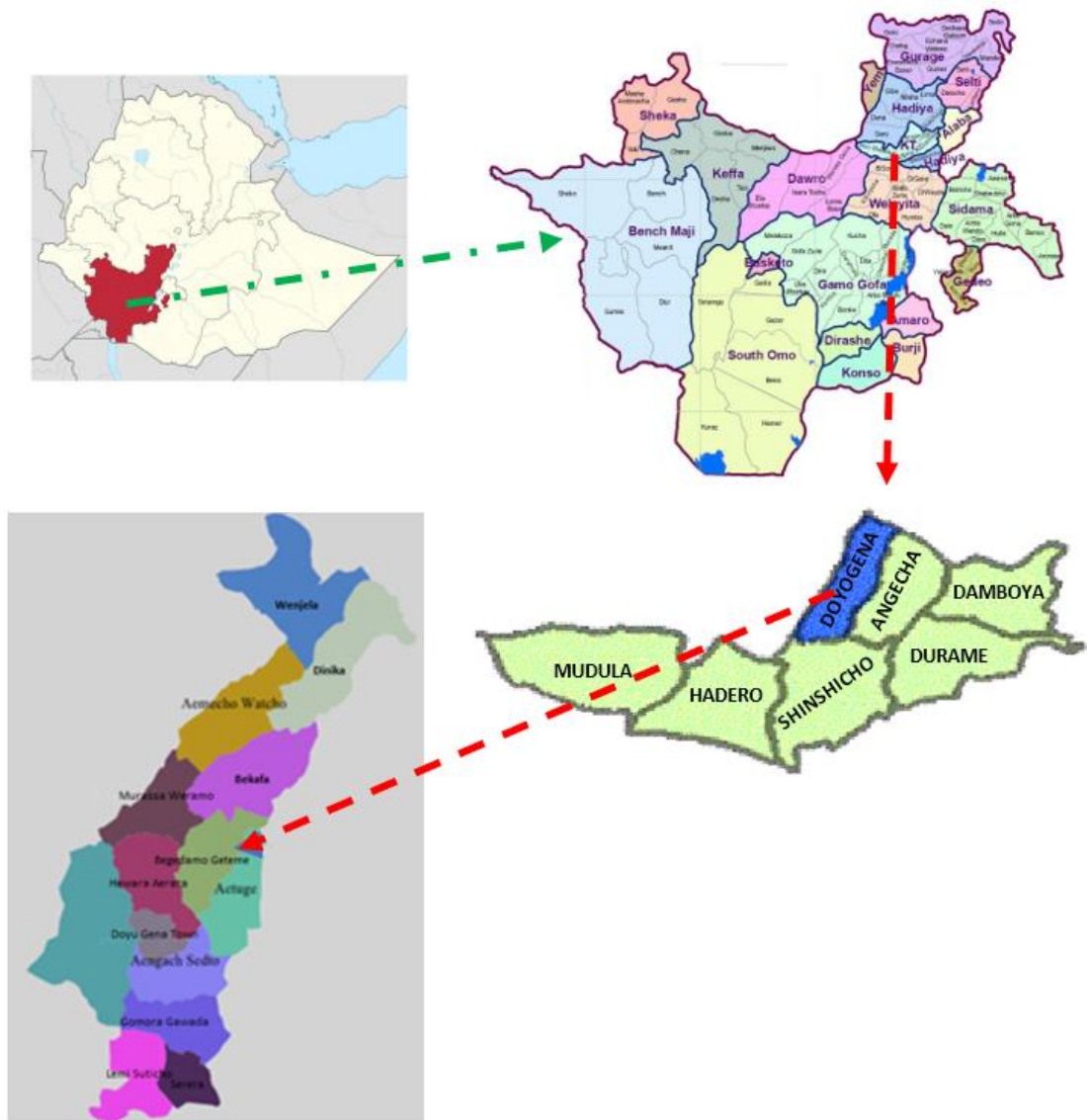


Figure 1: Map of Ethiopia showing SNNPR and the study district

3.1.2. Climate

The climatic conditions of this woreda (District) are Dega (Temperate) and Woyina Dega (Sub-tropical) with the annual minimum and maximum rain fall range from 2200mm-3100mm. The mean annual temperature of the area is 16°C. The mean minimum and maximum temperature of the area is 10.8°C and 18.6°C respectively. The warmest months of the area are between February and May. In these months, average temperature of the area reaches to 17.8°. On the contrary, the coldest month of the study area occurs between September and November where the average monthly temperature reaches to 15.6°C. Frost occurs in October and November occasionally (Doyogena Woreda Agricultural and Rural Development Office Report, 2013).

3.1.3. Livestock

According to Doyogena woreda Agricultural and Rural Development Office Report (2013), the woreda (district) has an estimated population of 126,786 cattle, 27,488 sheep, 24,395 goats, 7,839 horses, 15,934 donkeys, 5,820 mules, and 78,563 chickens. Out of the total 26,811 farm house holds found in the woreda (district) around five percent have no ox. The remains own at least a single ox. Donkeys are the most common pack animals. Communal grazing areas, private pastures and crop residues are the principal sources of food. Farmers in the study area pursue mixed agriculture in which crop and livestock productions are important components.

3.1.4. Soil Type

The soils of the study area are red and black clay loam. The red clay loams vary from 10 to 50 inch in depth. The thickness of the black layer varies with the slopes, very thick on flat ground and it disappears on steep slopes and replaced by red soil (AARC, 2014).

3.1.5. Major Crop Cultivation

The study area has small scale and subsistence mixed-farming; with livestock production is the main agricultural types that are practiced in the area. Crop production is mainly rain feed. Almost all of the cropland is planted to annual food crops, including cereals (Maize, Sorghum, Barley, Wheat, Teff), pulses (beans, peas), and root crop (potatoes). A very small fraction of farmers produces vegetables and fruits. These crops are grown mainly in home gardens or where agricultural field exists. Perennial crops such as enset, stimulants (coffee and chat) are also grown in considerable amounts. Livestock are also important to agriculture in the woreda (Doyogena Woreda Agricultural and Rural Development Office Report, 2013).

3.1.6. Land Use System of the Study Area

According to the Woreda Agricultural and Rural Development Office (2013), the land in the study area is classified through functional categories that are 3.08% grazing land, perennial crop 10%, construction 9.54%, annual crop 67.76%, forest 2%, cooperatives 2.98%, forest (natural) 1.48% and unproductive land 2.46%.

3.2. Method

3.2.1. Reconnaissance Survey

A reconnaissance survey of the study area was conducted from September 4-September 15, 2019. The study area has 17 kebeles. According to Agro-ecological condition and availability of medicinal plants 9 kebeles were selected purposively. The kebeles include Amecho and Bekafa from woinadega (sub-tropical), and Bokota, Serera town, Gomora gewada, Anicha sedicho, Wagebeta, Utuga, and Howora arara from Dega (temperate).

3.2.2. Selection of Informants

In this study, 90 informants were selected from 9 kebeles; from these 18 were key informants which were selected purposively based on their knowledge on traditional medicines by gathering information from local people in the study site. The rest 72 general informants were selected by snow ball sampling. The age of informants ranges from 15-90 years. Out of these 65 were male and 25 were female. Their marital status and level of education is listed on the following table.

Table 1: Profile of the informants in the study area

Age range	Male	Female	Total	Percent %
15-24	3		3	3.33
25-34	1	2	3	3.33
35-44	14	5	19	21.11
45-54	19	10	29	32.22
55-64	9	6	15	16.67
65-74	6	2	8	8.89
74-84	8		8	8.89
85-90	5		5	5.56
Total	65	25	90	100.00
Maternal status	Male	Female	Total	Percent %
Married	61	25	86	95.56
Unmarried	4		4	4.44
Educational level	Male	Female	Total	Percent %
Read and write	25	8	33	36.67
Unread	16	14	30	33.33
Completed	24	3	27	30

3.2.3. Data Collection

Ethnobotanical data was collected on January 2020; following the methods used by Martin (1995) and Cotton (1996). Accordingly, semi-structured interviews, participant observation, group discussion and guided field walks with informants were employed to obtain indigenous knowledge of the local community on health and vegetation of the locality.

Information regarding local names of medicinal plants, part(s) used, methods and preparation, disease treated, dosage used, route of application, (adverse effect), uses other than medicinal uses and management methods were recorded at the spot. The data were held based on checklist of semi- structured interviews (Appendix 5).

Local names of plants were studied by repeated inquiries at different times (2 times) with the same informants to check the accuracy of information obtained and information was recorded. Group discussions were conducted with 5-6 informants and

the discussion was mainly focused on treatment, conservation and the way of transfer of knowledge to new generation about medicinal plants during the time.

3.2.4. Specimen Collection

Specimens of medicinal plants were collected between January 18 January 30/ 2020 with two field trips. Based on ethnobotanical information provided by informants' specimens were collected, numbered, pressed, and dried for identification.

3.2.5. Specimen Identification

Preliminary identification of medicinal plants was done in the field. In addition, identification of unidentified specimens was done in February 2020 but due to COVID 19 it was extended to September 2020 by comparison with authentic specimen's illustration and taxonomic keys from Flora of Ethiopia and Eritrea Volume 1-8 and with the assistance of experts at Addis Ababa University, National Herbarium. And scientific names of those identified traditional medicinal plants were confirmed by my advisor Dr. Ermias Lulekal and stored at the National Herbarium, Addis Ababa University.

3.3. Data Analysis Technique

3.3.1. Descriptive Statistics

Ethnobotanical data were entered into Excel 2007 and analyzed with descriptive statistics method such as percentage and frequency were employed to analyze and summarize the data on medicinal plants, associated knowledge, management methods and conservation. The most useful information gathered on medicinal plants were reported by local people; medicinal value, application, methods of preparation, route of application, disease treated, dosage, parts and habit used were analyzed through descriptive statistical analysis (Martin, 1995).

3.3.2. Preference Ranking

Preference ranking was conducted following Martin (1995). Thirteen (13) most important medicinal plants commonly reported for their use in treating abdominal pain (Table 11), were considered for the preference ranking exercise. Nine (9) informants were selected to identify the best preferred medicinal plant species for treatment of abdominal pain. Each informant was provided with thirteen (13) medicinal plants reported to cure this disease with each leaf of medicinal plant used being paper tagged names and asked to assign the highest value thirteen (13) for plant species most

preferred, against this illness and the lowest value one (1) for the least preferred plant and in accordance of their order for the remaining ones. These values were summed up and rank given to each plant species (Table 11).

3.3.3. Direct Matrix Ranking

Direct matrix ranking exercises was done following Martin (1995) in order to compare multipurpose use of a given species and to relate this to the extent of its utilization verses its dominance. Based on information gathered from informants, seven multipurpose tree species were selected out of the total medicinal plants (Appendix 1), and six use diversities of these plants were listed form seven selected key informants to assign use values to each species (Table 12). The six use values include construction, furniture making, timber, firewood, charcoal and fencing.

Seven key informants were chosen to conduct this activity and each key informant was asked to assign use values (5= best, 4= very good, 3= good, 2= less used, 1= least used and 0= not used). Accordingly, each key informant uses values for the seven multipurpose medicinal plant species, average value of each use, diversity for a species was taken and each species were summed up and ranked.

CHAPTER FOUR

4. RESULTS

4.1. Ethnomedicinal Plant Species Used by People of Doyogena Woreda

A total of 67 medicinal plant species used for the treatment of human and livestock ailments were gathered and documented. Out of these 48 (71.64%) species were used for the treatment of human ailments, 8 (11.94%) species were used for the treatment of livestock ailments and the remaining 11(16.41%) species were used for the treatment of both livestock and human ailments.

The medicinal plants collected from the study area belong to 57 genera and 29 families. Family Asteraceae contained the highest 11 species, followed by Lamiaceae 8, Solanaceae 7, Acanthaceae 6 species. Apiaceae, Poaceae and Rubiaceae 3 species each and Amaranthaceae, Euphorbiaceae, Fabaceae and Rosaceae 2 species each. On the other hand, the family Alliaceae, Brassicaceae, Celastraceae, Commelinaceae, Cucurbitaceae, Cupressaceae, Hypericaceae, Lauraceae, Malvaceae, Menispermaceae, Musaceae, Myrtaceae, Oleaceae, Plantagiaceae, Podocarpaceae, Polygonaceae, Rhamnaceae, and Rutaceae represented by 1 species each (Appendix 2).

4.1.2. Habits of Medicinal Plants

The habits of medicinal plants collected in the study area show that herbs were the highest number with 40(59.7%), shrubs 15(22.39%), trees 9(13.43%), and climbers 3(4.48%) (Table 2).

Table 2. Habits of Medicinal Plants used in Doyogena Woreda

N_o	Habit	Frequencies	Percent %
1	Climber	3	4.48
2	Herbs	40	59.7
3	Shrubs	15	22.39
4	Trees	9	13.43
Total		67	100

4.1.3. Habitat of Medicinal Plants

As it is shown on the following table out of 67 medicinal plant species the highest number of species were collected from home garden 35(52.24%) followed by wild 21(31.34%) (Table 3).

Table 3. Habitat of medicinal plants used in Doyogena woreda

No	Habitat	Frequencies	Percent %
1	Home garden	35	52.24
2	Wild	21	31.34
3	Agricultural field	11	16.42
Total		67	100

4.1.4. Plant Part(s) Used for Preparation of Remedies

The most frequently used plant part (s) for remedy preparation were leaves 37 (50%) followed by roots 8(10.81%) (Table 4).

Table 4. Plant part(s) used for preparation of remedies

No	Parts used	Frequencies	Percent %
1	Leaves	37	50
2	Root	8	10.81
3	Seed	4	5.41
4	Fruit	3	4.05
5	Fruit and root	1	1.35
6	Bulb	1	1.35
7	Bark	1	1.35
8	Flower	1	1.35
9	Leaf and bark	2	2.7
10	Root and leaf	5	6.76
11	Leaf and fruit	1	1.35
12	Sap	6	8.11
13	Stem	1	1.35
14	Stem and leaf	1	1.35
15	Leaf and bark	1	1.35
16	Leaf stem and bark	1	1.35
Total		74	100

4.1.5. Condition of Preparation of Remedies

In the study area local people prepare remedies for human and livestock ailments in different forms. Such as fresh forms 82.0% and dry form 17.9% (Figure 2).

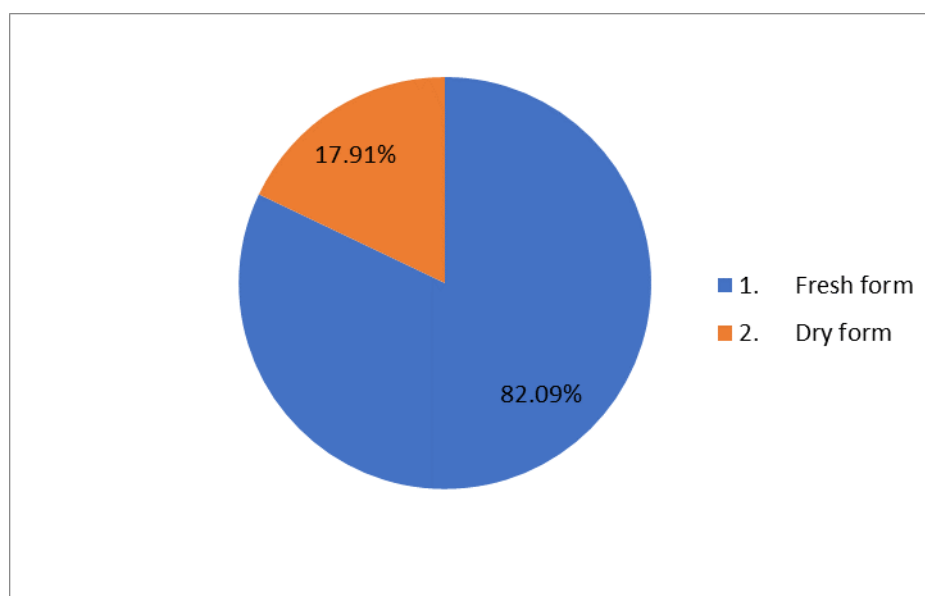


Figure 2. Condition of Preparation of Remedies

4.1.6. Preparation Methods of Medicinal Plants

The local people in the study area use different remedy preparation methods for different types of human and livestock ailments. The major method of preparation was squeezing 17(21.79%), followed by crushing 16(20.51%) and pounding 11(14.10%). The other methods of preparation were powdering, boiling, drying, cooking, crushing and squeezing, pounding and powdering, drying and crushing, powdering and boiling, fumigating, heating, drying and powdering (Table 5).

Table 5. Methods of preparation of remedies in Doyogena woreda

No	Preparation	Frequencies	Percent %
1	Crushing	16	20.51
2	Crushing and Squeezing	3	3.85

3	Boiling	7	8.97
4	Cutting	1	1.28
5	Powdering	4	5.13
6	Pounding and Powdering	1	1.28
7	Pounding	11	14.10
8	Drying and crushing	2	2.56
9	Powdering and boiling	2	2.56
10	Fumigate	1	1.28
11	Drying and powdering	3	3.85
12	Cooking	3	3.85
13	Heating	7	8.97
14	Squeezing	17	21.79
Total		78	100.00

4.1.7. Route of Administration and Dosage of Medicinal Plants

The most widely used route of administration method was oral 48(62.34%), followed by dermal 16(20.78%) (Table 6). Based on the informants' report, dosage have no uniformity, it is based on the age and strength of the patients. The dose given to the patients is estimated using pinch of finger and spoon for powder, size of finger for root, stem bark and leaves, using measurements like glass cup and coffee cup.

Table 6. The route of administration of medicinal plants in Doyogena woreda

N_o	Administration	Frequencies	Percent%
1	Dermal	16	20.78
2	Oral	48	62.34
3	Nasal	3	3.90
4	Dermal/Oral	3	3.90
5	Nasal and Oral	3	3.90
6	Oral and Optical	1	1.30
7	Optical	1	1.30
8	Oral/Dermal/Optical	2	2.60
Total		77	100.00

4.2. Medicinal Plants Used to Treat Human Ailments

4.2.1. Major Human Diseases and Number of Plant Species Used by Indigenous People

The major human ailments in the study area as reported by the informants were 31. The most frequently cited 3 diseases by the informants were abdominal pain, common cold and Tonsillitis. A total of 48 species of medicinal plants were reported to treat only human ailments (Appendix1).

4.2.2. Habits of Medicinal Plants Used to Treat Human Ailments

Concerning habit (growth form) of medicinal plants herbs with 29 species (60.4%) were the highest followed by shrubs with 11 species (22.9%), trees were represented with 6 species (12.5%) and climbers with few species 2 (4.2%) (Figure 3).

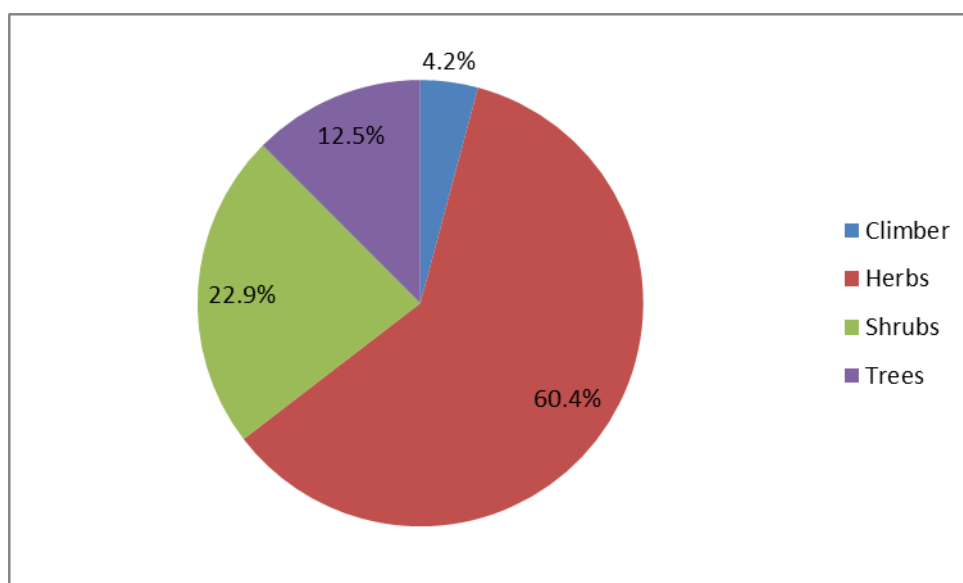


Figure 3. Habits of medicinal plants used for human ailments

4.2.3. Habitat of Medicinal Plants Used to Treat Human Ailments

The highest number of species were gathered from home garden 23(48%) followed by wild 16(33.33%) (Table 7).

Table 7. Habitat of medicinal plants for human ailments

No	Habitat	Frequencies	Percent %
1	Home garden	23	47.92
2	Wild	16	33.33
3	Agricultural field	9	18.75
Total		48	100.00

4.2.4. Parts Used and Mode of Preparation of Medicinal Plants Used to Treat Human Ailments

The most dominantly used plant parts for remedy preparation were leaves 27(56.25%) followed by root and seed 4(8.33%) each (Table 8).

Table 8. Parts of medicinal plants for preparation of remedies for human ailments in Doyogena woreda

No	Parts used	Frequencies	Percent %
1	Leaf	27	56.25
2	Root	4	8.33
3	Seed	4	8.33
4	Bulb	1	2.08
5	Bark	1	2.08
6	Flower	1	2.08
7	Root and leaf	2	4.17
8	Stem	1	2.08
9	Leaf and bark	1	2.08
10	Stem and leaf	1	2.08
11	Leaf, stem and bark	1	2.08
12	Fruit	3	6.25
13	Leaf and fruit	1	2.08
Total		48	100

The local people in the study area used different methods of medicinal plant preparation for different types of human ailments. The major method of remedy preparation was squeezing 11(21.57%), followed by crushing 8 (15.69%) (Table 9).

Table 9. Mode of preparation of medicinal plants for treating human ailment in Doyogena woreda

No	Preparation	Frequencies	Percent %
1	Crushing	8	15.69
2	Crushing and Squeezing	2	3.92
3	Boiling	6	11.76
4	Cutting	1	1.96
5	Powdering	4	7.84
6	Pounding, Powdering	1	1.96
7	Pounding	6	11.76
8	Drying and Fumigate	1	1.96
9	Cooking	2	3.92
10	Squeezing	11	21.57
11	Drying and Powdering	3	5.88
12	Heating	5	9.80
13	Drying and crushing	1	1.96
Total		51	100.00

4.2.5. Route of Administration

The most frequently reported route of administration was oral 25(52.08%) followed by dermal 13(27.08%) (Table10).

Table 10. The route of administration of medicinal plants in Doyogena Woreda

No	Administration	Frequencies	Percent %
1	Dermal	13	27.08
2	Oral	25	52.08
3	Nasal	3	6.25
4	Dermal/Oral	1	2.08
5	Nasal and Oral	2	4.17
6	Oral and Optical	1	2.08
7	Optical	1	2.08
8	Oral/Dermal/Optical	2	4.17
Total		48	100

4.2.6. Application of Medicinal Plants

According to the information given by the informants' medicinal plants in the study area were applied in different forms including, drinking 29 (38.16%), chewing 11(14.47%), creaming 9(11.84%), eating and massaging 6(7.89%) each, washing and sniffing 5(6.58%) each, holding by teeth 3(3.95%), and the least application methods were tying and dropping which accounts 1(1.32%) each (Figure 4).

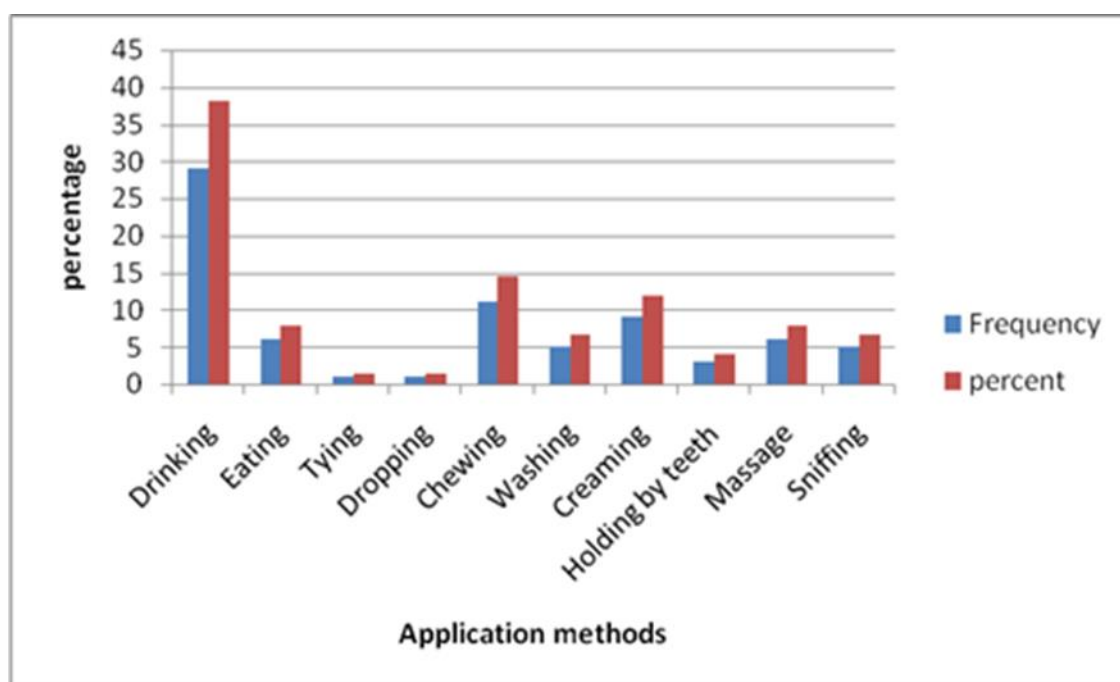


Figure 4. Application Methods of Medicinal Plants for Human Ailments in Doyogena Woreda

4.2.7. Preference Ranking

Preference ranking of thirteen medicinal plants reported for treating Abdominal pain was conducted after selecting 9 informants based on their indigenous knowledge about medicinal plants and asked to ranking and gives the highest number Thirteen (13) for most effective and gives One (1) for the least effective medicinal plants. *Ruta chalepensis* scored first and hence indicated as most effective and *Plantago lanceolata* scored the least (Table 11).

Table 11. Preference ranking of medicinal plants used in Doyogena Woreda to treat abdominal pain

Medicinal Plants	R1	R2	R3	R4	R5	R6	R7	R8	R9	Total	Rank
<i>Ajuga integrifolia</i>	13	10	8	9	10	11	7	8	9	85	3
<i>Allium sativum</i>	10	12	7	10	12	8	11	12	10	92	2
<i>Artemisia absinthium</i>	5	5	3	11	7	6	9	6	1	53	9
<i>Coriandrum sativum</i>	8	11	2	13	11	5	12	9	5	76	5
<i>Cymbopogon citratus</i>	2	8	6	2	6	10	5	5	8	52	10
<i>Justicia scandens</i>	6	4	4	8	5	4	13	7	6	57	7
<i>Ocimum urticifolium</i>	3	7	10	5	1	13	4	4	12	59	6
<i>Paederia pospischilii</i>	1	3	9	6	4	9	2	1	3	38	11
<i>Phaulopsis imbricata</i>	9	1	5	1	3	3	1	3	7	33	12
<i>Plantago lanceolata</i>	7	6	1	3	2	2	3	2	4	30	13
<i>Rumex nepalensis</i>	4	2	11	4	8	1	6	10	11	57	7
<i>Ruta chalepensis</i>	12	13	12	7	13	12	10	13	13	105	1
<i>Thymus schimperi</i>	11	9	13	13	9	7	8	11	2	83	4

4.2.8. Direct Matrix Ranking

The result of direct matrix ranking for multipurpose species of medicinal plants in the study area showed that *Eucalyptus globulus* scored first followed by *Juniperus procera* (Table 12).

Table 12. Direct matrix ranking of seven multipurpose medicinal plant species in Doyogena woreda

(5= best, 4= very good, 3= good, 2= less used, 1= least used, 0= not used)

Use	Medicinal Plant Species							Total	Rank
	<i>Croton macrostachyus</i>	<i>Eucalyptus globulus</i>	<i>Erythrina abyssinica</i>	<i>Juniperus procera</i>	<i>Olea europaea subsp. Cuspidate</i>	<i>Podocarpus falcatus</i>	<i>Prunus africana</i>		
Key informants	R1	R2	R3	R4	R5	R6	R7		
Construction	3	5	1	5	5	5	5	29	2
Furniture	0	5	0	5	5	5	5	25	5
Timber	0	5	0	5	3	5	5	23	6
Fire wood	2	5	5	5	5	3	3	28	3
Charcoal	1	5	3	5	5	3	4	26	4
Fence	3	5	4	4	5	4	5	30	1
Total	9	30	13	29	28	25	27	161	
Rank	7	1	6	2	3	5	4		

4.3. Major Livestock Diseases and Number of Plant Species Used by Indigenous People of Study Area

According to informants report a total of 12 different livestock ailments were identified in the study area. Among this frequently cited by informants were Abdominal swelling, Cold, Cough, Breast swelling and Abortion (Appendix 1). Of the total collected medicinal plants 8 species were reported to treat only livestock ailments and those 12 livestock ailments were reported to be treated by 19 medicinal plants in the area (Appendix 1).

4.3.1. Habit of Medicinal Plants Used to Treat Livestock Ailments

Among the collected medicinal plants from the study area, herbs with 62.5% were dominantly used to treat livestock ailments (Figure 5).

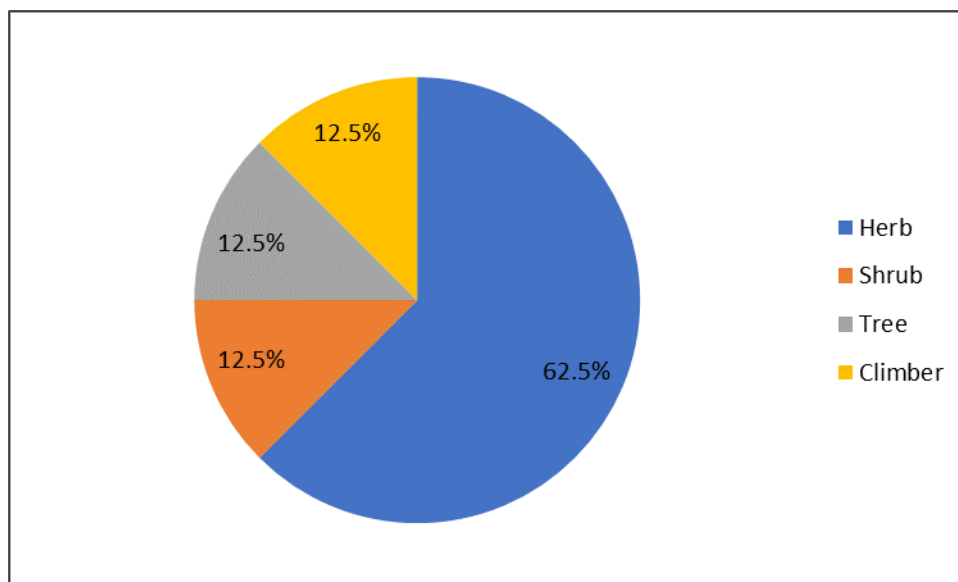


Figure 5. Habit of medicinal plants used in Doyogena Woreda to treat livestock ailments

4.3.2. Habitat of Medicinal Plants Used to Treat Livestock Ailments

Medicinal plants which were used for treatment of livestock ailments were gathered from various sources. Fifty percent of species were gathered from the home garden (Figure 6).

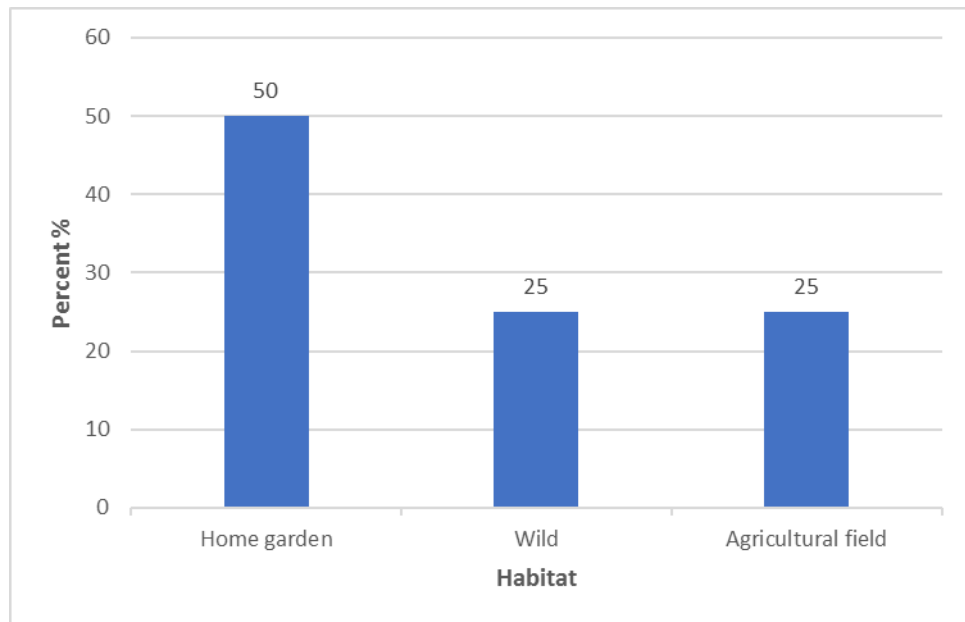


Figure 6. Habitat of medicinal plants used in Doyogena Woreda to treat livestock ailments

4.3.3. Plant Parts Used and Mode of Preparation

Based on the information given by the informants the part of medicinal plants used to remedy preparation for livestock ailments were leaves 63%, leaves and roots 25% and roots 13% (Figure 7).

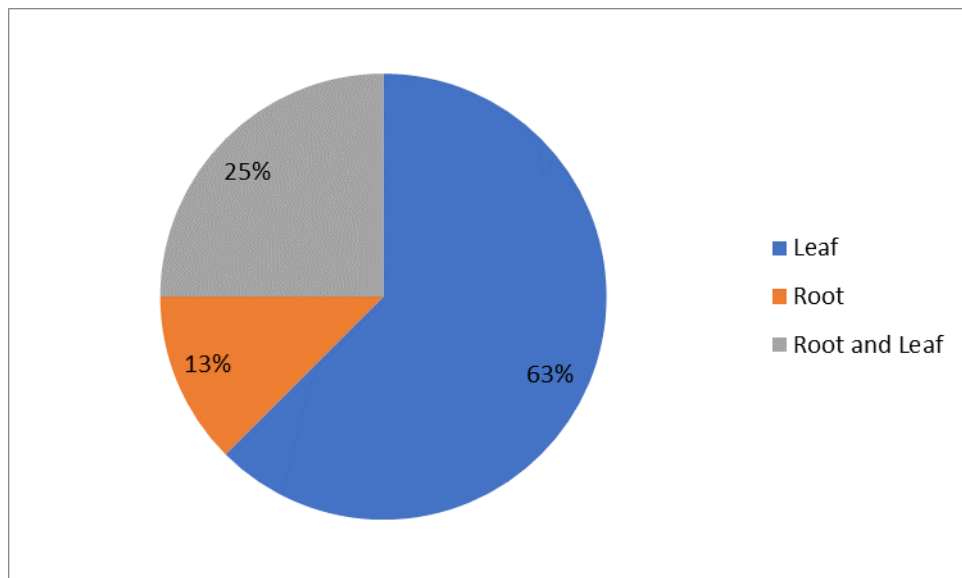


Figure 7. Plant parts used to treat livestock ailments used in Doyogena Woreda

The mode of preparation of these medicinal plants includes crushing 3(37.5%), pounding 2(25%), squeezing, pounding and boiling and drying and crushing 1(12.5%) each (Figure 8).

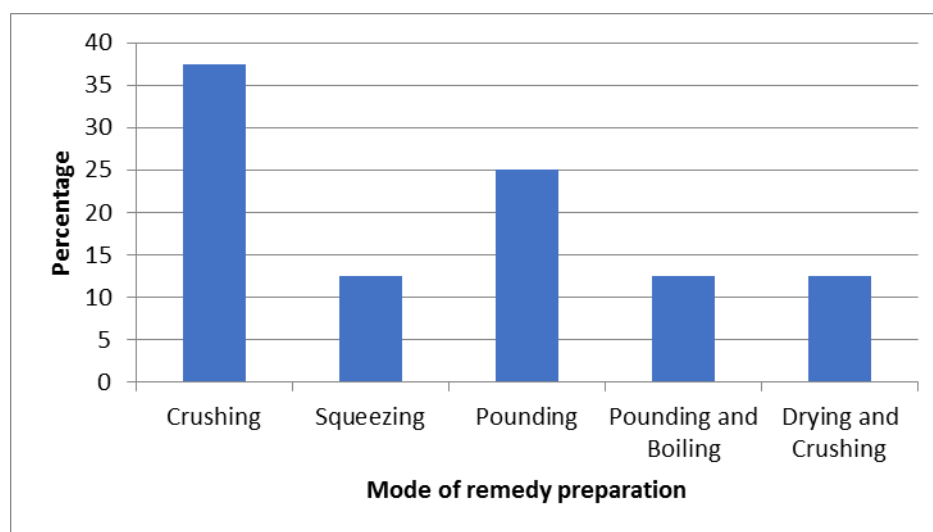


Figure 8. Mode of preparation of medicinal plants used in Doyogena Woreda to treat only livestock ailments

4.3.4. Application and Route of Administration

Oral application was the highest 6(75%) followed by dermal and nasal 1(12.5%) each (Figure 9).

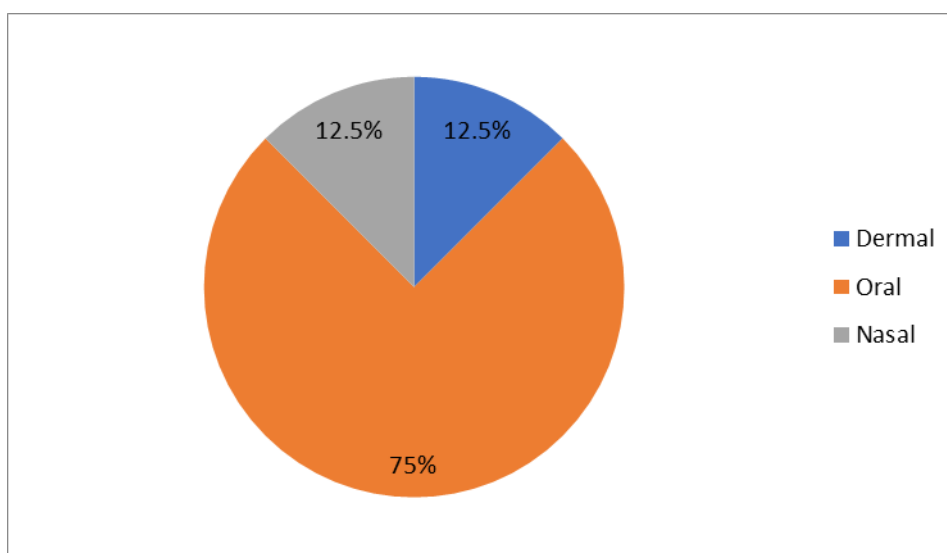


Figure 9. Route of administration of medicinal plants used in Doyogena Woreda for livestock

4.4. Medicinal Plant Species Used to Treat Both Livestock and Human Ailments

A total of 11 species of medicinal plants that belong to 11 genera were reported for the treatment of both human and livestock ailments in the study area. The family Asteraceae was reported by three species followed by Solanaceae with two species. These medicinal plants reported to treat 18 health problems of human and livestock ailments (Appendix 1).

4.4.1. Habit of Medicinal Plants Used to Treat Both Livestock and Human Ailments

This study showed that medicinal plants used to treat livestock and human ailments had different growth forms, herbs were the most commonly represented growth forms 6 (54.55 %) of the collections followed by shrubs 3 (27.27%) (Table 13).

Table 13. Habit of medicinal plants used for treating livestock and human ailments in Doyogena Woreda

No	Habit	Frequency	Percent %
1	Herb	6	54.55
2	Shrub	3	27.27
3	Tree	2	18.18
Total		11	100.00

4.4.2. Habitat of Medicinal Plants Used to Treat Both Livestock and Human Ailments

About 72.73% of the species were collected from home garden whereas 27.27% of the species were obtained from wild (Figure 10).

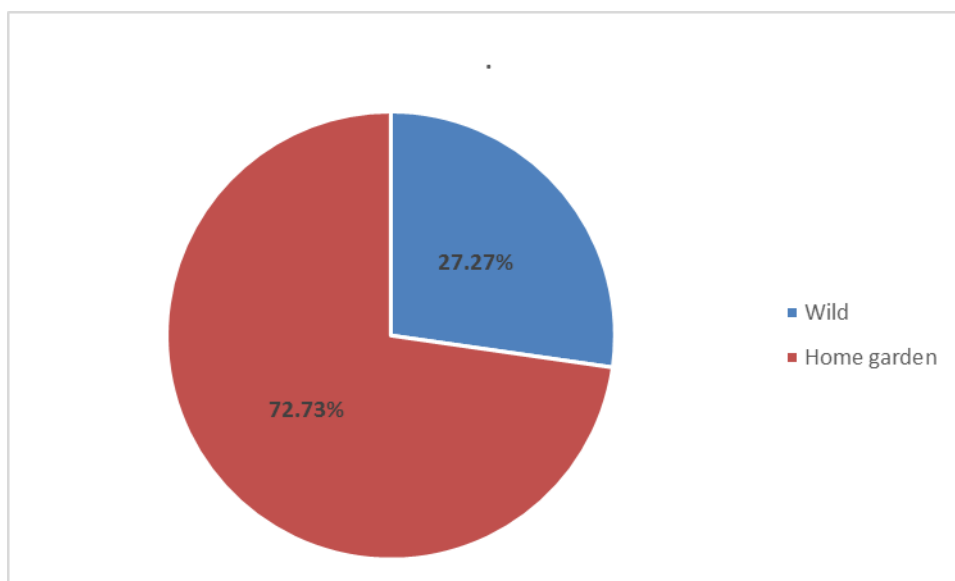


Figure 10. Habitat of medicinal plants used to treat both human and livestock ailments in Doyogena Woreda

4.4.3. Plant Parts Used and Mode of Preparation

The parts of the plants commonly used for remedy preparation for both human and livestock ailments were leaves (45.45%), followed by roots (27.27%) (Table 14).

Table 14. Parts of medicinal plants used for both livestock and human

No	Parts used	Frequencies	Percent %
1	Leaf	5	45.45
2	Root	3	27.27
3	Leaf and root	1	9.09
4	Leaf and bark	1	9.09
5	Fruit and leaf	1	9.09
Total		11	100.00

Local people in the study area use various preparation methods for remedies. The most commonly used methods were crushing, crushing and squeezing, crushing and pounding, boiling, pounding, squeezing, heating and cooking. However, crushing and squeezing (27.78%) each was the highest followed by pounding (16.67%) the third method was heating (11.11%) (Table 15).

Table 15. The preparation methods of remedies for human and livestock

No	Preparation	Frequencies	Percent %
1	Crushing	5	27.78
2	Crushing and squeezing	1	5.56
3	Boiling	1	5.56
4	Pounding	3	16.67
5	Heating	2	11.11
6	Cooking	1	5.56
7	Squeezing	5	27.78
	Total	18	100.00

4.4.4. Application and Route of Administration for Treating both Human and Livestock Ailments

There were different methods of application of medicinal plants in the study area including drinking (27.78%), creaming (22.22%), eating and massaging (16.67%) each and chewing (5.56%) (Table 16).

Table 16. Application of medicinal plants for treating both human and livestock ailments

No	Application Method	Frequency	Percent %
1	Drinking	5	27.78
2	Eating	3	16.67
3	Chewing	2	11.11
4	Washing	1	5.56
5	Creaming	4	22.22
6	Massage	3	16.67
	Total	18	100.00

Each medicinal plants used for human and livestock ailments were applied through different routes of administration including oral, dermal and oral and dermal.

However, oral application (72.73%) was the highest and commonly used route of administration followed by dermal/oral application (18.18%). The least method was dermal (9.09%) (Table17).

Table 17. Route of administration of medicinal plants for both human and livestock ailments

No	Administration	Frequencies	Percent %
1	Dermal	1	9.09
2	Oral	8	72.73
3	Dermal/Oral	2	18.18
Total		11	100.00

4.5. Sources and Transfer of Indigenous Knowledge on Medicinal Plants

4.5.1. Sources of Indigenous Knowledge

The knowledge on medicinal plants in Doyogena Woreda passes to the generation secretly along parents to the family members. Of the total informants, 20 (22.22%) of the informants reported that they gained their knowledge from their grandparents, 35(38.88%) of them gained from their fathers, 17(18.88%) of the informants reported that they gained from their mothers, others 14(14.44%) gained from their eldest brother, the last 5(5.55%) of the informants reported that gained their knowledge by trial and error (Table 18).

Table 18. Source of indigenous knowledge

No	Source of Indigenous knowledge	Frequencies	Percent %
1	Grand parents	20	22.22
2	Fathers	35	38.88
3	Mothers	17	18.88
4	Eldest brother	13	14.44
5	Trial and error	5	5.55
Total		90	100

4.5.2. Transfer of Indigenous Knowledge

The result of interview in the study area showed that mostly traditional knowledge was transferred between family members from parents to children, about 47.78% of the informants reported that indigenous knowledge of medicinal plants was transferred to the elder son through secretly, orally and by observation this means when the healer collected the remedy, he usually took the eldest son where the medicinal plant is found

during this the son could observe. And secondly the knowledge is transferred to trusted daughters 28.89% (Table 19).

Table 19. Way of transferring the knowledge of medicinal plants

No	Knowledge source	Number of informants	Percent %
1	Trusted daughter	26	28.89
2	Eldest son	43	47.78
3	Younger brother	4	4.44
4	Younger son	14	15.56
5	Younger sister	3	3.33
Total		90	100.00

4.6. Marketed Medicinal Plants in the Study Area

The result obtained from Doyogena market showed that most medicinal plants were not sold for medicinal purposes only. The informants reported that medicinal plants were sold for additional purpose like food, flavoring of food and spice. But some like *Ajuga integrifolia*, *Calpurnia aurea* and *Hagenia abyssinica* were sold for medicinal purpose (Appendix 6).

However, the local people prefer either collecting these plants by themselves from the available areas in the woreda to prepare the medicines or they prefer to go directly to the local healers to get treatment instead of buying the medicinal plants from the market.

4.7. Threats and Conservation of Medicinal Plants of the Study Area

4.7.1. Threats to Medicinal Plants

As reported by informants in the study area agricultural expansion was the highest threatening factor for medicinal plants (Table20).

Table 20. Threats and number of respondents who cited the factor

No	Factors	Number of respondents	Percent %
1	Construction	18	20.00
2	Agricultural expansion	35	38.89
3	Over grazing	17	18.89
4	Deforestation	8	8.89
5	Firewood	10	11.11
6	Urbanization	2	2.22
Total		90	100

4.7.2. Conservation of Medicinal Plants

The practice of medicinal plants use in the study area give priority to immediate use of medicinal plants than to sustainable future uses. Some medicinal plants were destroyed during harvesting. However, some practitioners try to conserve few medicinal plants in home garden such as *Ajuga integrifolia*, *Allium sativum*, *Artemisia absinthium*, *Coriandrum sativum*, *Cymbopogon citratus*, *Enset ventricosum*, *Hibiscus macranthus*, *Ocimum urticifolium*, *Ocimum lamiifolium*, *Physalis peruviana*, *Rumex nepalensis*, *Ruta chalepensis* and *Thymus schimperi*.

CHAPTER FIVE

5. DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1. Discussion

5.1.1. Diversity of Medicinal Plant Species Used by People of the Study Area

In the study area a total of 67 medicinal plant species used to treat human and livestock ailments were identified. Those plant species were distributed in 29 Families and 57 genera. Similarly, different studies reported various numbers of medicinal plants in different areas of Ethiopia. For example, Ermias Lulekal et al. (2013), 135 medicinal plants in Ankober District, North Shewa Zone, Amhara Region, Ethiopia, Endalew Amenu (2007), 188 medicinal plants in Ejaji Area, West Shewa, Ethiopia, Genet Shiferaw (2019), 83 medicinal plants in Alelitu Woreda North Shewa, Oromia Region Ethiopia and Alemitu Adane (2018), 62 medicinal plants in Ankesha District, Awi Zone, Amhara Regional State, Ethiopia. These showed that medicinal plants were diversified indifferent study areas of Ethiopia due to different agro ecological zones but there may be variation in terms of availability in those areas. Among the 29 families, the family Asteraceae was found widely distributed family in the study area (12.28%). Similarly, the dominance of the family Asteraceae for the treatment of human and livestock ailments was reported in the work of Alemitu Adane (2018), Seyum Getaneh (2009) and Mirutse Gidey et al., Zemedet Asfaw et al., Zerihun Woldu et al., (2009). This showed that the family Asteraceae was more diversified family of medicinal plants than other families in different areas of the country.

5.1.2. Habit, Habitat and Parts of Medicinal Plants Used for Preparation of Remedies in Doyogena Woreda

Results of the study showed that in the study area herbs 40(59.7%) were the highest proportion growth form of medicinal plants followed by shrubs 15(22.39%). This indicated that herbs were the most widely used medicinal plants in the study area as compared to other life forms. Similar research results were reported in different areas of Ethiopia by Endalew Amenu (2007), in Ejaji Area Chelay Woreda, Genet Shiferaw (2019), in Alelitu Woreda, Fisseha Mesfin, Talemso Seta and Abreham Assefa (2014), in Amaro Woreda, Ethiopia. This indicated that herbs are the most common growth forms of medicinal plants in many areas as compared to other growth forms. There may

be a correlation between growth forms of medicinal plants, seasons, socio-cultural influences, and healing practices of healers in different areas. In contrary, Ermias Lulekal et al., Ensermu Kelbessa, Tamrat Bekele (2008), Getu Alemayehu et al., (2015), Endalew Amenu (2007) reported in their study area, shrubs were the highest proportion followed by herbs. This could be due to wider presence of shrubs in those areas.

Concerning the habitat of those medicinal plants in the study area about 52.24% medicinal plants were obtained from home garden. This result disagrees with that of the studies made by Hailu Atnafu et al., (2018), Genet shiferaw (2019), Haile Yineger et al., (2008), and Ermias Lulekal et al., (2008) who reported that wild areas were primary sources of medicinal plants. This showed that the local people harvest more medicinal plants from home garden than from the wild. This could be related to the practice of cultivation of plants for medicinal purpose or other primary purposes in home garden.

The results of data on plant parts used in the study area indicated that, leaves were the most widely used plant parts in preparation of remedies. Similar ethnobotanical studies reported for different parts of Ethiopia by Behailu Bizuayehu and Temesgen Assefa (2017), Tigist Wondimu et al., (2007), Eshetu Girma (2017), Endalew Amenu (2007) and Abebe Ayele (2017), have also showed that leaves were the most commonly used parts. Comparatively to the collection of underground parts such as roots and stems, collecting leaves does not present a great threat to plant life. It has been proved that tree species do not suffer significantly from removal of up to 50% of their leaves (Paffenberger et al., 1992). In contrary other findings by Ermias Lulekal et al., (2013), Meaza Giday et al., (2015), Assegid Asefa and Tesfaye Abebe (2014) reported different result showing that root was the most frequently used plant part followed by the leaves in their respective research site. This might be related to the attitude of practitioners to use root than other parts. Getu Alemayehu et al., (2015) reported, the plant whose roots harvested for medicinal value have less sustainability unless conservation methods have been taken.

5.1.3. Dosage, Condition of Preparation and Route of Administration of Medicinal Plants

As per the information from the informants the dose of remedies from medicinal plants has no standard measurement. Traditional healers gave the medicine based on age and physical strength of the patients. The amount given to patients is also estimated by using pinch of finger and spoon for powder, size of finger for root, glass, cup, can (tassa), for liquid form. Similar findings were reported by Mulugeta Kuma (2014), Mengistu Geberehewot (2010) and Ermias Lulekal et al., (2013) stating that there are no standard measurements for dosage of remedies from plants in their study area. This indicated that, there is no common dose of medicinal plants in most herbal medicine system. It was noted that additives like milk, coffee and beso were also used for reducing certain adverse effect of medicinal plants.

Results of the study showed that the majority of preparation of remedies of medicinal plants in the study area was in fresh form (82.0%) followed by dry form (17.9%). This study agrees with Ermias Lulekal et al., (2013), Haile Yinger et al., (2008), Menigistu Gebrehiwot (2010) and Eskedar Abebe (2011), who reported that in their study area the fresh form of medicinal plants were most common. This shows that fresh form of preparation of medicinal plants were most effective for treatment of different human and livestock ailments than dry forms. Also, this could be related to immediate preparation of remedies than dry form.

Results of the study showed that among preparation and application methods of medicinal plants in the study area, the most commonly reported preparation was squeezing, followed by crushing. In contrast to this study Yemane Tilahun (2018), Genet Shiferaw (2019) and Genet Chekole (2017) showed that crushing was the most common remedy preparation method. This might be due to the fact that the practitioners believed that crushed medicinal plant parts gives immediate response for their health problems. However, Ermias Lulekal et al., (2008), reported that powdering and crushing were the most widely used methods of preparation. This indicated that methods of remedy preparation were not common in different areas of the country.

The result of this study showed that oral application was the most commonly reported method of application of remedies in the study area followed by dermal. Similar findings were reported by many other researchers such as Eshetu Girma (2011), Bishaw

Baye (2016), Mulugeta Kibebew (2016), Fisseha Mesifin (2009), Endalew Amenu (2007), Genet Shiferaw (2019), Alemitu Adane (2018) and Zewdie Kassa, Zemedu Asfaw and Sebsebe Demissew (2020). This indicated that local people in different study areas use oral application of medicinal plants as the most common mode of application. This could be related to rapid physiological reaction of medicinal plants when taken orally.

5.1.4. Major Human and Livestock Diseases and Corresponding Medicinal Plants Used to Treat

Results in the study area showed that there are about 31 types of human ailments in the woreda. The local people utilized 48 species of medicinal plants for human and 11 species for both human and livestock ailments. It could be noted that a single medicinal plant species can treat single ailment, similarly one ailment may have treated by single species or more than two species of medicinal plants. For instance, abdominal pain was treated by 13 species of medicinal plants followed by common cold treated by 7 species of medicinal plants. Similar finding was reported by Endalew Amenu (2007) in that a single ailment treated by more than two species. This showed that the local people have alternatives to use various medicinal plants to treat their health problems.

The study showed that in the study area a single species of medicinal plant was used to treat a number of human ailments. For example, *Ruta chalepensis* was reported to treat five types of human ailments (common cold, febrile illness, abdominal pain, headache and cold) and *Ocimum lamiifolium* treat four types of human ailments (febrile illness, eye disease, toothache and skin rash). This result showed that local people used the single species of medicinal plants to treat various human health problems. Similar finding by Mulugeta Kibebew (2016) reported (60.2%) of medicinal plant and Asegid Assefa (2014) reported (56%) of medicinal plants were used for human ailments in their respective study areas. This indicated that some medicinal plants have wide spectrum roles in a community.

5.1.5. Preference Ranking and Direct Matrix Ranking

The result of preference ranking showed that *Ruta chalepensis* was the most preferred medicinal plant to treat abdominal pain followed by *Allium sativum* and *Plantago lanceolata*. This study disagrees with Alemitu Adane (2018) which reported that *Zingiber officinale* was the most preferred species to treat abdominal pain in her study

area. This could be related to the popularity by local people and accessibility of these medicinal plants in the area. The result of direct matrix ranking in this study area showed that seven medicinal plant species were threatened species due to harvesting for their use other than medicinal value and this was the cause of depletion of those species in the area. Therefore, those species need more conservation attention in Doyogena Woreda. In contrary the finding of the study by Alemitu Adane (2018) reported that six species were most threatened species in her study area. Also, other study by Fisseha Mesfin et al., (2009) reported that five plant species were most threatened species due to over harvestings for their uses other than their medicinal purposes thus calling for more focus of conservation.

5.1.6. Major Livestock Diseases and Medicinal Plants Used by Indigenous People of Doyogena Woreda

As the information collected from the study area 12 livestock health problems were recorded during the interview and according to the informants the most common livestock health problems were Abdominal pain followed by Cold, Cough and Breast swelling. The study showed that the family Asteraceae was the most dominant family from all collected medicinal plants in the area. Similarly, Tigist Wondimu et al., (2007) reported that the family Asteraceae was commonly used to treat both human and livestock ailments in Dheeraa town Arsi Zone. This indicated that family Asteraceae showed dominancy in various areas of the country.

The study showed that some livestock ailments were found to be treated by more than one species of medicinal plants. For example, abdominal pain was treated by six different species (*Artemisia absinthium*, *Cymbopogon citratus*, *Daucus carota*, *Podocarpus falcatus*, *Solanecio gigas* and *Stephania abyssinica*) and cold treated by four species namely *Calpurnia aurea*, *Physalis peruviana*, *Solanecio gigas* and *Solanum schimperianum*. This showed that one livestock ailment was able to be treated by more than one plant species in the area. Similar finding was reported by Mulugeta Kuma (2014) and Mengistu Gebrehiwot (2010) who have indicated that a single ailment could be treated by more than two medicinal plants.

5.1.7. Marketed Medicinal Plants in Doyogena Woreda

The study conducted in Doyogena market showed that medicinal plants were not widely traded for medicinal purposes, but mostly for other purposes. Medicinal plants such as

Ajuga integrifolia, *Calpurnia aurea* and *Hagenia abyssinica* were sold for medicinal purposes only. Limited presence of medicinal plants in the market could relate to the notion that selling of medicinal plants may increase the accessibility of the plants and hence may decrease acceptance of the healers by the society (Alemitu Adane, 2018). Some more medicinal plants for example, *Allium sativum*, *Artemisia absinthium* and *Coriandrum sativum* were reported for marketability for other purposes like spices and flavoring. Similar reports were noted from other areas in Ethiopia (Endalew Amenu, 2007)

5.1.8. Traditional Medicinal Plants and Indigenous Knowledge Transfer in the Study Area

The results on the information gathered in this study on the informant's age categories showed that more indigenous knowledge was held among elderly people. Most of the time parents use traditional medicinal plants more than the younger generation. This can be related to their age old knowledge on the plants. And because of the expansion of modern education in the area mostly medicinal plants were not used by younger generations. Oral based indigenous knowledge transfer on medicinal plants was practiced in the study area without written documents to family members especially to elder son. Similar findings by Mengistu Gebrehiwot (2010), Ermias Lulekal et al., (2013) reported that indigenous knowledge of medicinal plants is transferred orally to the new generation. This indicated that there is no structured way of knowledge transfer in different parts of the country. This may also partly relate to the secrecy of indigenous knowledge held by the practitioners and the lack of knowledge about the importance of documentation of indigenous knowledge (Ermias Lulekal et. al., 2013).

5.1.9. Threats to and Conservation of Medicinal Plants and Indigenous Knowledge in the Study Area

The results showed that, the accessibility of medicinal plants in the study area is less when compared with the past decade. Agricultural expansion, construction, overgrazing, deforestation, firewood and urbanization were the most threatening factors in the study area. Agricultural expansion was the most threat factor in the study area. Similar findings were reported by Genet Shiferaw (2019), Alemitu Adane (2018) and Getnet Chekol (2011). This could be related to the interest of people to use land for

crop production giving less emphasis on maintaining an area for conservation in different corners of the country.

The depletion of medicinal plants is linked with the loss of indigenous knowledge associated with the plant. The results of study showed that modernization and availability of modern medication has also contributed to the loss of indigenous knowledge linked with medicinal plants. Similar findings by Genet Shiferaw (2019) and Mulugeta Kuma (2014) reported that the knowledge of medicinal plants loss caused by modernization and availability of modern medicine. This indicated that modernization could have negative impact on ethnobotanical knowledge unless handled with care.

Generally, this study showed that Doyogena woreda is rich in medicinal plants diversity, however the conservation efforts was very poor. As reported by informants during discussion and interview people give little attention for conservation. It was noted that only some informants conserved few medicinal plants by cultivating at home garden. For example, in the study area 35(52.24%) of medicinal plants were cultivated in home garden and 21(31.34%) observed in its natural habitat. similar findings were reported by Mulugeta Kibebew (2016), Fisseha Mesfin et al., (2009). However, during discussion with the key informants some traditional practitioners do not have interest to cultivate medicinal plants at home garden. This could relate to the intention for keeping secrecy of even the medicinal plant types by the knowledge holders. Similar findings were reported by Mulugeta Kibebew (2016) who reported that some healers have no interest to cultivate medicinal plants at home garden.

5.2. Conclusion

The present study showed that 67 medicinal plants distributed in 57 genera and 29 families are used in the study area. About 48 species were reported to treat human ailments, 8 species were documented to treat livestock ailments and 11 species were reported to treat both human and livestock ailments.

The majority of medicinal plant species were obtained from home gardens 35(52.24%), followed by wild 21(31.34%) and agricultural field 11(16.42%). Most of the remedies were prepared in fresh form (82%) followed by dry form (17.9%). In the present study most of the remedies were herbs 40(59.70%) followed by shrubs 15(22.39%), trees

9(13.43%) and climbers 3(4.48%). Leaves were used for medicinal purposes more than other plant parts for preparation of human and livestock remedies. Most of the medicinal plants were administered in oral route 48(62.34%) followed by dermal 16(20.78%).

The study revealed that there is a high diversity of the medicinal plant species in the study area and the culture of the people in using medicinal plants to treat both human and livestock diseases is strong. But the practice of transferring the indigenous knowledge to the younger generation is not well-structured and transparent as well. Therefore, awareness creation campaigns are timely needed to improve local community's knowledge on the importance and management of medicinal plants and awareness raising should be made among the healers so as to avoid erosion of the indigenous knowledge and to ensure its sustainable use.

5.3. Recommendation

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

- The woreda Agricultural office should create awareness to the local community on how to conserve and manage medicinal plants.
- The people in the study area as well as traditional healers should give priority for conservation of threatened species of medicinal plants.
- The Local Government should create awareness to the local society in cultivation of medicinal plants particularly in their home garden.
- The Government and concerned health institution should facilitate trainings to traditional healers to help the community use these medicinal plants in a more evidence based and scientific manner.
- Higher institutions should continue research on the use, conservation and preparation of herbal medications and enhancement of indigenous knowledge.
- In Doyogena school, particularly in the Biology Department teachers should give emphasis about medicinal plants and teach their students about how to utilize and conserve medicinal plants and facilitate practical attachment for students to pave the way for further advancement of herbal medication and research in the area.
- The traditional healers should give priority for conservation of threatened species of medicinal plants.

- The Local Government should encourage the local herbal medicine practitioners to enhance the use of traditional medicine through licensing and other incentives.
- The local agricultural sector should give due attention to threaten species of indigenous medicinal plants and encourage the local community in planting those threaten species of medicinal plants.
- *Calpurnia aurea*, *Prunus africana*, *Podocarpus falcatus*, *Juniperus procera* and *Olea europaea* need prior attention so the local Government should create awareness to the local people to cultivate and conserve these plants.
- To give more support to the finding of this research, further scientific investigations are needed for *Ruta chalepensis*, *Allium sativum*, *Plantago lanceolata* and *Enset ventricosum* to extract active contents and run phytomedicinal research.

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APPENDICES

Appendix 1. List of Medicinal Plant Species, Family Name and Local Name of the Species, Parts Used, Habit, Habitat, Disease Treated, Mode of Preparation and Route of Administration for Human and Livestock Ailments in Doyogena Woreda.

Scientific name	Local name	Family name	Part used	Habit	Habitat	Disease treated	Mode of preparation	Route of administration	Human or live stock	Coll. No. TK+
<i>Acanthus eminens</i> C.B. Clarke	Chocha	Acanthaceae	Leaves	Herb	Wild	Skin rush	Leaves are dried and powdered then mix with butter or oil then cream on the affected area	Dermal	Human	31
<i>Achyranthes aspera</i> L.		Amaranthaceae	Leaves	Herb	Wild	Skin rush	Leaves are crushed and the sap is applied	Dermal	Human	35
<i>Acmella caulirhiza</i> Del.	Mondele	Asteraceae	Root	Herb	Wild	Diarrhea	Roots are chewed	Oral	Human	69

<i>Ajuga integrifolia</i> Buch.Ham.ex, D.Don	Anamurcho	Lamiaceae	Leaves and roots	Herb	Home garden	Ascariasis	Leaves are squeezed and mixed with coffee and drink	Oral	Human	42
						Stomach ache	Root crushed and mix with coffee or milk and drink	Oral		
<i>Ajuga leucantha</i> Lukhoba		Lamiaceae	Leaves and Root	Herb	Home garden	Anthrax	Crash the fresh root and leaves and mix with water and drink	Oral	Livestock	54
<i>Allium sativum</i> L.	Wegutuma	Alliaceae	Bulb	Herb	Home garden	Stomach ache	Bulb chewed and swallowed	Oral	Human	72
						Common cold	Bulb boiled with milk and drink	Oral		

						Eye problem	Bulb squeezed and creamed on the eye	Optical		
<i>Amaranthus caudatus</i> L.		Amaranthaceae	Leaves	Herb	Wild	Diarrhea	Leaves are pounded and boiled with powdered <i>Allium sativum</i> and give to cattle	Oral	Live stock	20
<i>Artemisia absinthium</i> L.	Natra	Asteraceae	Leaves	Herb	Home garden	Hypertensi on	Leaves are boiled with coffee and Drink	Oral	Human	33
						Diabetes				
						Abdominal pain	Leaves are boiled with coffee and Drink	Oral	Live stock	
						Tonsillitis	Leaves chewed	Oral	Human	

<i>Artemisia afra</i> (Jacq ex willd)	Agufa	Asteraceae	Leaves	Herb	Home garden	Stomach ache	Leaves dried and powdered and mixed with coffee and drink	Oral	Human	52
						Diarrhea				
<i>Arundinaria alpina</i> K.Schum.	Kerkeha	Poaceae	Stem	Herb	Agricultural field	Tooth ache	Stem heated with fire and hold it by teeth	Tooth surface	Human	29
<i>Asperula arvensis</i>	Haro	Rubiaceae	Stem and Leaves	Herb	Agricultural field	Mich (Febrile illness)	Crushed and creamed	Dermal	Human	41
<i>Asystasia gangetica</i> (L.) T. Anders	Kecheba	Acanthaceae	Leaf	Herb	Agricultural field	Asthmatic	squeezing	Nasal	Human	35
<i>Brassica carinata</i> A.Br.	Hamilo	Brassicaceae	Leaf	Herb	Home garden	Abdominal pain	Leaves are cooked with butter and eaten with kocho	Oral	Human	6

<i>Calpurnia aurea</i> (Ait.)Benth	Senecho	Fabaceae	Leaf and Root	Shrub	Wild	Cattle Cold and Ring worm	Leaves are dried, crushed and mixed with water and wash	Dermal	Live stock	46
<i>Carduus schimperi</i> Sch.Bip.	Chua	Asteraceae	Root	Herb	Wild	Mich (Febrile illness)	Pound the root and the powder is mixed with food and eat	Oral	Human	26
<i>Catha edulis</i> (Vahl) Forssk. ex Endl.	Chat	Celastraceae	Leaf	Shrub	Home garden	Tonsillitis	Leaves are chewed and the sap is swallowed	Oral	Human	70
<i>Clematis hirsuta</i> Per.& Guill		Cucurbitaceae	Leaf, Stem and Bark	Climb er	Wild	Tumor/ Cancer	Crushed and apply	Dermal	Human	22
<i>Commelina</i> <i>benghalensis</i> L.	Laluncha	Commelinaceae	Root	Herb	Home garden	Ring worm	Fresh roots are powdered and	Oral	Human	71

							the sap is applied			
			Leaf			Mich	Leaves are squeezed and the sap is applied	Oral	Livestock	
						Cattle abortion				
<i>Coriandrum sativum</i> L.	Wedmano	Apiaceae	Seed	Herb	Home garden	Abdominal pain	The seed is chewed and swallowed or powdered and mixed with water and drink	Oral	Human	
<i>Crepis rueppellii</i> Sch.Bip.	Wchbe	Asteraceae	Root	Herb	Wild	Tonsillitis	Ponding the root and drink	Oral	Human	21
<i>Croton macrostachyus</i> Del.	Mesena	Euphorbiaceae	Leaf and Bark	Tree	Wild	Breast swelling	The leaves are heated and hold it on the swelling place	Dermal	Human	30
						Snake bite				

						Skin wart	Leaves are squeezed and creamed on the infected place		Livestock	
						Urine problem	Crushed and drink it with	Oral		
						Cattle cold	water Crushed and drink it with water	Oral		
<i>Cymbopogon citratus</i> (Dc.) Stapf	Hiticho	Poaceae	Root	Herb	Home garden	Abdominal pain	Roots are crushed and drink it by mixing it with water	Oral	Human and Live stock	36
						Abortion				
						Cattle cold				
<i>Datura stramonium</i> L.	Mechareka	Solanaceae	Leaf	Shrub	Wild	Rabies	Pound the leaf and cream it on the infected area	Dermal	Human	57

<i>Daucus carota</i> L.		Apiaceae	Leaf	Herb	Home garden	Cattle abdominal pain	Leaves crushed and mixed with water for drink	Oral	Live stock	50
<i>Discopodium penninervium</i> Hochst.	Chochnga	Solanaceae	Leaf	Shrub	Home garden	Rush	Fresh Leaves are crushed and mixed with warm water and wash	Dermal	Human	60
<i>Ensete ventricosum</i> (Welw.) Cheesman	Gishra	Musaceae	Root	Herb	Home garden	Human wound	For human the root is cooked and eaten with butter	Oral	Human	5
						Cattle wound	Raw root is given	Oral	Livestock	
<i>Erythrina abyssinica</i> Lam.ex Dc.	Welecho	Fabaceae	Leaf	Tree	Home garden	Tonsillitis	Leaves are chewed	Oral	Human	2
						Tinea versicolor	Leaves dried and crushed then mixed with	Dermal		

							butter and creamed it on the affected area			
<i>Eucalyptus globulus</i> Labill.	Nech bahr zaf	Myrtaceae	Leaf	Tree	Farm land	Common cold	Leaves boil and breath in the stem	Nasal	Human	1
						Head ache	Leaves squeezed and put it in the nose			
						Bleeding Nose				
<i>Foeniculum vulgare</i> Miller	Welenga	Apiaceae	Leaf and Root	Herb	Home garden	Diabetes	Leaves chewed and swallowed	Oral	Human	13
						Hypertensi on				
						Diarrhea				
						Kidney disease	Root crushed and drink with water	Oral		
						Cattle cough	Leaves crushed and mixed with water and drink	Oral	Livesto ck	

<i>Hagenia abyssinica</i> (Bruce) J.F. Gmel.	Tencho	Rosaceae	Flower	Tree	Wild	Tape worm	Flower pounded and drink with water	Oral	Human	44
						Eye problem	Flower is pounded and mixed with butter and creamed on eye surrounding	Optical		
<i>Hibiscus macranthus</i> Hochst. Ex A.Rich.	Hable	Malvaceae	Seed	Herb	Home garden	Mich	Seed boiled with water and drink	Oral	Human	25
						Common cold	Seed powdered and mixed with genfo and eaten			
						Liver disease	Small amount is mixed with butter and drink			

<i>Hordeum vulgare</i> L.	Soa	Poaceae	Seed	Herb	Home garden	Stomach ache	Seed powdered and mixed with water and drink	Oral	Human	11
<i>Hypericum quartinianum</i> A.Rich		Hypericaceae	Leaf	Herb	Wild	Tooth ache	Chewing the leaf	Oral	Human	38
<i>Juniperus procera</i> Hochst.ex Endl.	Yeabeshatid	Cupressaceae	Leaf	Tree	Wild	Tonsillitis	Chewed	Oral	Human	64
						Evel eye	Leaves are squeezed together with <i>Vernonia yabelloana</i> and <i>Phaulopsis imbricate</i> and mixed with water and drink			
<i>Justicia fiava</i> (Vahl)Vahl	Zemizemu	Acanthaceae	Leaf	Herb	Wild	Common cold	Leaf squeezed and smelled	Nasal	Human	39

<i>Justicia scandens</i> Vahl		Acanthaceae	Leaf	Herb	Agricu ltural field	Abdominal pain	Leaves dried, powdered and mixed with water and drink	Oral	Human	35
<i>Justicia schimperina</i> (Hochst. ex Nees) T. Anders.	Gulbana	Acanthaceae	Leaf and Root	Shrub	Agricu ltural field	Skin rush	Leaves crushed and mix with warm water and wash	Dermal	Human	55
						Cold	Leaves are warmed with fire and put it on the cold part			
<i>Leucas martinicensis</i> (Jacq.) R. Br.	Mumame	Lamiaceae	Leaf	Herb	Home garden	Livestock Common cold	Pounding the leaf and mixing it with water drink	Oral	Livesto ck	15
<i>Nicotiana tabacum</i> L.	Kosho	Solanaceae	Leaf	Herb		Abdominal pain	Chewing and swallowing	Oral	Livesto ck	27

					Agricu ltural field	Common cold	Chewing and put in the nose	Nasal		
<i>Ocimum lamiifolium</i> Hochst. ex. Benth.	Micha	Lamiaceae	Leaf	Shrub	Home garden	Mich and Tooth ache	Leaves squeezed and drink with coffee	Oral	Human	7
						Eye problem	Leaves squeezed and hold on the eye	Optical		
						Skin rush	Leaves Squeezed and message	Dermal		
<i>Ocimum urticifolium</i> Roth	Besobila	Lamiaceae	Leaf	Herb	Home garden	Abdominal pain	Pounding and drinking	Oral	Human	51
<i>Olea europaea</i> <i>L.subsp. cuspidata</i> (Wall. ExG.Don)	Weyra	Oleaceae	Leaf	Tree	Home garden	Tooth ache	Warm with fire and hold	Tooth surface	Human	68

<i>Paederia pospischilii</i> K.Schum		Rubiaceae	Leaf	Climber	Wild	Abdominal pain and Diarrhea	Squeezed and drink the sap	Oral	Human	23
<i>Persea americana</i> Mill.	Avocado	Lauraceae	Fruit	Tree	Home garden	Dandruff	Cream the fruit on scalp	Dermal	Human	73
<i>Phaulopsis imbricata</i> (Forssk.) Sweet.	Okoticho	Acanthaceae	Leaf	Herb	Agricultural field	Abdominal pain	Boiling the leaf and drinking	Oral	Human	54
<i>Physalis peruviana</i> L.	Date	Solanaceae	Fruit and Root	Herb	Home garden	Tonsillitis	Eating the fruit	Oral	Human	37
						Cattle cold	Pounding the root and mixing with water and drink	Oral	Livestock	
<i>Plantago lanceolata</i> L.	Duko	Plantagiaceae	Leaf	Herb	Wild	Abdominal pain	Squeezing and chewing	Oral	Human	16
<i>Podocarpus falcatus</i> (Thunb.) R.B.ex Mirb.	Zegisho	Podocarpaceae	Leaf	Tree	Home garden	Abdominal pain	Leaves are powdered and drink	Oral	Livestock	32

<i>Pruns africana</i> (Hook.f.) Kalkm.	Gerba	Rosaceae	Bark	Tree	Wild	Tooth ache	Cutting the bark and hold it with tooth	Tooth surface	Human	62
<i>Psychotria orophila</i> Petit.	Dukicho	Rubiaceae	Leaf	Shrub	Wild	Leg pain	Heat the leaf and hold it on the leg	Dermal	Human	43
<i>Pycnostachys</i> <i>abyssinica</i> Fresen.	Tontona	Lamiaceae	Leaf	Herb	Home garden	Eye problem	Fresh leaves are crushed and the sap is applied	Optical	Human	28
<i>Rhamus prinoides</i> L'Herit.	Gesha	Rhamnaceae	Fruit	Shrub	Home garden	Skin disease	Pounding the fruit and mixed it with lemon and cream it for 15 days	Dermal	Human	3
<i>Ricinus communis</i> L.	Chena	Euphorbiaceae	Fruit	Shrub	Agricu ltural field	Skin rush	Mix it with warm water and wash	Dermal	Human	59
<i>Rosmarinus</i> <i>officinalis</i> L.	Rosemeri	Lamiaceae	Leaf	Herb	Home garden	Hypertensi on	Pounding the leaf and drink	Oral	Human	34

							with areke (etanol)			
<i>Rumex nepalensis</i> spreng.	Goicho	Polygonaceae	Leaf and Bark	Herb	Home garden	Abdominal pain	The leaves are crushed, squeezed and drink	Oral	Human	10
						Tonsillitis				
						Hemorrhoi d	Fresh bark is crushed and squeezed and the sap is applied	Dermal		
						Joint pain				
<i>Ruta chalepensis</i> L.	Telecho	Rutaceae	Leaf and Fruit	Herb	Home garden	Common cold	The fruit together with coffee powder boiled and drink	Oral	Human	17
						Mich				
						Abdominal pain	Fruit chewed and swallowed	Oral		

						Head ache	Leaf smelled and put in the nose	Nasal		
<i>Solanecio gigas</i> (vatke.) c. Jeffrey	Arbaba	Asteraceae	Leaf	Shrub	Wild	Cattle cold	Crushed and drink	Oral	Human and Livestock	40
						Horse abdominal pain				
						Leg ache	Warm the leaves and put on the area of pain	Dermal		
						Swelling for both Human and Livestock	Warm the leaves and message			
<i>Solanum giganteum</i> Jacq.	Fugimelata	Solanaceae	Leaf	Shrub	Wild	Abdominal swelling	Chewing and swallowing the juice	Oral	Human	9
	Ziza	Solanaceae	Leaf	Shrub		Cold		Dermal		65

<i>Solanum schimperianum</i> Hochsh st. ex A. Rich.					Home garden	Breast swelling for both human and livestock	Mix with water and wash		Human and Livestock	
<i>Solanum tuberosum</i> L.	Dnich	Solanaceae	Root	Herb	Home garden	Kidney disease	Cooking it and eating	Oral	Human	18
<i>Spilanthes costata</i> Benth.	Bisbisha	Asteraceae	Leaf	Herb	Agricultural field	Tonsillitis	Leaves are chewed and swallowed	Oral	Human	41
						Evil eye	Squeezed and smelling	Nasal		
<i>Stephania abyssinica</i> (Dillon, and A. Rich.) Walp.	Werezebu	Menispermaceae	Root	Climber	Agricultural field	Horse abdominal pain	The root crushed and drink	Oral	Livestock	50
<i>Thymus schimperi</i> Ronniger	Zazancho	Lamiaceae	Leaf	Herb	Home garden	Abdominal pain	Crushed and drink	Oral	Human	47
						Cough	Boil and drink	Oral		

						Hypertensi on				
<i>Vernonia filigera</i> Olivi and Hiern	Reja	Asteraceae	Leaf	Shrub	Home garden	Wound	Squeeze and drop the sap on the wound	Dermal	Human	63
<i>Vernonia amygdalina</i> Del.	Hebicho	Asteraceae	Leaf	Shrub	Home garden	Intestinal worm	Crushed, squeezed and drink by coffee cup	Oral	Human	24
						Tumor				
						Clotting blood for cattle	Eating the leaves	Oral	Livesto ck	
<i>Vernonia auriculifera</i> Hiern	Barewa	Asteraceae	Leaf	Shrub	Home garden	Wound	Fresh leaves are pounded and the sap is applied	Dermal	Human	19
						Skin rash	Mix the leaves with warm water and wash			

<i>Vernonia yabelloana</i> Mesfin	Sema	Asteraceae	Seed	Herb	Wild	Inflammation of larynx	Seed is chewed and swallowed	Oral	Human	53
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**Appendix 2. List and percentage of Families, Genera and Species of Medicinal
Plants in Doyogena Woreda**

Family name	Number of genera	Percent %	Number of species	Percent%
Acanthaceae	4	7.02	6	8.96
Alliaceae	1	1.75	1	1.49
Amaranthaceae	2	3.51	2	2.99
Apiaceae	3	5.26	3	4.48
Asteraceae	7	12.28	11	16.42
Brassicaceae	1	1.75	1	1.49
Celastraceae	1	1.75	1	1.49
Commelinaceae	1	1.75	1	1.49
Cucurbitaceae	1	1.75	1	1.49
Cupressaceae	1	1.75	1	1.49
Euphorbiaceae	2	3.51	2	2.99
Fabaceae	2	3.51	2	2.99
Hypericiaceae	1	1.75	1	1.49
Lamiaceae	6	10.53	8	11.94
Lauraceae	1	1.75	1	1.49
Malvaceae	1	1.75	1	1.49
Menispermaceae	1	1.75	1	1.49
Musaceae	1	1.75	1	1.49

Myrtaceae	1	1.75	1	1.49
Oleaceae	1	1.75	1	1.49
Plantagiaceae	1	1.75	1	1.49
Poaceae	3	5.26	3	4.48
Podocarpaceae	1	1.75	1	1.49
Polygonaceae	1	1.75	1	1.49
Rhamnaceae	1	1.75	1	1.49
Rosaceae	2	3.51	2	2.99
Rubiaceae	3	5.26	3	4.48
Rutaceae	1	1.75	1	1.49
Solanaceae	5	8.77	7	10.45
Total	57	100.00	67	100.00

Appendix 3. List of Multipurpose Uses of Medicinal Plants other than Medicinal Value

No	Scientific names	Local name	Family name	Habit	Habitat	Uses other than medicinal
1.	<i>Allium sativum</i>	Wegutu ma	Alliaceae	Herb	Home garden	Spice
2.	<i>Artemisia absinthium</i>	Natra	Asteraceae	Herb	Home garden	Spice
3.	<i>Brassica carinata</i>	Hamilo	Brassicaceae	Herb	Home garden	Food
4.	<i>Calpurnia aurea</i>	Senecho	Fabaceae	Shrub	Wild	Fire wood
5.	<i>Coriandrum sativum</i>	Wedma mo	Apiaceae	Herb	Home garden	Spice
6.	<i>Croton macrostachyus</i>	Mesena	Euphorbiaceae	Tree	Wild	Furniture, firewood, charcoal, fence and construction
7.	<i>Datura stramonium</i>	Mechare ka	Solanaceae	Shrub	Road side	Fire wood
8.	<i>Eucalyptus globulus</i>	Bahrzaf	Myrtaceae	Tree	Agricultural field	Fence, charcoal, furniture, timber, fire wood and construction
9.	<i>Erythrina abyssinica</i>	Welecho	Fabaceae	Tree	Home garden	Fence, construction, charcoal and firewood
10.	<i>Hordeum vulgare</i>	Soa	Poaceae	Herb	Home garden	Food
11.	<i>Justicia schimperina</i>	Gulbana	Acanthaceae	Shrub	Fence	Fence

12.	<i>Juniperus procera</i>	Yabeshatid	Cupressaceae	Tree	Wild	Construction, timber, fire wood, charcoal, fence and furniture making
13.	<i>Olea europaea subsp. cuspidata</i>	Weyra	Oleaceae	Tree	Home garden	Construction, fire wood, furniture, timber, charcoal and fence
14.	<i>Persea americana</i>	Avocado	Lauraceae	Tree	Home garden	Food
15.	<i>Podocarpus falcatus</i>	Zegisho	Podocarpaceae	Tree	Home garden	Fence, construction, furniture, making, shade, timber, charcoal and fire wood
16.	<i>Prunus africana</i>	Gerba	Rosaceae	Tree	Wild	Construction, furniture, timber, fire wood, charcoal and fence
17.	<i>Rhamus prinoides</i>	Gesha	Rhamnaceae	Shrub	Home garden	For tella making
18.	<i>Rosmarinus officinalis</i>	Rosemeri	Lamiaceae	Herb	Home garden	Spice
19.	<i>Solanum tuberosum</i>	Dinich	Solanaceae	Herb	Home garden	Food
20.	<i>Thymus schimperi</i>	Zazanho	Lamiaceae	Herb	Home garden	Spice
21.	<i>Vernonia amygdalina</i>	Hebicho	Asteraceae	Shrub	Near fence	Fence

Appendix 4. List of Informants with Their Age, Sex, Kebele, Marital Status and Occupation

No	Name	Sex	Age	Kebele	High school completed	Read and write	Maternal status	Occupation
1.	Lonseke Ashuro	F	50	Ancha sedicho	Not completed	unread	Married	House wife
2.	Aregash Tekle	F	50	Ancha sedicho	Not completed	unread	Married	House wife
3.	Tarekegn Tafese	M	40	Ancha sedicho	completed	Read and write	Married	Farmer
4.	Abebe Bafa	M	60	Ancha sedicho	completed	Read and write	Married	Farmer
5.	Genet Desalegn	F	35	Ancha sedicho	completed	Read and write	Married	House wife
6.	Demisse Chefamo	M	40	Ancha sedicho	completed	Read and write	Married	Farmer
7.	Lapiso Kassa	M	50	Ancha sedicho	completed	Read and write	Married	Gospel worker
8.	Dutamo Gadena	M	75	Ancha sedicho	Not completed	Read and write	Married	Farmer

9.	Amarech Abera	F	55	Ancha sedicho	Not completed	Read and write	Married	House wife
10.	Wengame Denano	F	55	Ancha sedicho	Not completed	Unread	Married	House wife
11.	Lapiso Abuye	M	45	Gemor a gewada	completed	Read and write	Married	Civil servant
12.	Tesfaye Shanko	M	60	Gemor a gewada	completed	Read and write	Married	Farmer
13.	Abebe Anure	M	78	Gemor a gewada	completed	Read and write	Married	Farmer
14.	Abebe Abuye	M	64	Gemor a gewada	completed	Read and write	Married	Teacher
15.	Shgute Adene	M	65	Gemor a gewada	completed	Read and write	Married	Agricul tural worker
16.	Terefe Wolde	M	15	Gemor a gewada	Not completed	unread	Married	Farmer
17.	Belaynesh Takele	F	30	Gemor a gewada	Not completed	Read and write	Married	House wife

18.	Tirore Hatiso	M	40	Gemor a gewada	completed	Read and write	Married	Farmer
19.	Fitame Menebo	F	45	Gemor a gewada	Not completed	unread	Married	House wife
20.	Handebo Dtemo	M	55	Gemor a gewada	Not completed	unread	Married	Farmer
21.	Tarekegn Tafesse	M	58	Serera	completed	Read and write	Married	Farmer
22.	Tamrat Amde	M	53	Serera	Not completed	Read and write	Married	Farmer
23.	Ashenafi Abayneh	M	35	Serera	Not completed	Read and write	Married	Farmer
24.	Dereje Tamre	M	57	Serera	Not completed	Read and write	Married	Farmer
25.	Ayelech Tadesse	F	40	Serera	Not completed	Unread	Married	Farmer
26.	Admasu Welemo	M	50	Serera	Not completed	Read and write	Married	Farmer

27.	Menmo Shamebo	M	47	Serera	Not completed	Read and write	Married	Farmer
28.	Tariku Asefa	M	49	Serera	Completed	Read and write	Married	Farmer
29.	Abebe Uge	M	47	Serera	Not completed	unread	Married	Farmer
30.	Ashuro Adcho	M	43	Serera	Not completed	Read and write	Married	Farmer
31.	Mihretu Fleke	M	50	Howor a Arara	completed	Read and write	Married	Farmer
32.	Eyob Abera	M	45	Howor a arara	Not completed	Read and write	Married	Farmer
33.	Ayele Demisse	M	45	Howor a arara	Completed	Read and write	Married	Farmer
34.	Tareke Tesfu	M	38	Howor a arara	Completed	Read and write	Married	Farmer
35.	Adanech Bekele	M	39	Howor a arara	Not completed	Unread	Married	Farmer
36.	Dutemo Gadena	M	42	Howor a arara	Not completed	Unread	Married	Farmer

37.	Haile Takele	F	35	Howor a arara	Completed	Read and write	Married	Farmer
38.	Kassa Kefato	M	48	Howor a arara	Not completed	Read and write	Married	Farmer
39.	Ayelech Desta	F	52	Howor a arara	Not completed	unread	Married	House wife
40.	Tamire Kefato	M	38	Howor a arara	Not completed	Read and write	Married	Farmer
41.	Bizunesh Dutemo	F	25	Bekafa	Not completed	Read and write	Married	House wife
42.	Bizunesh Abera	F	35	Bekefa	Not completed	Read and write	Married	House wife
43.	Gebre Abebe	M	24	Bekefa	completed	Read and write	Not married	College Student
44.	Geneta Abebe	M	22	Bekafa	Completed	Read and write	Not married	College Student
45.	Shamebo Helebo	M	90	Bekafa	Not completed	Unread	Married	Farmer
46.	Adenech Gadena	F	58	Bekafa	Not completed	Read and write	Married	House wife

47.	Melese Dutemo	M	30	Bekafa	Completed	Read and write	Married	College Student
48.	Argabo Welde	M	85	Bekafa	Not completed	Unread	Married	Farmer
49.	Petros Lenos	M	60	Bekafa	Not completed	Read and write	Married	Farmer
50.	Sibame Argano	F	58	Bekafa	Completed	Read and write	Married	House wife
51.	Ayele Abuye	M	42	Wageb eta	Completed	Read and write	Married	Farmer
52.	Tabesse Deboch	M	53	Wageb eta	Not completed	Read and write	Married	Farmer
53.	Welendo Haile	M	80	Wageb eta	Not completed	Unread	Married	Farmer
54.	Arsulo Dubye	M	90	Wageb eta	Not completed	Unread	Married	Farmer
55.	Mulatu Tumiso	M	45	Wageb ta	Not completed	Unread	Married	Farmer
56.	Chakebo Megebo	M	50	Wageb eta	completed	Read and write	Married	Farmer
57.	Tremo Hembego	M	75	Wageb eta	Not completed	Unread	Married	Farmer

58.	Moleto Detebo	M	75	Wageb eta	Not completed	Unread	Married	Farmer
59.	Zelege Gembera	M	75	Wageb eta	Not completed	Unread	Married	Farmer
60.	Genure Helsebo	M	55	Wageb eta	Not completed	Read and write	Married	Farmer
61.	Asefa Herego	M	89	Amecho	Not completed	Read and write	Married	Farmer
62.	Abuto Tumebo	M	45	Amecho	Completed	Read and write	Married	Civil servant
63.	Soyo Dubale	F	65	Amecho	Not completed	Unread	Married	House wife
64.	Asho Hobe	F	64	Amecho	Not completed	Unread	Married	House wife
65.	Alero Ashengo	M	65	Amecho	Not completed	Unread	Married	Farmer
66.	Ashemo Hibiso	M	45	Amecho	Completed	Read and write	Married	Civil servant
67.	Ayelech Gebreal	F	45	Amecho	Completed	Read and write	Married	Civil servant
68.	Lunsoke Asero	F	50	Amecho	Not completed	Unread	Married	House wife

69.	Welete Paskal	F	50	Amecho	Not completed	Read and write	Married	House wife
70.	Handebo Hudaye	M	30	Amecho	Completed	Read and write	Married	Teacher
71.	Moloro Hobe	M	90	Utuga	Not completed	Unread	Married	Farmer
72.	Arkule Chefebo	F	45	Utuga	Not completed	Read and write	Married	Farmer
73.	Fitame Mesore	F	50	Utuga	Not completed	Unread	Married	House wife
74.	Desta Awile	M	40	Utuga	Not completed	Read and write	Married	Farmer
75.	Chufu Menure	F	60	Utuga	Not completed	Unread	Married	House wife
76.	Shamrbo Lugo	M	70	Utuga	Not completed	Unread	Married	Farmer
77.	Tumiso Ashebo	F	44	Utuga	Not completed	Unread	Married	House wife
78.	Hesebo Tundedo	M	45	Utuga	Completed	Read and write	Married	Farmer
79.	Eresene Gadena	F	65	Utuga	Not completed	Unread	Married	House wife

80.	Gichamo Helsbo	M	35	Utuga	Completed	Read and write	Married	Farmer
81.	Petros Lenso	M	75	Bokota	Not completed	Unread	Married	Farmer
82.	Dindamo Dnbere	M	74	Bokota	Not completed	Unread	Married	Farmer
83.	Mosare Tirore	M	80	Bokota	Not completed	unread	Married	Farmer
84.	Dotamo Aregeno	M	66	bokota	Not completed	Read and write married	Married	Farmer
85.	Matwas Tirora	M	40	Bokota	Completed	Read and write	Married	Farmer
86.	Denbelo Denbore	M	70	Bokota	Not completed	Read and write	Married	Farmer
87.	Dolo Hatiso	F	45	Bokota	Not completed	Read and write	Married	House wife
88.	Anamo Mesebo	M	45	Bokota	Completed	Read and write	Married	Civil servant
89.	Gintamo Menebo	M	40	Bokota	Not completed	Read and write	Married	Farmer

90.	Yishak Hachamo	M	50	Bokota	Not completed	Read and write	Married	Farmer
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Appendix 5. Marketed Medicinal Plants in the Study Area

No.	Scientific name	Local name	Family name	Uses
1.	<i>Ajuga integrifolia</i>	Anamurcho	Lamiaceae	Medicine
2.	<i>Allium sativum</i>	Wegutuma	Alliaceae	Food and medicine
3.	<i>Artemisia absinthium</i>	Natra	Asteraceae	Spice and medicine
4.	<i>Calpurnia aurea</i>	Senecho	Fabaceae	Medicine
5.	<i>Coriandrum sativum</i>	Wedmamo	Apiaceae	Spice and medicine
6.	<i>Cymbopogon citratus</i>	Hiticho	Poaceae	Flavoring of food and medicine
7.	<i>Hagenia abyssinica</i>	Tencho	Rosaceae	Medicine
8.	<i>Hibiscus macranthus</i>	Hable	Malvaceae	Spice and medicine
9.	<i>Hordeum vulgare</i>	Soa	Poaceae	Food and medicine
10.	<i>Nicotiana tabacum</i>	Kosho	Solanaceae	Smoking and medicine
11.	<i>Ocimum urticifolium</i>	Besobila	Lamiaceae	Flavoring of food and medicine
12.	<i>Persea americana</i>	Avocado	Lauraceae	Food and medicine
13.	<i>Rhamus prinoides</i>	Gesha	Rhamnaceae	For tella making and medicine
14.	<i>Rosmarinus officinalis</i>	Rosemeri	Lamiaceae	Flavoring of food and medicine
15.	<i>Ruta chalepensis</i>	Telecho	Rutaceae	Spice and medicine
16.	<i>Solanum tuberosum</i>	Denech	Solanaceae	Food and medicine
17.	<i>Thymus schimperi</i>	Zazancho	Lamiaceae	Flavoring of medicine

Appendix 6. Format for Collecting Ethnobotanical Information (Semi-structured interview)

1. Name of the respondent-----

Sex----- Age-----Maternal status-----

Occupation----- Kebele-----

Other information-----

2. What are the main human health problems in your locality or kebele?

3. What are the main livestock health problems or diseases?

4. Do you use plants to treat disease x in your locality?

A. Name of the plant-----

B. Habitat of the plant-----

C. Habit of the plant-----

D. Parts of the plant used-----

E. Preparation method-----

F. Amount used(dose)-----

G. Application method-----

H. Treats to the above plant-----

I. Method of conservation of the plant-----

J. Other uses of the plant-----

5. How do you prevent /control those diseases?

6. How do you treat human health problems?

7. How do you treat livestock problems?

8. Which plants do you use for treating those particular diseases?

9. Local name of the plant?

10. Habit of the plant t/s/h/c?

11. Habitat of the plant-forest/home garden/road side/rocky area/agricultural field/grazing land?

12. Plant parts used: root/stem/root bark/leaves/flowers/ fruits/seed/whole plant.

Others-----

13. Used along mixed with other materials?

14. Preparation for medicinal use: crushed/crushed and powdered/crushed pounded/extract with cold water/ boiled/ juice/latex/: other-----

15. Dose/ amount?

16. Does the dose differ among males, females, children, elders?
17. Any noticeable side effects?
18. Are there restrictions/taboos in collecting medicinal plants?
19. Are medicinal plants marketable?
20. Are there threats to those medicinal plants?
21. How do you conserve traditional medicinal plants?
22. How is the knowledge of traditional medicine passed to a family member/
younger generation?
23. How dose modernization interferes with traditional medicine application and
use?

Identification

Survey Area/kebele -----

Interviewer/facilitator-----

Date/Month/Year-----/-----/-----

Signature-----

-----Thank you -----

Appendix 7. Format for Collecting Ethnobotanical Information (Semi-structured interview) (in Kembatigna)

በርግን ጨክሱ 7. ዘብኔ ከሸከተ ቁመዕ ሁጅተ(ቆረም ጠሙተ ቅጠንሱ)

1.ጠሙስ ፈንቀሻንች ሱማ-----

1.ሜአተ ወይም ለባ-----ኡሙሩ-----አግሽ ወይም አግሱምቡ-----

2.ሉጄ ሀገራ-----ቀበልት-----

3.ዎሉ ሰዊቱ-----

2.ሀአከኔት ዎነ መን ፈይማ ሀው ኪይ አሎንተክ ወይም ቀበሌተክ-----

3.አማዜነ አዚች ወነ ፈይማ ሀው/ ሞሱ ኤበኖ ሐከኔስ-----

4.x-የመመኖ ሞስ ተምተዮንት ከሹ አሎንተክ ዮንዶ? -----

A. ካሽስ ሱማ-----

B. ካሹስ ሄአኖቡ -----

C. ካሹስ ሮሶኖ ሄጌጉ -----

D. ካሽስ መኖማች ሀከባንስ ተሜኖ -----

E. ሐትታን ቅጠንሴኖሲ -----

F. ሐበንከስ ተምቴንት -----

G. ሄቻን አጉድሱ -----

H. አሉድን ጨክሰንቶ ከሸከተ ቆረብ -----

I. ካሽስ ቆረቤኖ ወቀከት-----

J. ወሉስ ተሜኖ ወቀከት-----

5. ህክ ሞሱ ሀትተ ከመሞሃ ደንዴተን?

6. መን ፈይማ ሀው ሀትተ ከመሜኖ?

7. አማዜነ ሀው ቆረቢ ደንዴኖ ሀትተ አሴኔት?

8. ሀክ ካሽስ ተሜመዳት ህክ ሞሲስ ከመም ደንደኖ?

9. ሄጌግ ካሽስ ሱማ?

10. ካሹስ ሮስጨሞ አሉ?

11. ካሹስ ሄአኖ ማንስ፡- ኡዱማአንድ/ምን አሎሃንድ/ ወቄሃ ቶቹንድ/ ኪና አዜኔትንድ/ ሆጎ አላኔትንድ/ ግዛ ዜኤኖ

ቤኤቾኔትንድ?

12. ከሽቸስ ተምተንትቡ፡- ጠጽ አጎራንድ/ቦንጣንድ/ ዘራሩታንድ /ላሉታንድ/ ዜሬታንድ/ ሆሮመታንስድ/

ወይም ወሉስራት-----

13. ወልን ኤሬርት ተምትንድ?

14. ዘብንስ ቅጠንስቶንት ሐትጉታን፡-ኡዱልቴትንድ/ዊቴትንድ/ጨለ ወአ በርግቴትንድ/ ፈጩኮ ወእኔትንድ/

ወእን ኤሬርቴትንድ/ከሽቸ ፉለኖ ዘዛንቺኔትንድ ወለርኔትንድ-----

15. ቁንጠሲ ቀጠሲ?

16. አሴኖስ ቁንጡ፡-ጎኒ፡ሜሴላካ፡ጮላ፡ኑባብ?

17. ቆርሜን ደጌኑና አቂን ወለኖ ሀዋ?

18. ከአ ዘብ ካሻከተ ቁመኡ ከመሜሃንድ?

19. ከአ ዘብ ከአሽ ድኩት ዮሲሀንድ?

20. ኩ ዘብኔስ ካሻከት ኬነቶን ህጌሓራንድ?

21. ከአ በህል ዘቡ ሐትጉታን ቆረባንቲ?

22. ሐበንኩ ደጉ ዮኬ ከአ በህል ዘቡ ምን መን/ሀርዴ ቀላንቺ ህግሲ?

23. ከአ በህል ዘቡ ሐብዶልቹሃኒን ሀበንካ ሀትጉት ተምተን?

ገገስ ጫክስ

ሄአንት አሎክ/ቀበልክ-----

ጠምቶንት መንቹ/ቅጠንሴ መንቹ-----

በሩ/አገኑ/ዎጎ-----/------/------

ፈረማ-----ገለጣም-----

Appendix 8. Photographs Illustrating Field Activities



Picture 01: *Ruta chalepensis* L. [Photo courtesy by Tigist Kassa (2020)]



Picture 02: *Enset ventricosum* (Welw.) Cheesman [Photo courtesy by Tigist Kassa (2020)]



Picture 03: *Rhamus prinoides* L'Herit [Photo courtesy by Tigist Kassa (2020)]



Picture 04: Interview with informant [Photo Courtesy by Eyasu Abera (2020)]



Picture 05: *Brassica carinata* A.Br.
[Photo courtesy by Tigist Kassa (2020)]



Picture 06: Interview with informant
[Photo Courtesy by Eyasu Abera (2020)]



Picture 07: Sample collection [Photo
Courtesy by Eyasu Abera (2020)]



Picture 08: Sample collection [Photo
Courtesy by Eyasu Abera (2020)]



Picture 09: Visiting Kebele administration office [Photo Courtesy by Eyasu Abera (2020)]



Picture 10: Transporting collected sample [Photo Courtesy by Eyasu Abera (2020)]



Picture 11: Visiting Kebele administration office [Photo Courtesy by Eyasu Abera (2020)]



Picture 12: Sample pressing [Photo Courtesy by Eyob Abera (2020)]



Picture 13: Group discussion with informants at Aanicha Sedicho Kebele [Photo Courtesy by Eyasu Abera (2020)]



Picture 14: Sample collection [Photo Courtesy by Kefle Abera (2020)]



Picture 15: Group discussion with informants at Gomora Gewada Kebele [Photo Courtesy by Kefle Abera (2020)]

Calpurnia aurea
(Ait.) Benth.

DECLARATION

I, Tigist Kassa Wanore confirm that the work of presented in this thesis is my own, where information has been derived other sources. I confirm that this has been indicated in the thesis. The material contained in this thesis has not previously been submitted for a degree at Addis Ababa University any all the sources of materials used for thesis are acknowledge.

Name: Tigist Kassa Wanore

Signature: _____

Date: _____

Place Addis Ababa University

This thesis has been submitted for examination with my approval at an academic advisor.

Advisor: Ermias Lulekal (PHD)

Signature: _____

Date: _____