# A Study on the Ethnobotany of Medicinal Plants and Floristic Composition of the Dry Afromontane Forest at Bale Mountains National Park, Ethiopia

**By**

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# Table of Contents

# List of Tables

# List of figures

# List of Appendices

# Abstract

*An ethnobotanical study on medicinal plants of Bale Mountains National Park and adjacent areas in Sinana Dinsho, Goba and Adaba Districts, and floristic composition of the Dry Afromontane Forest in the park was conducted during 30/07/03 – 12/08/03, September 2003, November 2003, January 2004 and June 2004. A total of 176 medicinal plants were documented from the ethnomedicinal investigation. These species are distributed among 141 genera and 71 families. About 57.95%, 11.36% and 30.68% of these plants are used to treat only human, only livestock and both human and livestock ailments respectively. A total of 74 human and 25 livestock ailments were reported. Hepatitis B from human, and blackleg,* ***Darissaa*** *& hepatitis (****Dhukuba Alati****) from livestock ailments were the most frequently reported ailments. The most utilized growth forms are herbs (91 species, 51.7%) followed by shrubs (64 species, 36.36%). Leaves (40.88%) followed by roots (34.71%) are the most frequently used plant parts for traditional medicine. Usually, fresh materials are preferred for medicine preparations that are processed mostly by crushing, concoction and decoction. Drinking the prepared medicines is the most frequently applied method of drug application. The most recurrently used route of drug administration is oral and this is followed by dermal. The most common local uses of these plants other than their medicinal values include forage (27.88%), fencing (19.23%), firewood (17.31%) and construction (15.87%). Nearly half (44.19%) of the informants consulted are aware to conserve rare plants in their surroundings. Significant numbers of beliefs useful for the conservation of medicinal plants were detected but they are being neglected by the youth generation. The major threats to medicinal plants in the study area are agricultural expansion & intensification and deforestation for various purposes. Indigenous knowledge is mostly transferred to an elect of a family member in word of mouths. This is thus prone to fragmentation and /or loss. Therefore, integration of indigenous studies in school curricula and in situ and ex situ conservation of locally scarce medicinal plants is mandatory.*

*For the floristic composition study, a total of 90 plots were established at three sites (Adelle, Boditi and Gaysay) in an altitudinal range of 3008 – 3408 m. The cover abundance values, density, and diameter at breast height and list of species were then generated from each plot. About 230 species belonging to 157 genera and 58 families were identified and documented from this investigation alone. Analysis of vegetation data revealed 5 homogenous clusters. The density of trees in the diameter class >2 cm is 766 and 458 individuals /ha respectively at Adelle and Boditi forests. The basal area of Adelle forest is 26.39$m^2$ /ha whereas it is 23.34 $m^2$ /ha for Boditi forest. About 43.34% of the basal area at Adelle and 56.65% at Boditi forests are contributed by Juniperus procera and Hagenia abyssinica respectively. Both Adelle & Boditi are found at an earlier secondary stage of development and have more or less a similar trend of development. The population structures of tree species were assessed and these have clearly signaled the occurrence of excessive cutting of selected size classes of ecologically, economically and medically important tree species for various purposes particularly for construction purpose. These have also enabled to evaluate the reproduction and /or regeneration status of useful tree species.*

# 1. Introduction

The highland area of Ethiopia was once covered with extensive forest resources (E.M.A., 1988). However, the country has lost these resources at an alarming rate due to various reasons. According to EFAP (1994), the annual loss of forest resources of the country is estimated between 150,000 and 200,000 ha. The rapidly declining forest cover of the country is thus a serious threat to the conservation of biological diversity, especially the forest genetic and wildlife resources.

The most important reason behind the rapid deforestation rate in the country is the ever-increasing human population growth. This rapid increment in human population is associated with a very high demand for agricultural and grazing lands, forest resources for firewood, charcoal, timber, construction, and many other purposes. Fire, inappropriate investment activities, and lack of viable land use policy have also been key factors for the rapid decline of forests in the country (Friis, 1992; Taye Bekele *et al*., 1999).

Taking these problems into consideration, the EWCO has designated about 98 Protected Areas nine of which are National Parks, principally for the management and conservation of larger fauna, mostly mammals. Nevertheless, some Wildlife Conservation Areas like the Bale Mountains National Park are appropriate for *in situ* conservation of numerous species such as *Juniperus procera* and *Hagenia abyssinica* trees other than the mammal conservation activities (EFAP, 1994).

The Bale Mountains National Park is primarily established for the conservation of the critically endangered Ethiopian endemic mammal species, the Ethiopian Wolf (*Canis simensis*) and another Ethiopian endemic mammal, the mountain nyala (*Tragelaphus buxtoni*). Nonetheless, the Park has extremely diverse habitats that are mainly the results of altitudinal variations and these have supported so many other endemic species of flora and fauna (Miehe & Miehe, 1994). About 26% of the mammal and 6.1% of the bird species found in the area are Ethiopian endemics. Several rare endemic species of amphibians are also known to occur in the area. The endemicity

is confined not only to the country but also specifically to the Bale Mountains massif (Williams, 2002).

The wild stocks of the economically important crop species, *Coffee arabica*, are also found in and around the park. The second largest stand of moist tropical forest remaining in the country, the Harenna Forest, is found in the southern side of the park area. This is a dense, closed canopy forest and is the only cloud forest in the country. Moreover, the park is a site for the origin of over forty streams that join to form the four major rivers namely, the Wabi Shebele, the Web (leading to the Genale and Juba rivers), the Welmel and Dumal Rivers. The availability of these rivers and other water bodies in the area are incredibly vital for the livelihood of both the lowland and highland dwellers (Williams, 2002).

Despite these, the Bale Mountains National Park and many other Protected Areas in Ethiopia are not well managed and their resources are being exploited unsustainably mainly due to the growing demand to these resources of the rapidly growing human population, lack of local community participation in the conservation efforts and absence of law enforcements. The loss of these biological resources is thus associated in one way or another to the socioeconomic and ecological problems of the country (Shibru Tedla, 1995).

For effective management and conservation of this unique ecosystem of the country, there is an urgent need to develop a successful management plan and this in turn requires detailed baseline information regarding the ecology and ethnobotany of the area. Miehe & Miehe (1994) studied the Ericaceous Forests of the Bale Mountains. Menassie Gashew & Masresha Fetene (1996) studied the plant communities of the Afroalpine vegetation of Sanetti plateau. The National Herbarium (2004) carried out a general biodiversity assessment of the park and surrounding areas. Nevertheless, the floristic composition, plant community and structural analysis of the Dry Afromontane Forest in the Bale Mountains National Park have not yet been investigated.

A study on the use and value of wild plants to the people of Bale was also made by Menassie Gashew (1991). However, only 44 commonly used medicinal plant species were identified in his work and is thus far from complete. Moreover, B & M Development Consultants (2001) and IDR

(2004) conducted a socio-economic survey on the medicinal plants of the area. However, what they analysed and wrote their results is based up on local names only implying that their result is not reliable and much confusion might have occurred regarding the identity of medicinal plants and eventually the information gathered. Even so, the information they gathered is not as detailed as needed. Detail investigations regarding the ethnobotany of medicinal plants of the area like their traditional utilization, management, status and threats are thus still lacking. The current work on the ethnobotany of medicinal plants, floristic composition, plant community and structural analysis of the vegetation in the study area is believed to fill these two major gaps and contribute a lot to the effort being made in the development of an efficient management plan for effective conservation of the park resources.

The ethnomedicinal aspect of this study documents the accumulated plant use indigenous knowledge of the area and plants of medical importance. This by itself is extremely useful since medicinal plants have incredible roles for the conservation of biological diversity in general. These roles originate from the fact that people have special meanings and respects for medicinal plants as a result of their cultural identity, health support, livelihood or economic functions in many people's lives. In other words, the single most important role for medicinal plants in biological and ecological conservation stems from the foundations that they can provide for the involvement of people in conservation of natural habitats (Schopp-Guth & Fremuth, 2001).

Moreover, medicinal plants have been the most important remedies utilized by about 80% of the Ethiopian population to cover the primary healthcare system of the country. The chief reasons for long-term dependency on traditional medicine in preference to modern healthcare practices comprise cultural acceptability, better accessibility, cost-effectiveness and biomedical benefits from centuries of accumulated indigenous knowledge (Dawit Abebe, 2001). The increasing human population and the frequently inadequate provision of modern western medicine aggravates the growth in demand for traditional medicine (Marshal, 1998).

Another key role for medicinal plants is that they have been major sources for very important bioactive compounds, which are utilized industrially for the synthesis of modern drugs. Medicinal plants have a very high potential and provide a much better chance of discovering new

drugs or substances that could be utilized against various ailments (Mendelsohn & Balick, 1995; Dawit Abebe, 2001). Ethnobotanical investigations are thus very crucial in providing baseline information regarding such potential medicinal plants (Martin, 1995).

The plant-based ethnomedicinal documentation of the area in and around the Bale Mountains National Park is thus extremely useful due to the limitless value of medicinal plants to the indigenous people and their roles in the conservation of the biological resources of the park and surrounding areas.

# 2. Objectives

## 2.1. General Objectives

The general objectives of this study are

- to compile the indigenous knowledge on utilization and management of medicinal plants in and around Bale Mountains National Park;
- to evaluate the status of medicinal plants in the study area;
- to determine the floristic composition and analyze structure of the Dry Afromontane Forest in the park;

## 2.2. Specific Objectives

The specific objectives of the study are

- to identify medicinal plant species used by the local people for the treatment of different human and livestock ailments in and around Bale Mountains National Park (BMNP);
- to document plants of medicinal value, and describe their use, methods of use and related information;
- to investigate the traditional management of medicinal plants in the study area;
- to determine the floristic composition, identify plant communities and carryout structural analysis of the Dry Afromontane Forest in the park.
- to assess the conservation status of medicinal plants and identify threats.

# 3. Literature Review

## 3.1. Overview of the Ethiopian Vegetation

The land surface of Ethiopia has been very uneven due to the continued occurrence for millennia of erosion, volcanic eruptions, tectonic movements and subsidence. These situations have given the country great geographical diversity with high and rugged mountains, incised river valleys, rolling plains, flat-topped plateaus and deep gorges (Demel Teketay, 1999). Consequently, the altitudes of the various topological features of the country range from about 110 m b.s.l. (Kobat sink, Afar Depression) to 4620 m a.s.l. (Ras Dejen). The western and southeastern highlands of the country are separated by the Great Rift Valley that runs from north to south (Demel Teketay, 1999; Zerihun Woldu, 1999). These variations in the physical conditions and altitudes of the country have resulted in a wide spectrum of habitats, flora and fauna (Demel Teketay, 1999; Zerihun Woldu, 1999).

The vegetation of Ethiopia is described by a number of authors, among which Pichi-Sermoli's (1957), is one of the oldest and most intensive that laid the basis for the systematic investigation of the vegetation and environmental factors in Ethiopia. Based on his observation, 24 vegetation units were recognized in Northeast Tropical Africa of which 22 are found in Ethiopia.

The vegetation of mainland Africa was categorized by White (1983) in 17 types of which three also occur in Ethiopia namely, Sudanian Regional Center of Endemism, Afromontane Archipelago-like Regional Center of Endemism and Somalia-Massai Regional Center of Endemism. The Afroalpine Archipelago-like region of extreme floristic impoverishment is included within the Afromontane Archipelago-like Regional Center of Endemism. Such classifications of the vegetation of Ethiopia are however very broad.

Descriptions of community types of the Ethiopian vegetation were also made by many authors among the most recent of which are: Tamrat Bekele (1993), Kebrom Tekle *et al*. (1997), Teshome Soromessa (1997), Sebsebe Demissew (1998), Tesfaye Awas *et al*. (2001), Kumlachew

Yeshitila and Tamrat Bekele (2002), Abate Ayalew (2003), Kitessa Hundera (2003), and Simon Shibru and Girma Balcha (2004).

According to Sebsebe Demissew (1998), Demel Teketay (1999), Zerihun Woldu (1999), and Friis & Sebsebe Demissew (2001), the Ethiopian vegetation is now broadly categorized into nine major types of which the current study area is grouped in the Dry Evergreen Montane Forest. This vegetation type has been inhabited by the majority of the Ethiopian population for centuries and has been severely degraded by the continuing destructive activities of humans. Its altitudinal distribution ranges from about 1500-3400 m a.s.l. and is characterized by the following plant species: *Juniperus procera, Olea europaea* subsp*. cuspidata, Carissa spinarum, Rosa abyssinica,* and *so on.* This vegetation type is associated with *Hyparrhenia spp., Eragrostis spp., Panicum spp., Sporobolus spp., Eleusine spp., Pennisetum spp., Eriosema spp., and Crotalaria spp*. (Demel Teketay, 1999; Zerihun Woldu, 1999).

## 3.2. Ethnobotany and its significance

Traditional people around the world possess unique knowledge of the natural resources on which they depend for food, medicine and general utility including tremendous botanical expertise (Martin, 1995). This implies that man is absolutely dependent on other organisms for his life. Although various animal and mineral products contribute to his welfare it is the plant kingdom that is most essential to man's well being, especially in supplying his basic needs. The cumulative knowledge of so many generations have been kept by the indigenous people of the world indicating a very close relationship between man and plants throughout the development of human culture. Johnson (undated) thus defined ethnobotany as the study of the cultural knowledge of plants, including plants for medicinal uses.

According to Bye (1985), the field of ethnobotany studies the biological, including the ecological, basis of interaction and relationship between plants and people over evolutionary time and geographical space. Martin (1995) defined ethnobotany as all studies concerning plants that describe local people's interaction with the natural environment. Thus the term ethnobotany

includes all sorts of relationships between people and plants and its definition can easily be summed up in four words namely; people, plants, interactions and uses (Cotton, 1996).

The relationship between plants and human cultures is not limited to the use of plants for food, clothing, and shelter but also includes their use for religious ceremonies, ornamentation and healthcare (Schultes, 1992).

Basic quantitative and experimental ethnobotany includes basic documentation, quantitative evaluation of use and management, and experimental assessment (Martin, 1995). Today, ethnobotanical surveys include applied projects that have the potential to ameliorate poverty levels of people, allowing them to make more educated decisions about their future directions. These new approaches enhance the quality of the science, provide compensation for the cultural groups, and take into account environmental concerns. This modern approach is based on interdisciplinary team usually composed of an ethnobotanist, taxonomist, linguistics, an anthropologist, an ecologist, a physician and others to gather more detailed and reliable information. Some of these team members are in-country colleagues who have arranged the details of the expedition as well as the contractual agreements for reciprocal programs of the village or community (Martin, 1995; Flaster, 1996).

As a global community we are now in the midst of a crisis in loss of biological and cultural diversity. Both medicinal plant knowledge systems and the rich biological resources on which they depend are being erased at an unprecedented and unacceptable rate. In many societies and communities undergoing accelerated westernization, fewer young people are interested in devoting themselves to the extensive training required to learn about traditional healing plants. Fortunately as this decline has accelerated, there has been a resurgent interest in ethnobotany. Accordingly, ethnobotanists are racing against time to document and understand traditional knowledge systems before they vanish (Balick and Cox, 1996).

Ethnobotany is very important for the documentation, gathering, analyzing and dissemination of indigenous botanical knowledge, cultural practices, evaluation of the use and management of botanical resources and how these resources are influenced by human activities (Martin, 1995;

Cotton, 1996). The rapid loss of biodiversity and the concomitant loss of indigenous knowledge systems are some of the challenges facing ethnobotanists in the near future (Martin, 1995). Cunningham (1997) indicated traditional management practices to be very helpful in order to protect endangered species and fragile habitats and these practices are better investigated with the ethnobotanical researches dealing with the past and present relationships and interactions between plants and the indigenous people.

According to Cox and Balick (1994) ethnobotanical researches are also extremely useful for the successful development of pharmaceutical products from medicinal plant resources. This is so because ethnobotanical researches have been very crucial in providing preliminary information for further screening and extraction of bioactive chemicals from plants.

Various techniques are available to gather ethnobotanical data among which are open-ended, semi-structured, structured interviews and questionnaires (Cotton, 1996). Besides these, analytical tools like preference ranking and direct-matrix ranking and paired comparisons are also useful in data quantification and verification (Martin, 1995; Alexiades, 1996; Cotton, 1996). Triangulation and group discussion (Martin, 1995) and informant consensus (Alexiades, 1996) are very useful to refine field ethnobotanical information. Voucher specimens of ethnobotanically useful plants should then be collected, identified, labeled and deposited at herbaria so that the ethnobotanical investigation will be more informative, scientific and complete (Martin, 1995).

## 3.3. The Value of Medicinal Plants in Human Healthcare Needs

The World Health Organization (WHO) estimates that about 80% of the world's people rely chiefly on traditional medicine; mostly of plant origin to meet their primary healthcare needs (Farnsworth *et al*., 1985; Duke, 1992).

Mankind has used plants to cure diseases and relieve physical sufferings beginning from earliest times. Ancient people of all age have had some kind of knowledge about medicinal plants, which was developed as a result of trial and error and passed on from generation to generation (Hill,

1989). Consequently, traditional medicine has been very crucial for the provision of primary healthcares to millions of people, despite the recent development of western medicine.

Traditional medicine, as defined by the World Health Organization (WHO), can be summarized as 'the sum total of all the knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing (WHO, 1998).

WHO also defines herbal medicines as'' Finished, labeled medicinal products that contain as active ingredients aerial or underground parts of plants, or other plant material, or combinations thereof, whether in the crude state or as plant preparations. Plant material includes juices, gums, fatty oils, essential oils, and any other substances of this nature. Medicines containing plant material combined with chemically defined active substances, including chemically defined, isolated constituents of plants, are not considered to be herbal medicines, exceptionally, in some countries herbal medicines may also contain, by tradition, natural organic or inorganic active ingredients which are not of plant origin'' (WHO, 1996).

Developing countries like Ethiopia have been facing so many complicated problems to satisfy their primary healthcare services. Governments of such countries have been unable to ensure provision of quality services at an affordable price to everyone and especially to the most vulnerable groups of their citizens. One of the reasons for this is the absence of enough local pharmaceutical production and a heavy loss of foreign currency due to purchase of pharmaceutical imports (Dawit Abebe, 2001).

The so-called nearest dispensary and pharmacy may sometimes be so many kilometers away from the rural people that they may have to travel for several days before finding it. Consequently, transport fees and the high cost of the medicine should be taken into account other than the loss of working days (Dawit Abebe, 2001). Typically, more than 80% of the health budgets in developing countries are directed to services that reach approximately 20% of the population. Many people of developing countries are thus lacking effective access to western

medicine, whereas those who entertain it are still dependent on alternative medications (Hamilton, 2003).

According to WHO (2001), consultation of traditional medicine practitioners is very helpful for the development and incorporation of useful approaches in the planning and budgeting system for healthcare provisions of most developing nations and indigenous communities.

On the other hand, traditional medicine is a medical system that is easily affordable, accessible, and culturally acceptable (Marshal, 1998; Dawit Abebe, 2001). As a result of this fact, traditional medicine remains as the main source of everyday healthcare for the majority of the population of developing countries (WHO, 2001). Significant proportions of populations of developed nations are also dependent on some kind of complementary medicine. For instance, 40% of Americans (Eisenberg *et al*., 1998) and 40% of Australians (Mac Lennan *et al*., 1996) were using some form of complementary medicine on a regular basis.

A number of countries have already integrated traditional medicine into their national healthcare systems and this has enhanced the formalization of traditional health services. Very good examples for this are some Asian countries like China, India, and South Korea (WHO, 2001). This integration in China was launched in the late 1950s and recently, over 30 universities or colleges have been established for traditional medicine training with an enrolment rate of 37,000 students. About 2,522 traditional medicine hospitals equipped with 353,373 staff and 236,060 beds have also been established to treat 200 million outpatients and almost 3 million inpatients annually. Moreover, 95% of general hospitals in China have traditional medicine departments, which treat about 20% outpatients on a day-to-day basis (WHO, 2001).

The use of plants as a source of medicine is very diverse in Ethiopia due to the extremely diverse socio-economic and cultural landscape of the country, which in turn is due to the existence of some 80 ethnic groups with distinct languages and dialects. Plant-based traditional medicine also consists of the largest segment of the Ethiopian traditional medicine (Dawit Abebe, 1986; Teferi Gedif and Hahn, 2002), which in turn is an integral part of the local culture i.e., beliefs, lifestyles and attitudes (Dawit Abebe & Ahadu Ayehu, 1993). Ethiopia is known for its rich medical lore

and almost all plants of the Ethiopian flora are used somewhere somehow medicinally (Amare Getahun, 1976; Jansen, 1981).

The majority of the Ethiopian population (over 85% in rural areas and a very significant number in urban areas) has been dependent on traditional medicine (WHO, 1998). However little effort has been made so far with regard to research activities and formalization of the traditional medicine (Dawit Abebe & Ahadu Ayehu, 1993). It is in 1975 that the Ministry of Health set up an office for traditional medicine for evaluating traditional medicine, conducting chemical screening of the medicine, and a census of traditional medical practitioners (Dawit Abebe, 1996). Despite this, little progress was made and interest in traditional medicine declined since the relationship between traditional and modern medicine in Ethiopia is not going harmoniously (Dawit Abebe, 1996).

## 3.4. Plants in Ethnoveterinary Medicine

In most developing countries particularly, in Sub-Saharan Africa, disease remains one of the principal causes of poor livestock performance, leading to an ever-increasing gap between the supply of, and the demand for, livestock products. The ever-declining provision of animal health services has resulted in the resurgence of a number of epizootic diseases, undermining the economic efficiency of livestock production in Africa (Tafese Mesfine & Mekonen Lemma, 2001).

The use of modern veterinary services in order to solve the above problems has created the following problems in almost all developing countries (Gemechu Wirtu *et al*., 1999; Tafese Mesfine & Mekonen Lemma, 2001):

- inadequate manpower and logistical inputs;
- scarce and erratic supply of veterinary drugs and supplies;
- high cost of veterinary drugs and supplies;
- poor communication facilities and other modern amenities;
- counter-productive government policies, which do not promote the complementary utilization of modern veterinary and indigenous knowledge systems;

- inadequate attention to the development of ethnoveterinary medicine and other indigenous knowledge systems.

These situations have forced the majority of the populations of developing nations like Ethiopia to rely chiefly on traditional animal health practices (ethnoveterinary medicine) to control common health problems of their livestock (Gemechu Wirtu *et al*., 1999). In such situations ethnoveterinary medicines like medicinal plants, surgery techniques and others provide readily available low cost alternatives to the poor society of developing nations (ITDG and IIRR, 1996).

Livestock owners have an amazingly good knowledge of ethnobotany, due to the fact that most of the *materia medica* used in ethnoveterinary medicines is from plants (Mathias-Mundy and McCorkle, 1989). Thus ethnobotanical knowledge of local people has formed the foundation for the worldwide screening of plant material as potential source of medical drugs (Spore, 1992).

Livestock owners also have a good understanding of the plant parts and quantities needed, and the methods used in harvesting, processing, storing, preserving and utilizing medicinal plants to ensure good drug efficacy and to enhance the survival of the plant germplasm (Lotscher and Beese, 1983; Levy, 1988).

Despite the fact that ethnoveterinary medicine has been very crucial for the animal healthcares of most developing countries it has not yet been well documented and much effort is needed in research and integration activities in these countries (Dawit Abebe and Ahadu Ayehu, 1993; McCorkle and Mathias, 1996).

## 3.5. Traditional Medicinal Plants and their Conservation

Throughout history, traditional medicinal plants have been known to play key roles in the healthcare of almost all developing nations since they are used in treating and preventing specific ailments and diseases. About 25% of the modern western medicines are also plant based (Posey, 1990). They are also used as a source of fuel, building material, craftwork material, dyes, food supplements and others. Despite their importance, they are seldom handled within an organized,

regulated sector; most are still exploited with little or no regard to the future generation (Akerel *et al*., 1991).

Today, medicinal plants are threatened allover the world including Ethiopia due to over exploitation; overgrazing; habitat loss and alteration; destructive harvesting techniques; trade; deforestation for firewood, agriculture, timber and construction materials (Hamilton, 2003).

An increasing demand for arable land and forest products due to the rapidly growing population and poverty of the rural people have been major threats for the survival of many of the Ethiopian endemic plant species (Ensermu Kelbessa *et al*., 1992). Many medicinal plants of Ethiopia are thus being lost at an alarming rate. This holds especially true because most species of medicinal plants are collected from the wild. The part of the plant collected for medicinal purposes also poses serious danger to the survival of the plant (Getachew Addis *et al*., 2001).

Consequently, the battle to save the enormous medicinal plants of the world and the associated traditional plant use knowledge is becoming a race against time (Hamilton, 2003). Lange (1998) outlined the major areas of focus in order to ensure the conservation and sustainable use of medicinal plants as follows: *in situ* and *ex situ* protection; enhancement of cultivation efforts; improved management of wild populations; public awareness; trade monitoring; national and international legislation; law enforcement; self regulation; better information about wild-harvested plants; and certification of wild-harvested plant materials from sustainable sources.

## 3.6. Ethnomedicinal Research in Ethiopia

Ethnomedicinal research in Ethiopia has been very recent activity (Mesfin Tadesse and Sebsebe Demissew, 1992) and it was neglected and considered irrelevant in the past time (Dawit Abebe and Ahadu Ayehu, 1993). In fact, some early visitors have made inventory of medicinal plants in some areas of the country but the information has not been easily accessible to most researchers (Dawit Abebe, 1986).

It is very recently that relatively proper documentation of medicinal plants of the country was performed (e.g., Amare Getahun, 1976; Jansen, 1981; Dawit Abebe, 1986; Mesfin Tadesse, 1986; Gelahun Abate, 1989; Dawit Abebe and Istifanos Hagos, 1991; Menassie Gashew, 1991; Mesfin Tadesse and Sebsebe Demissew, 1992; Dawit Abebe and Ahadu Ayehu, 1993; Abbink, 1995; Mirutse Giday, 1999; Bayafers Tamene, 2000; Dessalegn Dessissa, 2000; Debela Hunde, 2001, Getachew Addis *et al*., 2001; and Kebu Balemie *et al*., 2004). However, most of the studies made so far are more general and do not focus on a specific ethnic group or agro-ecological zone of the country so that the results of these research works are not as detailed as needed.

Of course, few of the research works made more recently are specific to some ethnic groups or agro-ecological zones of Ethiopia. Examples of such works include: Mirutse Giday (1999), Bayafers Tamene (2000), Dessalegn Dessissa (2000), Debela Hunde (2001), Getachew Addis *et al.* (2001), and Kebu Balemie *et al*. (2004).

Documentation of medicinal plants and the associated indigenous knowledge of each ethnic group or agro-ecological zone of the country is thus far from complete. This research work is thus believed to contribute to the ongoing effort being made by the country for the conservation and sustainable use of medicinal plants and the associated indigenous medicinal plant use knowledge.

# 4. Description of the Study Area

## 4.1. General Features and Location of the Study Area

The Bale Mountains are located between latitudes $6^0$40'-$7^0$10'N and longitudes $39^0$30'- $40^0$E (Miehe & Miehe, 1994). These form part of the Bale-Arsi massif that forms the western section of the southeast Ethiopian highlands (Friis, 1992). Among the southeastern Ethiopian highlands, the Bale Mountains form the extreme bastion, with the highest elevation at Tullu Deemtu (4377 m a.s.l.) (Miehe & Miehe, 1994). An extensively farmed plateau of about 2500 m a.s.l. frames these mountains to the west, north, and east directions (Williams, 2002).

The current study area is located in Oromiya National Regional State, Bale Zone between latitudes $06^0$054.641'–$07^0$5'43.5''N and longitudes $039^0$33'19.5''–$039^0$59.235'E (Figure 1). The altitudinal range of this area lies between 2441-3600 m a.s.l.

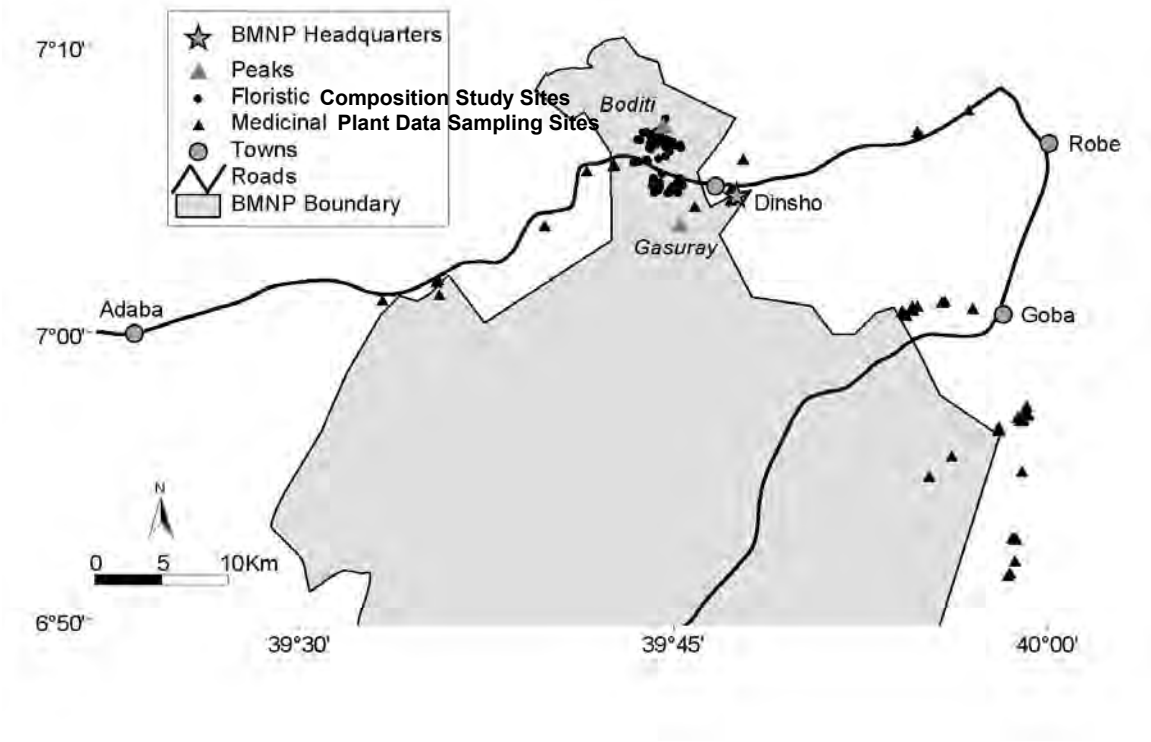



Figure 1. Map showing the study area.

## 4.2. Geology and Soil

The lava outpourings of the Miocene and Oligocene geological periods, between 38 and 7 million years ago, were responsible for the formation of the Bale Mountains (Mohr, 1963). The rocks formed from these trapean lavas mainly consist trachytes, with some amounts of rhyolytes, tuffs, basalts, and associated agglomerates (Morton, 1976; cited in Lisanework Nigatu and Mesfin Tadesse, 1989; Williams, 2002). The degree and nature of weathering of these rocks depends on the past and present climates of the area. The trachytic and basaltic rocks weather predominantly to the fairly fertile loam soils that are of reddish-brown to black in colour (Miehe & Miehe, 1994).

## 4.3. Climate

According to Miehe & Miehe (1994) and Williams (2002), the great altitudinal variation and the bulk of the massif that attracts orographic rainfall are the main reasons for the existence of huge climatic variations over the area of the Bale Mountains. As shown in Figure 2, this area has a very high rainfall distribution (bimodal) from March to October, with the highest rain falling from July to October and then in April. The dry season then extends from November to February. The mean annual rainfall in the current study area is 1218.64 mm. The lowest and highest total annual rainfalls recorded were in 2002 (840.9 mm) and in 1994 (1890.6 mm) respectively over the nine years considered. The mean annual minimum and maximum temperatures of the area are 2.36 $^0$C and 15.5 $^0$C respectively. The lowest and highest values of mean monthly minimum temperature were recorded in December (-1$^0$C) and August (6.1$^0$C) respectively. The corresponding values for the mean monthly maximum temperature were observed in October (14$^0$C) and February (21.3$^0$C).

The dry season at higher altitudes is characterized by a vast fluctuation of daily temperature, the lowest temperatures (for example, -15$^0$C) occurring at night and the highest temperatures (for example, +26$^0$C) during the day. The rainy season on the other hand is characterized by a very much less daily temperature fluctuation and it is relatively warmer. Of course, this season rarely freezes and the temperature rarely rises over 20$^0$C (Miehe & Meihe, 1994; Williams, 2002).

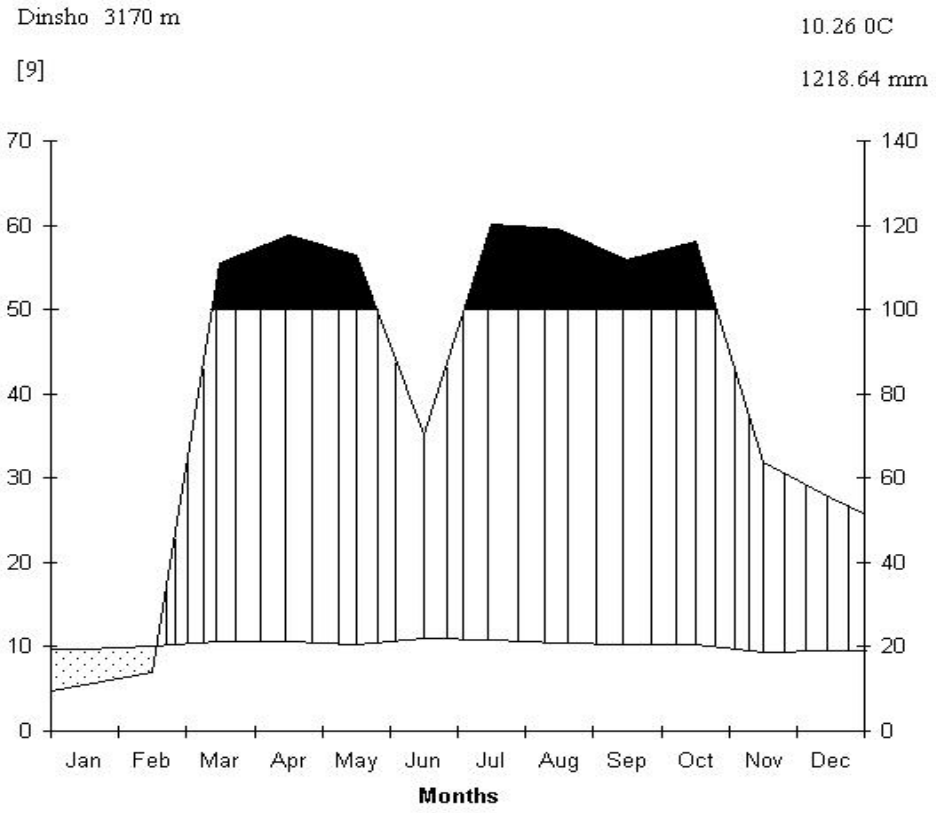



Figure 2. Climadiagram (after Walter, 1985) showing rainfall distribution and temperature variation from 1994 – 2002 at Dinsho (BMNP Headquarters).

*Data source: National Meteorological Service Agency.*

## 4.4. Vegetation

The vegetation in the northern part of the Bale Mountains forms the southern margin of the 'widespread, largely undifferentiated Afromontane forest area' of central and north Ethiopia (Miehe & Miehe, 1994). Altitudinal and associated climatic variations along this site have resulted in the formation of four distinct vegetation zones each of which has its own unique flora and fauna. These are the grasslands of Gaysay valley and Dinsho, the *Juniperus-Hagenia* forests, the *Erica* or heather belt, and the Afro-Alpine moorlands of the plateau and the central peaks (Williams, 2002).

The *Juniperus-Hagenia* forests have little undergrowth and are dominated by *Juniperus procera* and *Hagenia abyssinica* trees. These forests also contain *Hypericum revolutum* (which has large golden-yellow flowers), *Rosa abyssinica* (the only indigenous African rose), and *Myrsine melanophloeos* trees amongst others (Miehe & Miehe, 1994).

The Gaysay and Dinsho grasslands have been formed partly due to human activities. *Artemisia afra*- a staple food plant of the Mountain Nyala, and the gray-green leaved 'everlasting' flower (*Helichrysum splendidum*) are among the most important plant species in the grassland area (Miehe & Miehe, 1994).

## 4.5. Human population, land use and status of health services

Pastoralism and cultivation of crops like wheat and barely are the major economic activities of the local people in the study area (Miehe & Miehe, 1994). The percentage distributions of the land use patterns of Sinana Dinsho District, on which the floristic composition study is based, are summarized by the Planning and Economic Development Office of Bale Zone (1998) as follows: Arable land (Cultivated, 26.09%; Cultivable, 2.95%); Pasture, 32.77%; Forest, bush and shrubs, and BMNP, 31.98%; Settlement and other constructions, 3.8%; and Unutilized land, 2.4%.

CSA (2004) summarized the human population size of the three districts in which the ethnobotanical information was gathered and of these, Sinana Dinsho (186967) is the largest and Goba (86163) is the least populated. The figure for Adaba (130677) is also big. Females represent about 50.9% of the human population in these districts and the rest (49.1%) are males. Sinana Dinsho (105.4 ind./km$^2$) is also denser than the other two districts whereas Goba (53.2 ind./km$^2$) is the least in terms of density. The human population density at Adaba is 60.3 ind./km$^2$. It will not be thus difficult to guess the impact of these huge human population pressures on the natural resources of the area more particularly on the Bale Mountains National Park that has accommodated enormous numbers of wildlife species.

An attempt was also made to assess the available modern medication systems at the three districts. Based on the annual report of Human Health-2003/2004, Bale Zone Health Office, the existing numbers of health workers are summarized in Table 1. According to this report there is

hardly any hospital in all of the three districts except the one in Goba. The numbers of health centers are 1, 2, and none respectively at Sinana Dinsho, Adaba and Goba. Sinana Dinsho (9) has the highest number of clinics next to Adaba (6) and the least number is found at Goba (3). The number of health posts at Sinana Dinsho and Adaba are respectively 3 and 1, and Goba has none. These figures suggest that the available human health centers are very few in number and are not enough to supply adequate modern medication to the huge number of human population in the area.

Moreover, if we try to calculate the ratio of modern health workers to the total human population in each district, we will get extremely small figures indicating that the majority of the local people are not using western medications rather are largely depending on the use of traditional medicines for their primary healthcare needs.

Table 1. Number of modern health workers at Sinana Dinsho, Goba and Adaba districts

| **Health workers** | **Sinana Dinsho** | **Goba** | **Adaba** |
|---|---|---|---|
| Medical Doctors | 0 | 6 | 1 |
| Health Officers | 1 | 0 | 1 |
| Sanitarians | 2 | 2 | 1 |
| Senior Nurses | 11 | 28 | 8 |
| Junior Nurses | 5 | 6 | 5 |
| Laboratory Technicians | 3 | 5 | 2 |
| Pharmacists | 2 | 4 | 1 |
| Health assistants | 6 | 33 | 18 |

The same report also shows the list of ten top (leading) causes of human admission at Goba and Ginner hospitals in 2003. These ailments in order of their frequency include tuberculosis of respiratory system, bronchi pneumonia, abortion without mention of sepsis or toxemia, delivery without mention of complication, infection of skin and subcutaneous tissue, gastro-enteritis and colitis, tab of intestine, peritoneum and mesenteric gland, diabetes mellitus, appendicitis, and gastritis and duodenitis.

A considerable effort was also made to gather some information with regard to veterinary health services and number of health workers at the three districts. Accordingly, the 2004 annual report

of Agricultural Office of Bale Zone summarizes the number of animal health workers in Table 2 below. Sinana Dinsho and Adaba districts have only three veterinary health service centers each and only two are reported at Goba district, and the contribution of these centers is therefore very little and /or negligible. As shown in Table 2 the available health workers are by far few in number to provide sufficient modern health services to the extremely huge numbers of cattle and other animals known to occur at the three districts. The inadequacy of sufficient veterinary services is also a great disaster for the endangered and endemic wild animals of the country that are found in and around the Bale Mountains National Park. The use of ethnoveterinary medicine is thus the most dominant and easily accessible source of animal health service at the three districts.

The ten top animal diseases reported so far in these areas are also included in this report. These veterinary illnesses in the order of their frequency comprise black leg, gastro lysis, anthrax, internal parasites, external parasites, trypanosomiasis, lump skin diseases, bursolosis, part water and African horse sickness.

Table 2. Number of veterinary health workers at Sinana Dinsho, Goba and Adaba districts

| Health Workers | Sinana Dinsho | Goba | Adaba |
|---|---|---|---|
| Doctors (DVM) | 1 | - | 1 |
| Assistants Vet. | - | 1 | 2 |
| Technicians | 7 | 4 | 2 |

# 5. Materials and Methods

## 5.1. Site Selection

A reconnaissance survey was made from 30/07/03 – 02/08/03 to obtain an impression on the general physiognomy of the vegetation and identify sampling sites in the study area. The fieldwork was done during 03/08/03 – 12/08/03, September 2003, November 2003, January 2004 and June 2004.

Based on the reconnaissance survey, sampling sites for ethnobotanical data collection were selected from three districts that contain and /or border the BMNP i.e., Adaba, Sinana Dinsho and Goba Districts.

For the floristic composition data collection, three sites (Adelle & Boditi forests, and Gaysay grassland) were chosen within the park area some 5 to 7 km northeast of the BMNP headquarters. These sites were chosen because they are relatively better protected and the extent of human disturbance is relatively less than in the other areas of the Dry Afromontane Forest in the park. The altitudinal range of these sites lies between 3008-3408 m a.s.l. The Gaysay grassland is almost a flat area that lies between Adelle and Boditi. It is also found at the lowest altitude among the three sites.

## 5.2. Ethnomedicinal Data Collection

### 5.2.1. Informant selection

A total of 49 traditional medicine practitioners (of which eight are females and 41 males) were chosen systematically following Martin (1995) and Kebu Balemie *et al.* (2004) with the help of local administrators and local people from the three districts in a total of 16 kebeles that are found within or bordering the park area. Information regarding the depth of traditional knowledge of each practitioner was first gathered from the local people in each kebele. The same

information was collected from the local administrators under each kebele. The information obtained from the local people and the administrators are then crosschecked and mostly similar responses from the two groups were used to identify knowledgeable practitioners. During this activity a considerable effort was made to involve equitable numbers of female practitioners but this was not possible due to the relative absence of female practitioners in all the kebeles considered. This case is also true in most other parts of the country, and traditional healers are thus mostly males as can be seen in the informants' list of Debela Hunde (2001), Getachew Addis *et al*. (2001) and Kebu Balemie *et al*. (2004).

Ethnomedicinal information was gathered by means of field observation, semi-structured interviews following Cotton (1996), informant consensus following Alexiades (1996), direct matrix ranking, and preference ranking following Martin (1995).

### 5.2.2. **Semi-structured interview**

Semi-structured interviews were conducted following Cotton (1996). These interviews were made using the local language (Oromiffa) with the help of translators. But before conducting the interview the objectives of the study were briefed i.e., documentation of indigenous knowledge on medicinal plants use and management, and not to pass the information to other local people nor to use it for medical practices.

Once agreed upon these ideas, the interviews were conducted and relevant data based on the information shown in Appendix VIII were recorded. These interviews were done mostly in the field in order to avoid the probable confusions with regard to the identity of the medicinal plants. Some of the ethnomedicinal information was also recorded from the best three knowledgeable traditional medicine practitioners with the help of a tape recorder. Moreover personal observations of the general habitats where medicinal plants are located were noted during and after the interviews.

### 5.2.3. Field observation

A number of field observations were made during the reconnaissance survey and the field trips made latter with the help of traditional medicine practitioners. After conducting the interviews, medicinal plants were collected from the field noting the general habitat, topography, habits and abundance of these plants. The general morphological features like flower color, leaf shape, type of fruit, height, and growth form etc., of the medicinal plants and their associations with other plants were also recorded in the field following Cotton (1996).

### 5.2.4. Informant consensus

In order to evaluate the reliability of the information recorded during the interview, the same informant was met during two different field trips and interviewed for the same ideas and questions as before. Consequently, the ideas of the informant in the two interviews that were not in agreement with each other were rejected since they were considered as irrelevant information. Only the relevant ones were taken into account and analysed. This method was adopted from Alexiades (1996).

### 5.2.5. Direct matrix ranking

A direct matrix ranking exercise was done following Martin (1995) in order to compare the various use diversities of a given species and to relate this to the extent of its over utilization. Based on the information gathered from informants, seven multipurpose species were selected out of the total medicinal plant database and eight use-diversities of these plants were listed for 15 selected key informants to assign use values to each species. The eight use-diversities chosen include: medicine, construction, firewood, charcoal, fencing, forage, food, and furniture. The use values were given as 5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used, 0 = not used. Accordingly, each key informant gave use values for the seven multipurpose medicinal plant species and average value of each use-diversity for a species was taken and the values of each species were summed up and ranked.

### 5.2.6. Preference ranking

Preference ranking was conducted following Martin (1995) on the status of seven medicinal plants depending on their degree of scarcity. These plants were chosen based on the information obtained from the informants. Fifteen key informants were selected and invited to rank these plants according to their level of scarcity in the study area. Accordingly, each informant assigned the highest value for the most scarce plant species, and the lowest value for the plant species that is the least scarce. The values assigned by each key informant for each of the seven medicinal plants were summed up and the total scores were ranked.

A preference ranking excercise (Martin, 1995) was also employed among fifteen selected key informants to identify the best-preferred medicinal plant species for the treatment of the most frequently reported human illness, i.e., hepatitis B (*Dhibee Sinbiraa*). Each key informant was provided with seven medicinal plants reportedly used to cure this disease, and asked to assign the highest value (7) for the plant species they prefer most against this illness and the lowest value (1) for the least preferred plant and appropriate values for the rest of plants based on their degree of efficacy. These values were then summed up and ranks were assigned for each plant species, the highest total score being ranked as 1$^{st}$.

## 5.3. Floristic Composition Data Collection

### 5.3.1. Plot establishment

Five transects were laid on each of the two sites (Adelle & Boditi) beginning from the ericaceous zone to the edge of the forests adjacent to Gaysay grassland. The distance between the transects was 500 m. A total of 32 (Adelle) and 36 (Boditi) nested plots (30x30 m for trees, 5x5 m for shrubs and 2x2 m for herbs) were established at every 35 m drop in altitude along these transects.

Gaysay grassland shows little altitudinal difference at its various localities and floristic data were collected from this site following Kumlachew Yeshitila and Tamrat Bekele (2002) through

selection of homogenous representative stands after an intensive observation and understanding of the uniformity of the vegetation composition in the area. In other words, a subjective sampling procedure was followed in such a way that the various conditions encountered were represented by at least one sample. In such a way, 22 nested plots (5x5 m for shrubs and 2x2 m for herbs) were analysed from this site.

### 5.3.2. Vegetation data collection

Altitude was measured for each sample plot using 'Pretel' digital altimeter, and GPS readings of latitude and longitude coordinates were also recorded. Then a complete list of herbs, shrubs, lianas and trees were made in each plot. The occurrence of lichens, bryophytes and vascular epiphytes were also noted. The 1-9 modified Braun-Blanquet scale (van der Maarel, 1979) was used to estimate the cover-abundance values of tree and shrub species as follows:

Scale 1: rare, generally one individual
2: sporadic, with less than 5% cover of the total area
3: abundant, with less than 5% cover of the total area
4: very abundant, with less than 5% cover of the total area
5: 5-12% cover of the total area
6: 12-25% cover of the total area
7: 25-50% cover of the total area
8: 50-75% cover of the total area
9: 75-100% cover of the total area

The circumference at breast height (i.e., 1.3 m from ground) > 3.14 cm of tree and shrub species were measured using measuring tape and latter converted to obtain estimates of DBH (i.e., diameter at breast height) following Abate Ayalew (2003). In cases where the tree or shrub branched at about breast height, the circumference was measured separately for the branches. Trees and shrubs with DBH > 2 cm (i.e., circumference > 3.14 cm) were counted in each plot.

## 5.4. Plant Specimen collection and Identification

Voucher specimens of plants were collected from the study area, allotted collection numbers, pressed, and dried for identification at the National Herbarium (ETH), Addis Ababa University. GPS readings of latitudes and longitudes were also taken at the sites where each medicinal plant is collected. Some of the plants were identified in the field while most are identified at the National Herbarium by comparing with already identified herbarium specimens and using taxonomic keys in the Flora of Ethiopia and Eritrea (Hedberg & Edwards 1989, 1995; Edwards, *et al*. 1995; 2000). These voucher specimens were eventually kept at the National Herbarium.

## 5.5. Data Analysis

Ethnobotanical data gathered through preference ranking were analysed using cluster analysis in the program, SPSS 10.0. However, most of the ethnomedicinal data like the ones recorded through semi-structured interviews were analysed using Microsoft Excel spread sheets.

Vegetation data was analysed using TWINSPAN program version 1.0 (Hill, 1979). In this program the following options were chosen: Number of pseudospecies cut levels 3; Cut levels 0 6 10; minimum group size for division 3; maximum number of indicators per division 10; maximum number of species in final tabulation 55; weights for levels of pseudospecies 1 3 3; and all the rest of the different options in this program were set to default values.

The plots are thus grouped into clusters by this program and the community types distinguished from the output were further refined in a synoptic table. The product of average cover-abundance values of a species and its frequency in a community type were taken as the synoptic values of the species in the community type (van der Maarel *et al*., 1987). Eventually, the community types were named after one or more dominant and /or characteristic species.

Structural analysis was performed on the basis of density, frequency, DBH and basal area per hectare. Ten DBH classes (2-10, 10-20, 20-30, 30-50, 50-70, 70-90, 90-110, 110-130, 130-150, and >150 cm) were constructed after Kitessa Hundera (2003), and the density and percentage

distribution of woody species were computed in each class. The distribution of the size classes was evaluated by computing the density of individuals with DBH >10 cm and > 20 cm as well as the ratio of the former to the latter (Grubb *et al*., 1963). The patterns of species population structure detected were interpreted as a sign for the alteration in population dynamics in the forests (Popma *et al*., 1988).

The following structural parameters were calculated for some species following Mueller-Dombois and Ellenberg (1974), and Martin (1995) as follows:

Percent frequency of a species = the number of plots in which that species occurs /total number of plots multiplied by 100.

Relative frequency = Frequency of species A / total frequency of all species X 100.

Density of a species = the number of individuals of that species /area sampled.

Relative density = Density of species A /total density of all species X 100.

Basal area ($m^2$) = $(DBH/200)^2\pi$, where DBH is the diameter (cm) at breast height, $\pi$= 3.14.

Dominance = Total of basal area / area sampled

Relative dominance = Dominance of species A / total dominance of all species X 100.

Importance Value Index = Relative density + Relative frequency + Relative dominance

# 6. Results and Discussion

## 6.1. Ethnomedicinal plants used by the local people

A total of 176 species of medicinal plants (Appendix I) were gathered and documented from the study area out of which 102 species (57.95%) were noted to treat only human ailments while 20 species (11.36%) are used to treat only livestock ailments. Fifty four species (30.68%) are used to treat both human and livestock ailments. The informant consensus on these medicinal plants (Appendix II) could confirm the efficacy of these plants against some human and /or livestock ailments.

These medicinal plants are distributed among 141 genera and 71 families. The family Asteraceae had the highest number of species (28) than the other families. The next highest family in terms of species number is Apiaceae (11). Lamiaceae is the third (10), Solanaceae the fourth (9), Fabaceae the fifth (7), Rosaceae the sixth (6), Euphorbiaceae and Ranunculaceae the seventh (5), and Crassulaceae and Rubiaceae the eighth (4). The rest of the families are represented by at most three species.

The largest number of medicinal plants is collected from Sinana Dinsho District (139 species, 58.65%). This is a very big figure as compared to the one reported by B & M Development Consultants (2001) in which case only 36 plants have been recorded from the same district. The second largest number of medicinal plants is collected from Goba District (75 species, 31.65%). This is again a big figure as compared to the number of plants (41) reported by the same consultants from this district. The least number of species collected is from Adaba District (23 species, 9.71%).

Out of the total medicinal plant species documented, 8 species were reported as medicinal in all of the three districts, and 35 species were reported as medicinal in both Sinana Dinsho and Goba Districts. Likewise, nine species were reported as medicinal in both Adaba and Sinana Dinsho Districts, and two species in both Adaba and Goba Districts. These observations are good indicatives for the efficacy of the medicinal plants.

Out of the total medicinal plant collections in this study, 18 species occur in the medicinal plant list of Getachew Addis *et al*. (2001), 60 species in Mesfin Tadesse and Sebsebe Demissew (1992), 20 species in Menassie Gashew (1991), 10 species in Debela Hunde (2001), 5 species in Kebu Balemie *et al*. (2004), 22 species in Bayafers Tamene (2000), 29 species in Amare Getahun (1976) in Ethiopia, and 12 species in Anokbonggo (1992) outside Ethiopia. The widespread use of these plants by the different groups of societies could confirm their efficacy to a certain extent.

Analysis of the growth forms of these medicinal plants reveals that, herbaceous species constitute the largest number and /or proportion with 91 species (51.70%). The next largest growth form is represented by shrubs with 64 species (36.36%). Trees make up the third growth form with a total of 12 species (6.82%). Other growth forms of these medicinal plants include lianas with 2 species (1.14%), herbaceous climbers with 4 species (2.27%), trailing herb with 1 species (0.57%) and epiphytes with 2 species (1.14%) (Figure 3). This indicates that medical practitioners of the study area have been mostly depending on herbaceous species followed by shrubs. Similar observations have been reported in Mirutse Giday (1999).

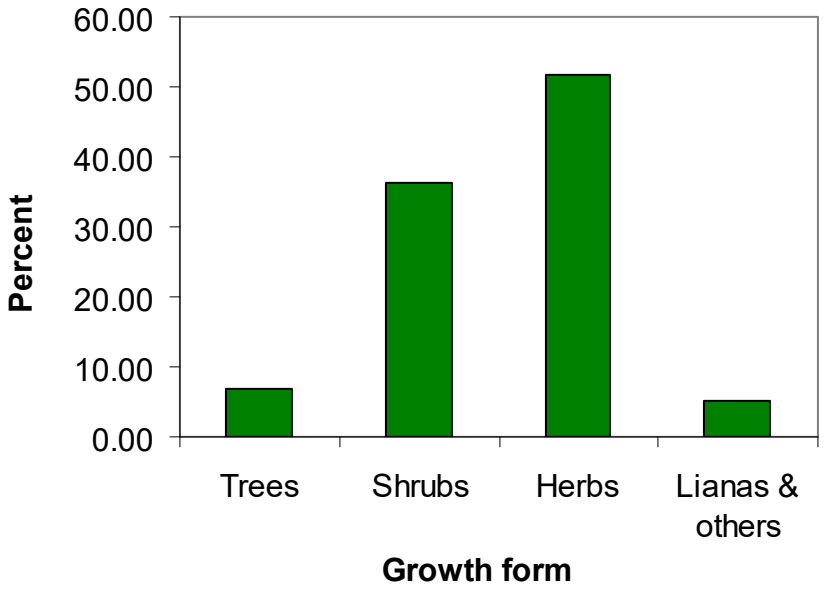



Figure 3. Percentage distribution of the growth forms of medicinal plants

With regard to the plant parts used for medicinal purposes, medical practitioners mostly harvest leaves (139 species, 40.88%) and roots (118 species, 34.71%) of the plants. The rest of the plant parts used to prepare medicines include fruits (19 species, 5.59%), seeds (16 species, 4.71%), barks (16 species, 4.71%), whole part (8 species, 2.35%), stem (7 species, 2.06%) and others (17 species, 5%) (Figure 4). The current investigation showed roots as the second most collected plant parts for medicinal purposes and this situation could be a severe threat for some rare and slowly reproducing medicinal plants at least in the long run. However, the collection of leaves for medicine preparation could be regarded as sustainable as far as some leaves are left over on the parent plant. Similar observations were also reported in Dawit Abebe and Istifanos Hagos (1991), Mirutse Giday (1999) and Bayafers Tamene (2000).

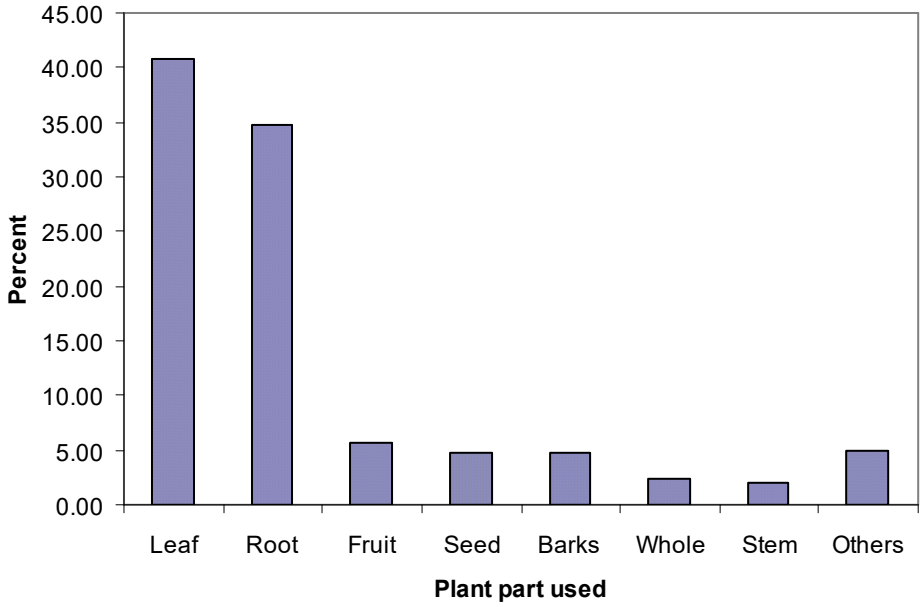
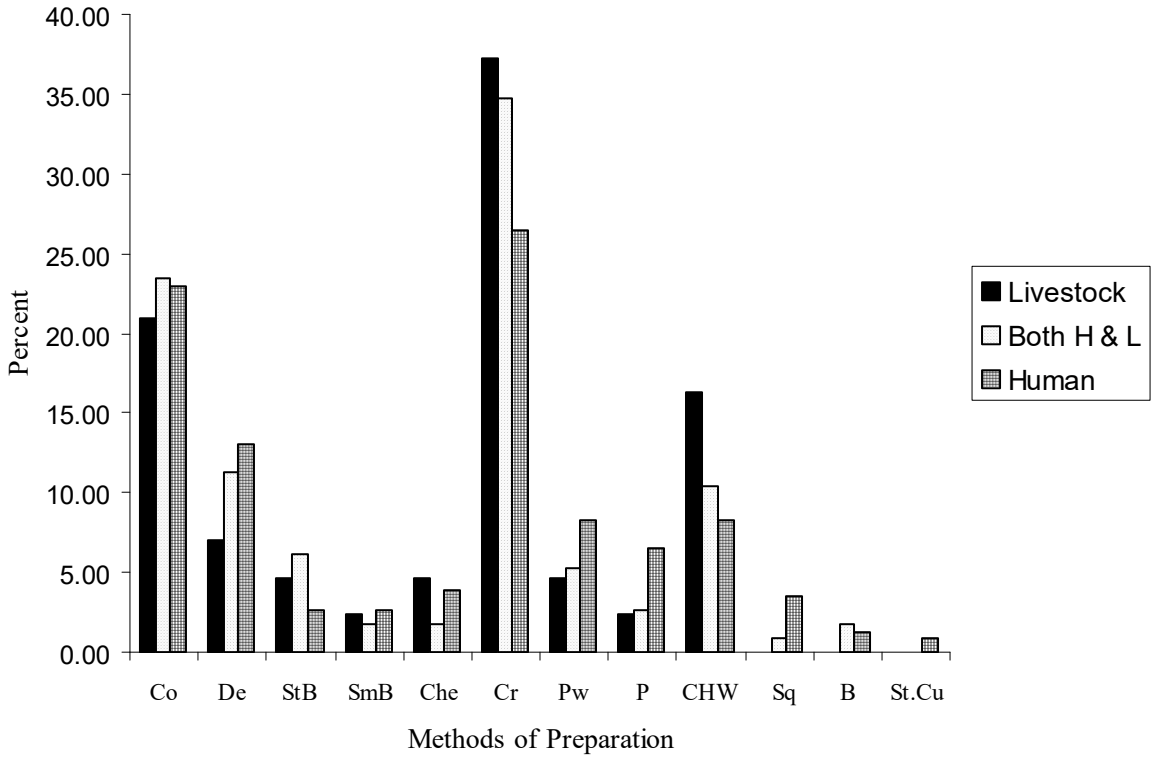



Figure 4. Percentage distribution of the plant parts used for medicinal purposes

The local people employ several methods in order to prepare traditional medicines from these plants. Some of the methods recorded in this study include concoction, decoction, steam bath, smoke bath, chewing, crushing, powdering, pounding, crushing and homogenizing with water, squeezing, burning, and stem cutting. However, crushing and concoction followed by decoction are the most frequently used methods of traditional medicine preparations in the study area

(Figure 5). The majority of these preparations are drawn from mixtures of different plant species for the treatment of a single ailment and a similar finding was seen in Dawit Abebe (1986).




**Key**: Co (concoction), De (decoction), StB (steam bath), SmB (smoke bath), Che (chewing), Cr (crushing), Pw (powdering), P (pounding), CHW (crushing and homogenizing with water), Sq (squeezing), B (burning), and St.Cu (stem cutting)

Figure 5. Methods of traditional medicine preparation

The major routes of traditional drug administration in the study area are oral, dermal, nasal, anal, auricular, optical, and intravenous. As can be seen from Figure 6, oral administration is the most dominant route of drug application. This is followed by dermal and then nasal administrations. Anal and the other routes of application are very infrequent. These findings are in line with Dawit Abebe (1986), Bayafers Tamene (2000), Debela Hunde (2001), and Kebu Balemie *et al*. (2004).

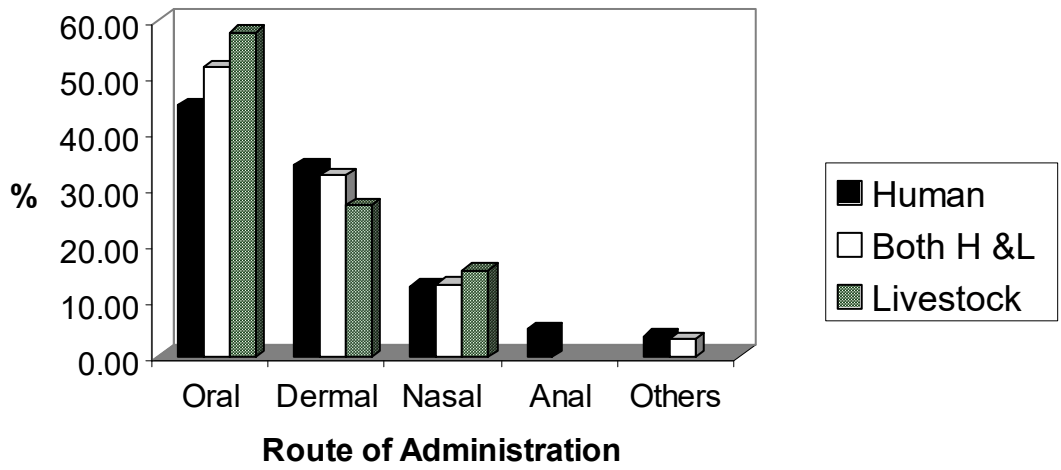



Figure 6. Percentage distribution of the routes of administrations of plant remedies

The various traditional medicines are prepared and applied from fresh and /or dried plant materials. But the vast majority of medicines are prepared from fresh materials. The traditional medicine practitioners believe that in most cases unless the medicinal plants are exploited in fresh for medicine preparations and immediate applications, their medicinal properties will either decline or will be lost totally. The second form of plants used for medicinal purposes is either fresh or dried forms and the last one is dried form of plants (Figure 7) indicating that the majority of the healers are dependent on fresh materials. The dependency of most healers on fresh materials could also aggravate the decline of rare medicinal plant species from the study area since the demand increases the frequency of harvest. This result is in line with Debela Hunde (2001) and Kebu Balemie *et al*. (2004).

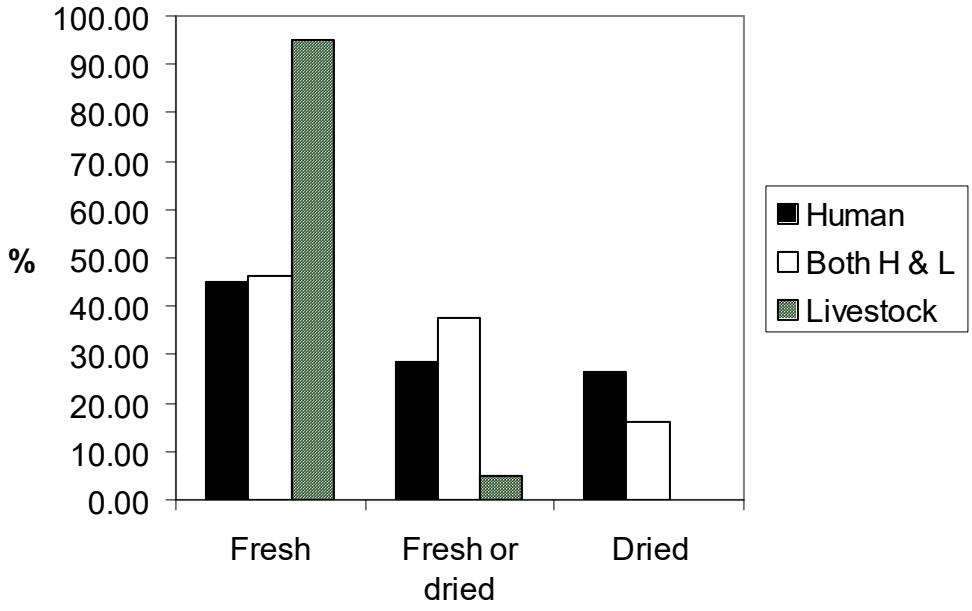
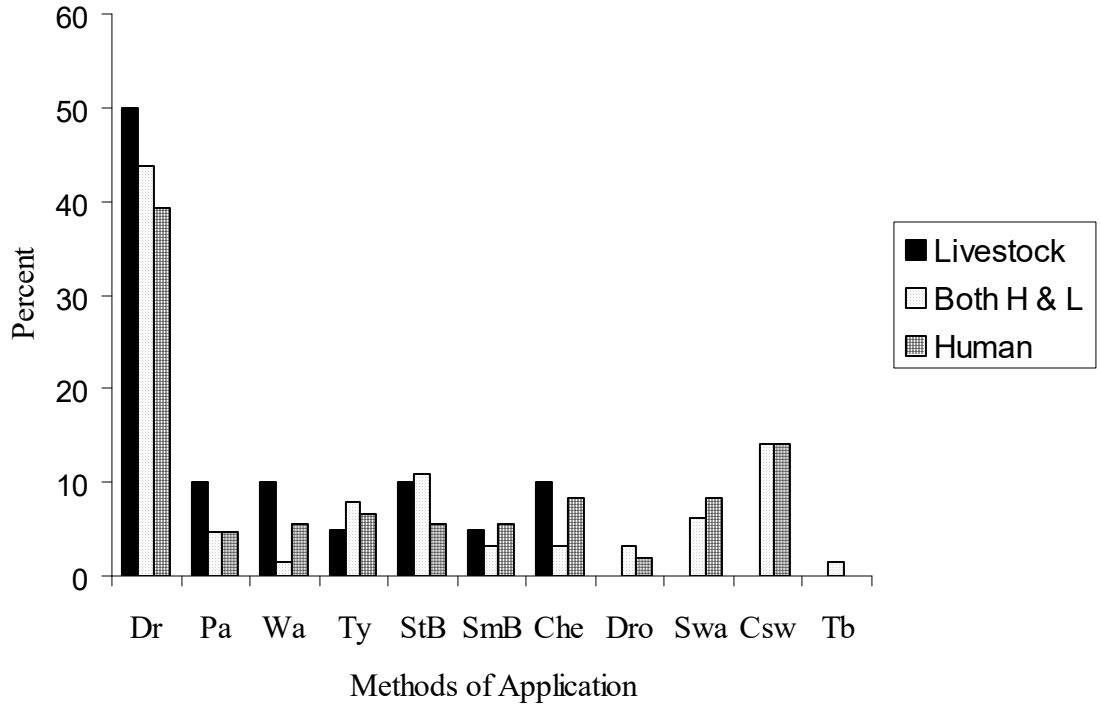



Figure 7. Proportion of fresh and /or dried plant materials used for medicinal purposes

The prepared traditional medicines are applied in a number of methods among which are drinking, painting, washing, tying, steam bath, smoke bath, chewing and swallowing, dropping, swallowing (direct eating), chewing and swallowing juice, and tooth brushing. But drinking the prepared medicines is the most frequently used method of traditional drug application in the current study area (Figure 8) and this is in line with Kebu Balemie *et al*. (2004).




**Key**: Dr (drinking), Pa (painting), Wa (washing), Ty (tying), StB (steam bath), SmB (smoke bath), Che (chewing and swallowing), Dro (dropping), Swa [swallowing (direct eating)], CSw (chewing and swallowing juice), and Tb (tooth brushing).

Figure 8. Methods of application of plant remedies

Practitioners often use any dry clean container (42.5%) to preserve traditional medicines. Almost equivalent proportions of informants (37.5%) do not of course have the habit of preserving traditional medicines but rather are totally depending on freshly prepared medicines. About 12.5% of the informants used to enclose prepared medicine with plastic bags while about 5% and 2.5% used to seal in bottle and in clean sheet of cloth respectively.

### 6.1.1. Medicinal plants used to treat human diseases

As described earlier, the local people utilize102 medicinal plant species (57.95%) to treat different human ailments (Appendix III). These plants are classified under 50 genera and 31 families. The different growth forms of human medicinal plants constitute herbs (55 species,

31.25%), shrubs (36 species, 20.45%), trees (5 species, 2.84%), herbaceous climbers (2 species, 1.14%), epiphytes (2 species, 1.14%) and liana (1 species, 0.57%) out of the total medicinal plant database (Table 3). Most of these plants (90 species, 88.24%) are collected from the wild indicating a significant harvesting pressure on the wild plant resources of the area. Of course, some (9 species, 8.82%) are cultivated and few (3 species, 2.94%) are either wild or cultivated (Figure 9). The dominance of wild collections is also reported in Mirutse Giday (1999), Bayafers Tamene (2000) and Debela Hunde (2001).

Table 3. Number and percent distributions of human, veterinary, and both human & veterinary medicinal plant species out of the total medicinal plant database

| | Human | | Both H & L | | Livestock | |
|---|---|---|---|---|---|---|
| Growth form | No | % | N0 | % | No | % |
| Herbs | 55 | 31.25 | 22 | 12.50 | 14 | 7.95 |
| Shrubs | 36 | 20.45 | 23 | 13.07 | 5 | 2.84 |
| Trees | 5 | 2.84 | 7 | 3.98 | | 0.00 |
| H (climbers) | 2 | 1.14 | 1 | 0.57 | 1 | 0.57 |
| Epiphytes | 2 | 1.14 | | 0.00 | | 0.00 |
| Lianas | 1 | 0.57 | 1 | 0.57 | | 0.00 |
| H (Creepers) | | 0.00 | 1 | 0.57 | | 0.00 |

***Key***: *H (climbers) = herbaceous climbers; H (Creepers) = herbaceous creepers*

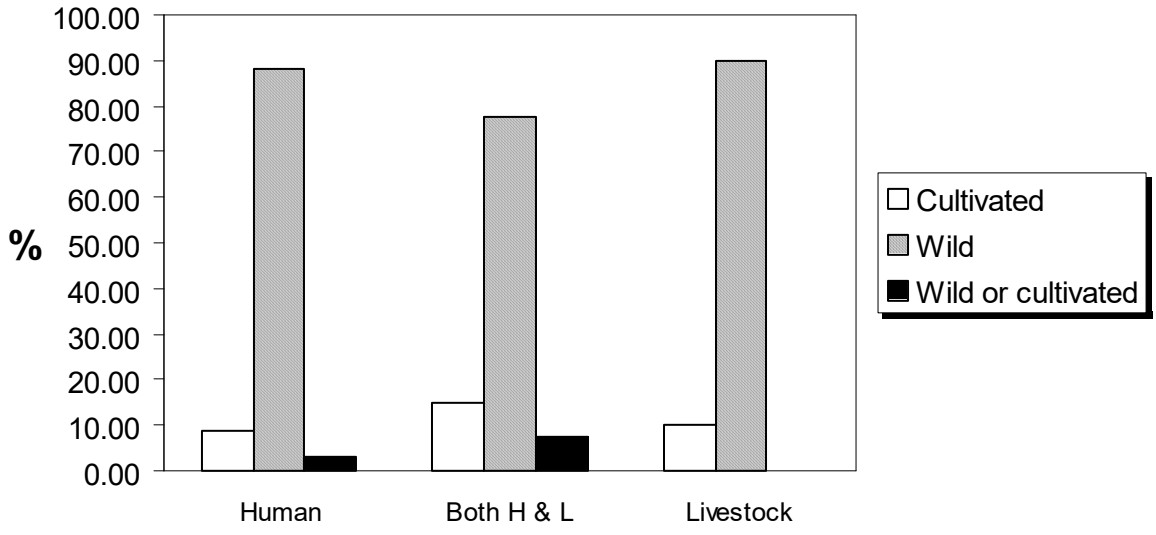



Figure 9. Graph showing percent distribution of the sources (habitats) of medicinal plants used by the local people to treat human, livestock, and both human & livestock ailments

The parts of these plants used for medicinal purposes are summarized in Figure 10. Leaves (105 species, 40.08%) and roots (85 species, 32.44%) are mostly used by the medical practitioners for medicine preparation. Fruits (17 species, 6.49%), barks (15 species, 5.73%), seeds (13 species, 4.96%), stems (7 species, 2.67%), whole part (6 species, 2.29%), and others (14 species, 5.34%) like flowers, latex, stem oil and twigs exhibited relatively low frequency of uses in this study. Even though most of the plant species are harvested for their leaves, considerable numbers of species are also harvested for their roots indicating some degree of threat on these plants. Similar results were also reported in Dawit Abebe and Istifanos Hagos (1991) and Mirutse Giday (1999). The dominance of leaf utilization was also observed in a study made by Bayafers Tamene (2000).

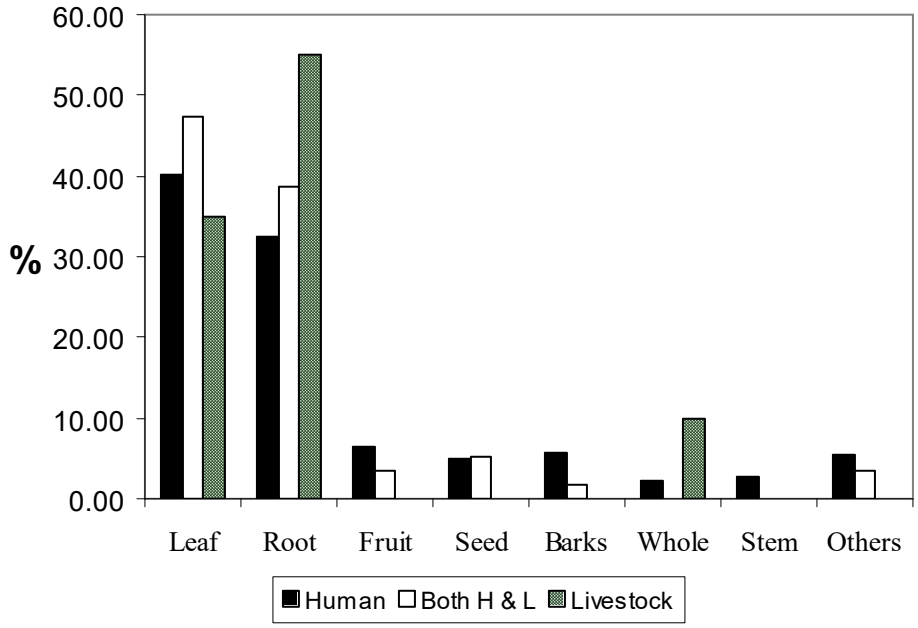



Figure 10. Plant parts used for treating human, both human & livestock, and livestock ailments

The most frequently applied methods of medicine preparation are crushing (61 species, 26.41%), concoction (53 species, 22.94%) and decoction (30 species, 12.99%). These are followed by powdering (19 species, 8.23%), crushing and homogenizing in water (19 species, 8.23%) and pounding (15 species, 6.49%). The other methods of drug preparation include chewing (9 species, 3.90%), squeezing (8 species, 3.46%), steam bath (6 species, 2.60%), smoke bath (6 species, 2.60%), burning (3 species, 1.30%), and stem cutting (2 species, 0.87%) (Figure 5).

Different routes are followed to apply the various traditional medicines. However, oral (110 species, 44.72%), dermal (84 species, 34.15%) and nasal (31 species, 12.60%) administrations are the usual routes of human drug application. Anal (12 species, 4.88%), auricular (6 species, 2.44%), optical (2 species, 0.81%) and intravenous (1 species, 0.41%) are relatively not commonly used routes of drug application (Figure 6). Similar results were also seen in Dawit Abebe (1986), Dawit Abebe and Ahadu Ayehu (1993), Mirutse Giday (1999), Bayafers Tamene (2000), Debela Hunde (2001) and Kebu Balemie *et al*. (2004).

The different parts of these human medicinal plants are processed and applied to patients from fresh materials (95 species, 45.02%), fresh or dried materials (60 species, 28.44%), and dried materials (56 species, 26.54%) (Figure 7). Thus the great majority of traditional medicines are prepared and applied to patients from fresh materials indicating the harvesting pressure on these plants. This is once more in line with Debela Hunde (2001) and Kebu Balemie *et al*. (2004).

Medical practitioners of the study area apply these preparations to patients using the following methods: drinking (42 species, 39.25%), chewing and swallowing juice (15 species, 14.02%), swallowing (eating) (9 species, 8.41%), chewing and swallowing (9 species, 8.41), tying (7 species, 6.54%), washing (6 species, 5.61%), steam bath (6 species, 5.61%), smoke bath (6 species, 5.61%), painting (5 species, 4.67), and eye or ear drops (2 species, 1.87%) (Figure 8). Thus drinking the prepared medicine is the most frequently used method of traditional drug application and this is in accordance with Kebu Balemie *et al*. (2004).

#### 6.1.1.1. Description of the most frequently reported medicinal plants used to treat only human ailments

##### *A. Olea europaea* (L.) subsp. *cuspidata* (Wall. ex G. Don) Cif., OLEACEAE

This is an evergreen tree, rarely a shrub, 5-15 m tall distributed in the Evergreen *Juniperus* – *Podocarpus* forest of the flora of Ethiopia and Eritrea (Afar, Eritrea, Tigray, Gondar, Welo, Shewa, Kefa, Gamo Gofa, Sidamo, Bale, Harerge) and Sudan, Somalia, South through East

tropical Africa to South Africa; Arabia, the Himalayas and SW Asia with altitudinal ranges of 1700-2700 (-3000) m (Green, 2003).

The fruits of the European subspecies are edible and sometimes used to extract oil. In Ethiopia leaves, twigs, and wood are used to fumigate milk containers. Twigs are also used as toothbrushes. The wood is hard, polishes well and has many uses, including carving (Green, 2003).

The stem and stem oil of this plant are used in the current study area to cure six human health defects namely, skin diseases, earache, evil spirit, hemorrhoids, eczema and *Qumata*. The stem oil of this plant is mixed with butter and powdered leaves of *Clematis hirsuta* for painting over the wound of patients with eczema. About three drops of the stem oil is also reported to be very effective against earache. Smoke bath and inhalation after burning the stem of this plant is also good to treat evil spirit cases (Appendix III).

Traditionally, this plant has a number of medical uses elsewhere in Ethiopia. According to Getachew Addis *et al*. (2001), the leaves, stem bark and exudates are respectively used to treat toothache, eczema and cutaneous leishmaniasis (*Yewof Beshita*). The stem oil is used to heal circumcision wound, skin disease and fumigation in humans (Bayafers Tamene, 2000). The bark and roots are respectively used to cure malaria (Abbink, 1995) and hemorrhoids (Mesfin Tadesse and Sebsebe Demissew, 1992). Hemorrhoids are also cured with the stem vapor of this plant. Smoke-bath of whole parts of this plant is used to treat mentally sick goats, running nose, cough and febrile illness (Debela Hunde, 2001). Menassie Gashew (1991) also found leaves as utilized for the treatments of skin allergies and dermatological disorders; sap for blood clotting; and oil for asthma and muscular aches.

## *B. Clerodendrum myricoides* (Hochst.) R. Br. ex Vatke, LAMIACEAE

*Clerodendrum myricoides* (Marasissa, Or.; Misirich, Amha.) is a suffrutescent herb, or erect, or scandent shrub up to 4 m tall. It is common in grassland, bushland, woodland, gallery forests, roadsides, rocky outcrops, lava plains, and termite hills at altitudes of 700-2600 m. This species

is distributed in the flora of Ethiopia and Eritrea (Eritrea, Tigray, Gondar, Welo, Shewa, Arsi, Welega, Ilubabor, Kefa, Gamo Gofa, Sidamo, Harerge), most parts of Africa, to Nigeria in the west and S Africa in the south, also in Madagascar (Ryding, in prep.).

Decoctions of roots are used to treat cough, headache, abdominal pains and malaria. The bark has been used against snakebites (Ryding, in prep.).

Seven human health defects are healed in the study area using the roots, leaves, twigs, fruits and root barks of this species. Bathing over the steam after boiling leaves of this species and *Clutia abyssinica* is for instance very helpful for the treatment of epilepsy. The rest of the human health problems healed with this species include headache, evil spirit, liver disease, dry cough, toothache and *Qilensa* (Appendix III).

The ethnomedical value of this plant is enormous elsewhere in Ethiopia. Root decoctions are applied as antidotes in poisonings (Amare Getahun, 1976). The root and whole plant parts are used to treat leprosy and hemorrhoids respectively (Mesfin Tadesse, 1986). Conjunctivitis, hemorrhoids and asthma can be cured using the whole plant parts (Mesfin Tadesse and Sebsebe Demissew, 1992). Roots and leaves of the plant are also used to treat gonorrhea and rabies (Getachew Addis *et al*., 2001). This plant is again very helpful for the treatment of pneumonia, malaria, gonorrhea, and diuretic (Dessalegn Dessissa, 2000). The roots of this plant are also used in Uganda for bursitis of the knee, and after rat or squirrel bite (Anokbonggo, 1992).

## *C. Solanum anguivi* Lam., SOLANACEAE

*Solanum anguivi* (Mujule Worabessa, Or.) is a herb or shrub c 2 m high that is common in evergreen bushland and semi-deciduous woodland, along trails in or at edges of lowland and mountain forest, usually a woody plant of waste places, at altitudes of 500-2800 m. It is distributed in the flora of Ethiopia and Eritrea (Eritrea, Welo, Gondar, Gojam, Welega, Shewa, Ilubabor, Kefa, Harerge), widespread in tropical Africa from Senegal to Somalia, south to Angola and Mozambique, also in tropical Asia from India to China and the Philippines. The plant

is sometimes cultivated in east Africa and elsewhere for its fruits that are edible. It is not known if it is cultivated in Ethiopia (Friis, in prep.).

Acute stomach illness, tinea versicolor, hemorrhoids, febrile illness, eczema and *Naqarsa* are the human ailments treated in the study area using the roots, leaves and fruits of this plant. Chewing the roots of this plant and swallowing the fluid is for instance very helpful for the treatment of febrile illness (Appendix III).

### *D. Euphorbia lathyris* L., EUPHORBIACEAE

This species is a robust erect annual to 1.5 m high introduced mainly as a medicinal plant. It grows at about 2000 m and is found in Shewa? Harerge and Europe. 'Seeds are eaten for headache, never with honey' (Gilbert, 1995).

Mostly the seeds and rarely the fruits of this plant are used in the current study area for the treatment of jaundice, gonorrhea, liver disease, hepatitis B and intestinal worms. Gonorrhea is for instance treated through the oral intake of crushed or powdered fruits or seeds early in the morning (Appendix III).

## 6.1.2. Medicinal plants used to treat livestock health problems

Medicinal plants recorded in this study for their veterinary use by the medical practitioners to treat only livestock health problems add up to 20 species (11.36%) (Appendix IV) and are grouped in 17 genera and 12 families. The majority of these plants are wild (18 species, 90%) and very few are cultivated (2 species, 10%) (Figure 9). As shown in Table 3, the growth forms of these plants constitute herbs (14 species, 7.95%), shrubs (5 species, 2.84%), and herbaceous climber (1 species, 0.57%) out of the total medicinal plants. These figures thus indicate that herbaceous plants are the most utilized medicinal plants for livestock health problems.

Roots account for the greatest (11 species, 55%) use parts of veterinary medicinal plants and leaves (7 species, 35%) are the next most exploited plant parts for ethnoveterinary medicine.

Whole parts (2 species, 10%) of some plants are relatively used to a lesser extent (Figure 10). This finding is similar to the study done by Debela Hunde (2001) and Kebu Balemie *et al*. (2004).

Similarly the most frequently applied modes of ethnoveterinary medicine preparation include crushing (16 species, 37.21%), concoction (9 species, 20.93%), and crushing and homogenizing in water (7 species, 16.28%) (Figure 5). This is again somehow close to the finding of Kebu Balemie *et al*. (2004).

The three common routes of drug application for livestock are oral (15 species, 57.69%), dermal (7 species, 26.92%) and nasal (4 species, 15.38%) administrations (Figure 6). Medicines prepared and applied from fresh materials (19 species, 95%) are by far the commonest forms of ethnoveterinary drugs (Figure 7). And the various medicinal preparations are taken mostly by drinking (10 species, 50%) (Figure 8). These results are also comparable with the result for human medicinal plants and Dawit Abebe (1986), Mirutse Giday (1999), Bayafers Tamene (2000), Debela Hunde (2001) and Kebu Balemie *et al*. (2004).

#### 6.1.2.1. Description of the most frequently reported medicinal plants used to treat livestock ailments only

##### *A. Solanecio gigas* (Vatke) C. Jeffrey, ASTERACEAE

This is a shrub or small tree 1.75-6 m high commonly found in margins and clearings in montane forest with *Juniperus* and *Hagenia*, gullies, riverbanks at altitudes of 1750 – 3350 m. It is endemic to Ethiopia (Gondar, Gojam, Welo, Shewa, Ilubabor, Kefa, Bale, Harerge) and not known elsewhere. This species is an extensively used medicinal plant in Ethiopia (Mesfin Tadesse, in press).

Leaves are used in the study area to treat hepatitis (*Dhukuba Alati*) in stock. To cure this disease, the crushed leaves of the plant are mixed with cold water and administered orally, and some amount is brushed over body parts (Appendix IV).

##### *B. Ocimum lamiifolium* Hochst. ex Benth., LAMIACEAE

This plant is a shrub or subshrub, 0.7 – 3 m tall found in clearings and edges of primary and secondary mountain forests and bushland, tall grassland, abandoned fields, with some tolerance for shadow, rarely also cultivated as an ornamental. It occurs at altitudes of 1200 – 2900 m in the flora of Ethiopia and Eritrea (Eritrea, Tigray, Gondar, Gojam, Shewa, Arsi, Welega, Ilubabor, Kefa, Gamo Gofa, Sidamo, Harerge), from East Africa to Malawi, Zaire and Cameroon (Sebald, in prep.).

In the study area this plant is used to heal two livestock ailments namely, hepatitis (*Dhukuba Alati*) and diarrhea (*Albati*). Root decoction is boiled with water and administered orally to treat hepatitis (*Dhukuba Alati*). The root of this plant, and leaves of *Vernonia amygdalina* and *Clutia abyssinica* are crushed in fresh and mixed with cold water for oral intake to treat diarrhea (*Albati*) (Appendix IV).

### *C. Cycniopsis humifusa* (Forssk.) Sengl., SCROPHULARIACEAE

Roots of this species are used in the current study area to treat hepatitis (*Dhukuba Alati*). Root concoction with *Vernonia amygdalina* is mixed with water for drinking against this disease. Crushed root is also mixed with water and administered orally and nasally. The residue is rubbed over backbone area (Appendix IV).

## 6.1.3. Medicinal plants used to treat both human and livestock diseases

A total of 54 (30.68%) medicinal plant species of human and veterinary importance were also gathered and documented in this study (Appendix V). These plants are classified under 50 genera and 31 plant families. The local people collect the majority of these plants (42 species, 77.8%) for medicinal and other purposes from wild habitats. Only 8 (14.8%) medicinal plant species of this category are cultivated and 4 species (7.41%) are either wild or cultivated (Figure 9). Shrubs (23 species, 13.07%); and herbs (22 species, 12.50%) are the most dominant growth forms of these plants. The number of tree species in this category is 7 (3.98%). The rest of the growth forms are very insignificant as compared to the total medicinal plant database (Table 3).

As that of medicinal plants for human use, the largest proportion of plant parts utilized for medicine preparations is accounted by leaves (27 species, 47.37 %) followed by roots (22 species, 38.60%). The other plant parts used include seeds (3 species, 5.26%), fruits (2 species, 3.51%), bark (1 species, 1.75%), and others (2 species, 3.51%) (Figure 10). These plant parts are commonly prepared and applied from fresh materials (26 species, 46.43%). Significant proportions are also used either in fresh or dried forms (21 species, 37.50%) and relatively few forms are dried (9 species, 16.07%) (Figure 7).

Crushing (40 species, 34.78%) and concoction (27 species, 23.48%) are here the commonest methods of drug preparation. Decoction (13 species, 11.30%) and crushing & homogenizing in water (12 species, 10.43%) follow these and the other methods used include steam bath (7 species, 6.09%), powdering (6 species, 5.22%), pounding (3 species, 2.61%), smoke bath (2 species, 1.74%), chewing (2 species, 1.74%), burning (2 species, 1.74%), and squeezing (1 species, 0.87%) (Figure 5).

These preparations are taken in different routes but oral (32 species, 51.61%) followed by dermal (20 species, 32.26%) are the usual routes of drug application. Nasal (8 species, 12.90%), auricular (1 species, 1.61%), and optical (1 species, 1.61%) are also used even though their use frequencies are relatively smaller (Figure 6). Drinking (28 species, 43.75%) the prepared medicines is here also the commonest method of drug application used by the local people (Figure 8). This outcome is in accordance with Kebu Balemie *et al*. (2004).

### 6.1.3.1. Description of most frequently reported medicinal plants used to heal both human and livestock ailments

#### *A. Allium sativum* L., ALLIACEAE

This plant is an herb usually cultivated in home gardens and in small-irrigated fields and it grows best with an altitudinal range of 1800-2800 m throughout the cooler parts of Ethiopia. Currently

it is being grown in all parts of the world and is employed for its variety of uses; like its medicinal value for a range of skin and stomach problems and also in the preparation of a variety of food types, more particularly in making dried foods for storage (Tewolde Berhan Gebre Egziabher & Sue Edwards, 1997).

In the current study area this plant is reported to treat 15 different human and 6 livestock ailments. One of the human diseases treated by the practitioners using this plant is acute stomach illness (*Agano*). Two fresh bulbs are eaten alone per day until the patient recovers from this disease. Another human disease treated by this plant is Asthma. Its bulb is concocted with roots of *Ranunculus multifidus* and *Cynoglossum coeruleum*, mixed with butter and given to the patient orally while laying on his back. Ringworm is also a human skin disease treated by this plant. Infected part is tied, burnt with glowing nail and painted with crushed root of *Carduus nyassanus, Arisaema schimperianum* and *Allium sativum*; and leaves of *Clematis hirsuta* and *Inula confertiflora*. Other ailments cured with this plant include diarrhea, evil eye, herpes zoster, earache, lung disease, hepatitis B, intestinal worms, *Kambussa, Naqarsa*, pneumonia, typhoid fever and eczema (Appendix V). The bulb of this plant is used elsewhere in Ethiopia to treat jaundice and cutaneous leishmaniasis (Getachew Addis *et al*., 2001).

The antifungal property of the freshly pressed juice of this plant is proved in a laboratory test by Dawit Dakisso *et al*. (2001) and this is in agreement with the current ethnomedical information i.e., its curative activity against ringworm. Alliin and allicin are steroid compounds known to occur in this plant (Glasby, 1991). Alliin has platelet aggregation inhibitor and antithrombotic activities. Allicin has antidiabetic, antihypertensive, antibiotic and antithrombotic activities (Harborne and Baxter, 1993). Thus the curative ability of this plant against the majority of the diseases listed in this study could be associated with the different properties of the steroid compounds alliin and allicin in the plant.

## *B. Rumex nepalensis* Spreng., POLYGONACEAE

*Rumex nepalensis* (Shabee, Or.; Tult, Amha.) is a perennial herb growing up to 2 m tall and is mostly common in disturbed habitats as a weed, and in Afroalpine moorlands. It grows best in an altitudinal range of 1200-3900 m. This plant is widely distributed in the flora of Ethiopia and Eritrea (Eritrea, Tigray, Gondar, Gojam, Welo, Shewa, Arsi, Welega, Ilubabor, Kefa, Gamo Gofa, Bale, Harerge). It is also common throughout Africa, Madagascar, S and E Asia (Hedberg, 2000).

The local people use this species to cure 12 human and 3 livestock diseases. Gonorrhea (*Chobto*) is one of the human ailments treated using this species. Root of *Asparagus africanus*, *Rumex nepalensis* and *Euphorbia schimperianum* are crushed and boiled with water for drinking against this disease. Liver disease, tinea versicolor, hepatitis B and evil spirit are also some other human diseases treated using the root of this plant (Appendix V).

Blackleg (*Aba Gorba*) is among the livestock diseases cured by the concoction of this plant with those of *Erythrina brucei, Vernonia myrantha, Ruta chalapensis, Nicotiana tabacum, Cucumis ficifolius, Allium sativum and Nigela sativa*. Diarrhea (*Albati*) is another livestock illness treated with the concoction of the roots of this plant and those of *Carduus nyassanus* and *Cynoglossum coeruleum* (Appendix V).

Elsewhere in Ethiopia, this plant is used ethnomedically to treat colic in livestock (Gemechu Wirtu *et al*., 1999), and as an antidote for poisoning as well as a laxative (Amare Getahun, 1976).

The anthraquinones: emodin and physcion have been found in this plant (Glasby, 1991). Emodin has atileukaemic and antitumour activities, and physcion has cathartic activity (Harborne and Baxter, 1993). Unfortunately these activities of the plant were not recorded in the current ethnomedical investigation.

### *C. Clematis hirsuta* Perr. & Guill., RANUNCULACEAE

This plant is a shrubby climber, 5 m tall or more, sometimes producing flexible long

stolons or runners. It is common in edges and remnant montane forests and bushlands, wood grassland, dissected plateau lava beds, roadsides and paths. It grows in the various regions of the flora of Ethiopia and Eritrea (Eritrea, Tigray, Gondar, Gojam, Welo, Shewa, Arsi, Ilubabor, Kefa, Sidamo, Bale, Harerge) and is also widely spread in many parts of tropical Africa and Arabia (Demel Teketay, 2000).

The practitioners of the study area use this plant to cure 9 human and 3 livestock ailments. Leaves of this plant are used to cure the human diseases like hemorrhoid, toothache, eczema, tuberculosis, *Ito*, ringworms, headache, and *Naqarsa*. This species is also very helpful for the treatment of the livestock diseases like *Chachabsa*, blackleg and *Naqarsa* (Appendix V).

The leaves of this plant are used elsewhere in Ethiopia for the treatment of hemorrhoids and *Naqarsa* in humans (Bayafers Tamene, 2000). Somewhere in Africa, the roots are used for otitis media and dental carries (Anokbonggo, 1992).

### *D. Verbascum sinaiticum* Benth., SCROPHULARIACEAE

*Verbascum sinaiticum* (Harboqana, Or.; Ye'ahiya Joro, Amh.) is a biennial plant distributed in cultivated ground and in grassland with an altitudinal range of 1300-3300 m in the various regions of the flora of Ethiopia and Eritrea (Eritrea, Shewa, Arsi, Harerge, Tigray, Gojam, Bale, Welega), Sudan, Somalia, Kenya, Sinai, Israel, Jordania and Syria to Afghanistan and the former Southern Russia (Fischer, in prep.).

Mostly the roots and occasionally leaves of this plant are used by the local people to heal ten human and four livestock ailments. Among the human ailments healed using this plant include Herpes zoster, *Naqarsa*, cold, diuretic, rabies, nosebleed, acute stomach illness and diarrhea. The livestock ailments on the other hand comprise *Chachabsa*, *Darissaa*, abdominal constipation and Hepatitis (*Dhukuba Alati*) (Appendix V).

Somewhere in Ethiopia, roots are applied to heal epilepsy and rabies (Getachew Addis *et*

*al.*, 2001), and gonorrhea (Debela Hunde, 2001). The roots are in addition used against diuretic, diarrhea and dysentery (Menassie Gashew, 1991). The flowers and roots of this plant are once more used to cure hemorrhage and hyperpigmentation (Mesfin Tadesse and Sebsebe Demissew, 1992). This plant is also used to heal kidney problems in humans (Dessalegn Dessissa, 2000), and blackleg and neonatal death in stock (Gemechu Wirtu *et al.*, 1999).

### *E.* ***Cucumis ficifolius*** **A. Rich., CUCURBITACEAE**

*Cucumis ficifolius* (Hanchote, Or.; Yemidir Embuay, Amh.) is a trailing perennial herb growing up to 4 m long. It commonly occurs in grasslands and wooded grasslands, *Acacia* woodland, rocky slopes, and also in secondary vegetation and cultivated places. It is found in some regions of the flora of Ethiopia and Eritrea (Eritrea, Tigray, Gojam, Shewa, Welega, Gamo Gofa, Harerge) and E Uganda, Kenya, Rwanda, and N Tanzania in an altitudinal range of 1300-2400 m (Jeffrey, 1995). Its root extract is used in local honey *Woine-Tej* to make beverage more intoxicating (Jeffrey, 1995).

In the current study area practitioners use mostly the roots and sometimes the fruits of this plant to heal nine human and two livestock ailments. Some of these human ailments include evil eye, gonorrhea, rabies, liver disease, elephantiasis, hemorrhoids and eczema. Whereas blackleg and *Chachabsa* are the two livestock ailments healed using this plant (Appendix V).

Somewhere in Ethiopia, fruits and whole plant parts are used to heal infected sores, diarrhea, stomach disorder and for poisoning protection (Bayafers Tamene, 2000). Leaves are used against gonorrhea. The roots are applied against toothache, abdominal colic (*Kurtet*), rabies, and diuretic (Getachew Addis *et al*., 2001). The fruits and roots are respectively used to cure scabies (Mesfin Tadesse, 1986), and gonorrhea (Mesfin Tadesse and Sebsebe Demissew, 1992). Thus the current information with regard to gonorrhea and rabies are in line with these findings.

## *F. Withania somnifera* (L.) Dun., SOLANACEAE

*Withania somnifera* (Hunso, Hunzo, Unzo, Or.; Gizawa, Amh.) is a shrub, subshrub, or woody-based herb, that grows up to 2 m high and usually grows in cultivations, in disturbed places in the highlands, on lake shores, along temporary steams, on river banks, and in disturbed places in open woodland and in *Acacia-Commiphora* bushland in the lowland of the flora of Ethiopia and Eritrea (Eritrea, Tigray, Welo, Afar, Gondar, Gojam, Shewa, Kefa, Gamo Gofa, Sidamo, Harerge), Djibouti, Somalia; widespread in the Mediterranean and Asia, reaching as far as the Canary Islands in west and east to southern Asia, and Australia; also widespread in tropical and South Africa; at altitudes of 600 – 2700 m (Friis, in prep.).

This plant has narcotic properties; its wide distribution must be partly due to dispersal by man. In traditional medicine decoctions of the plant are used, for example, as painkillers (Friis, in prep.).

In this study commonly the roots, occasionally the leaves and very rarely the stem barks were found to be very helpful for the treatment of eight human and two animal diseases. Some of the human diseases encompass gastritis, influenza, evil eye, gonorrhea, eye disease, evil spirit, cold and *Qilensa*. Whereas the two animal diseases are *Darissaa* and evil spirit (Appendix V).

Elsewhere in Ethiopia, the roots, leaves and roots, and leaves are used to treat hysteria (*Likift*), evil eye, and jaundice respectively (Getachew Addis *et al*., 2001). Leaves and roots are also applied to heal stomach disorder, evil eye, and evil spirit (Bayafers Tamene, 2000; Dessalegn Dessissa, 2000; Kebu Balemie *et al*., 2004). The roots are used to heal febrile illness, evil eye and anthrax (Mirutse Giday, 1999; Debela Hunde, 2001), headache (Mesfin Tadesse & Sebsebe Demissew, 1992), and malaria (Mesfin Tadesse, 1986). This plant is also used to treat eye diseases (Kebu Balemie *et al*., 2004), typhoid and chest pain (Mirutse Giday, 1999). Some of these information like the use of the plant for stomach disorder, evil eye, evil spirit and eye disease are in line with the current study.

## *G. Silene macrosolen* A. Rich., CARYOPHYLLACEAE

This is an erect perennial herb growing 30-(60) (-90) cm high and mostly occurs on steep rocky slopes in soil pockets and crevices, less often in black valley bottom soils in grassland. It is found in some regions of the flora of Ethiopia (Tigray, Gondar, Welo, Shewa, Arsi, Sidamo, Bale, Harerge), and Sudan, Kenya and Tanzania with altitude ranges of (1900)-2500-3600 (Gilbert, 2000).

About ten human and two animal diseases are treated in the study area using the roots of this plant. Root and leaves of *Euphorbia depauperata and* roots of *Silene macrosolen* and *Rumex abyssinicus* are crushed, mixed with water and honey, and warmed for drinking to treat one of the human diseases called hepatitis B. Some other human ailments include *Aininas*, diarrhea, headache, evil eye, eye disease, liver disease, acute stomach illness and cold. The roots of this plant are also very helpful to treat the livestock diseases known as *Darissaa* and hepatitis (*Dhukuba Alati*) (Appendix V).

Elsewhere in Ethiopia, this plant is used to heal evil spirit and stomachache (Dessalegn Dessissa, 2000) and this is in agreement with the current result.

## *H. Leonotis ocimifolia* (Burn.f.) Iwarsson., LAMIACEAE

*Leonotis ocimifolia* (Urgo, Or., Yefers Zeng, Amh.) is a shrub 1-5 m tall found often near rocky outcrops in shallow soil, in mountain forest margins, grassland often on disturbed grounds, roadside and abandoned cultivations at altitudes of 500-3700 m. This species is distributed in the flora of Ethiopia and Eritrea (Eritrea, Tigray, Gondar, Welo, Gojam, Shewa, Arsi, Welega, Ilubabor, Kefa, Gamo Gofa, Sidamo, Bale, Harerge), from East Africa to South Africa (Iwarsson, in prep.).

Typically the leaves and on the odd occasion the roots of this plant are used in the study

area for the treatment of nine human and two livestock diseases. An example of a human disease healed by chewing the leaves and swallowing the fluid of this plant is gastritis. The rest of the human ailments comprise abdominal distension, acute stomach illness, headache, breast pain, constipation, madness, hepatitis B and febrile illness. Anthrax and *Badhaftu* are the two animal ailments cured with this plant (Appendix V).

The flower and roots of this plant are used somewhere in Ethiopia to heal gout, leishmaniasis, and *Naqarsa* (Mesfin Tadesse & Sebsebe Demissew, 1992).

## *I. Asparagus africanus* Lam., ASPARAGACEAE

*Asparagus africanus* (Serritii, Or.) is an erect or climbing or scrambling shrub growing up to 6 m long. It is common in the *Acacia* woodland, secondary forests, and forest margins and as hedgerows in the flora of Ethiopia and Eritrea (Eritrea, Tigray, Gondar, Gojam, Welo, Shewa, Arsi, Welega, Kefa, Gamo Gofa, Sidamo, Bale, Harerge) and Sudan, Somalia, Uganda, Kenya, Tanzania to S Africa, and Arabia to India in the altitudinal ranges of (700-) 1450-2900(-3800) m (Sebsebe Demissew, 1997).

The local people use the roots, leaves, fruits and stem barks of this plant to cure the human health defects like breast pain, scabies, gonorrhea, rabies, liver disease, impotence, eczema and *Dhibee Kabana*. These parts of the plant are also used to treat animal health defects like rabies and *Hudhaa* (poisons) (Appendix V).

The leaves and stem of the plant are used elsewhere in Ethiopia to cure gastritis, breast swelling, general malaise and body swelling in humans (Kebu Balemie *et al*., 2004). Leaves are used to treat circumcision wound (Bayafers Tamene, 2000), and roots for hemorrhoids (Mesfin Tadesse, 1986). Somewhere in Africa, fruits are used for purulent conjunctivitis (Anokbonggo, 1992). The information regarding breast problem is in line with the current result.

### *J. Vernonia amygdalina* Del., ASTERACEAE

This plant is a shrub or small tree, 2-10 m high commonly occurring in *Podocarpus* or *Pouteria* forest, usually in open spots near streams, or in fringe of glades, secondary forests, evergreen woodland and bush land, roadsides, wasteland, and also grown in backyard gardens of the flora of Ethiopia and Eritrea (Eritrea, Tigray? Welo, Gondar, Gojam, Shewa, Welega, Ilubabor, Kefa, Gamo Gofa, Sidamo, Bale, Harerge) and Sudan, Uganda, Kenya, Tanzania, and Yemen with altitude ranges of (650-) 1200-3000 m (Mesfin Tadesse, in press).

The leaves of this plant are used together with those of *Rhamnus prinoides* L'Herit. in the preparation of a local beer (*Tella*) but more commonly they are used as fumigants. The bark is used as a febrifuge (Mesfin Tadesse, in press).

*Vernonia amygdalina* is used in the study area for the treatment of six human and three livestock ailments. A decoction of the leaves of this plant and the stem internal bark of *Hagenia abyssinica* are used in the treatment of ascariasis and expulsion of other intestinal worms in humans. This plant is also used to heal the human health defects like hepatitis B, nosebleed, cold and eczema. The leaves of this plant are also very helpful to cure the livestock ailments like diarrhea, scabies and hepatitis (*Dhukuba Alati*) (Appendix V).

Elsewhere in Ethiopia, the leaves and roots are used against malaria (Mesfin Tadesse, 1986; Mesfin Tadesse & Sebsebe Demissew, 1992). The sap is used as a purgative and dried flower is used for stomach disorder (Amare Getahun, 1976). As found somewhere in Africa, leaves have strong oxytoxic agent and induce strong uterine contractions (Anokbonggo, 1992).

## 6.2. Common health problems in the study area

In this study a total of 74 human and 25 livestock ailments were reported and their frequency of report and the number of medicinal plant species used is given in Appendix VI. The most recurrently reported human health problem with a frequency of report 21 is hepatitis B (*Dhibee*

*Sinbiraa*). About 22 different plant species are reportedly used to treat this disease and some of these are used alone while most are applied in combinations. The next most frequently informed human disease with a frequency of report 19 is gonorrhea (*Chobto*) and the local people utilize about 18 medicinal plants to treat this disease. *Naqarsa* and *Qilensa* [*Harassa (Yebird Beshita*)] are the third recurrently reported human diseases for which the local people use 17 and 21 medicinal plant species respectively to treat them. Among the 74 human illnesses, the lowest frequency (1) belongs to abdominal pain, *Aininas*, dry cough, elephantiasis, eyebrow irritation, headache and oral sore of children, impotence, *Kaliti*, madness, menstrual problem, pharingitis, pneumonia, *Quruba*, *Rajoo*, dandruff, spasm, stabbing pain and taeniasis.

With regard to livestock health problems blackleg, *Darissaa (Gamoji or Zalaqa*) and hepatitis (*Dhukuba Alati*) constitute the most regularly reported ailments each with a frequency of report 16. The local people use about 19 medicinal plants to treat the first illness while each of the latter two diseases are treated using 17 medicinal plant species. Diarrhea (*Albati*) is the next livestock ailment whose frequency of report is 9 and treated with 12 medicinal plant species. This is followed by nose swelling in mules (*Chachabsa*) that is treated with the involvement of about six medicinal plant species. Evil eye, eye disease, *Gonde*, lung disease, *Rajoo*, swelling and *Tigani* are animal illnesses with the lowest frequency of report (1).

The result of the preference ranking excercise for the seven medicinal plant species used to treat the most frequently reported human ailment, i.e., hepatitis B (*Dhibee Sinbiraa*) is given in Table 4. As shown in this table, *Rumex abyssinicus* ranked first and hence is the most effective medicinal plant to cure this illness. The second, third, fourth and fifth most preferred medicinal plants against this disease are *Hagenia abyssinica, Silene macrosolen, Rumex nepalensis*, and *Nigella sativa*. The medicinal plant species with the lowest total score that ranked 7$^{th}$ is *Allium sativum* indicating that this species is the least preferred of the seven medicinal plants for the treatment of hepatitis B.

Table 4. Preference ranking of seven medicinal plants used to treat hepatitis B in humans (*Dhibee Sinbiraa*).

| Species | *Allium sativum* | *Rumex nepalensis* | *Silene macrosolen* | *Leonotis ocimifolia* | *Hagenia abyssinica* | *Nigella sativa* | *Rumex abyssinicus* |
|---|---|---|---|---|---|---|---|
| **Respondents** | **A** | **B** | **C** | **D** | **E** | **F** | **G** |
| **R1** | 1 | 6 | 5 | 4 | 3 | 2 | 7 |
| **R2** | 2 | 4 | 1 | 3 | 6 | 5 | 7 |
| **R3** | 1 | 2 | 4 | 5 | 7 | 3 | 6 |
| **R4** | 1 | 3 | 7 | 2 | 6 | 4 | 5 |
| **R5** | 7 | 1 | 3 | 2 | 4 | 5 | 6 |
| **R6** | 1 | 2 | 5 | 3 | 6 | 4 | 7 |
| **R7** | 1 | 7 | 6 | 4 | 2 | 3 | 5 |
| **R8** | 1 | 4 | 3 | 5 | 7 | 6 | 2 |
| **R9** | 4 | 3 | 2 | 5 | 7 | 1 | 6 |
| **R10** | 1 | 4 | 6 | 2 | 5 | 3 | 7 |
| **R11** | 7 | 6 | 5 | 1 | 4 | 3 | 2 |
| **R12** | 2 | 1 | 3 | 5 | 7 | 4 | 6 |
| **R13** | 1 | 3 | 4 | 6 | 5 | 2 | 7 |
| **R14** | 7 | 6 | 2 | 1 | 4 | 3 | 5 |
| **R15** | 1 | 5 | 6 | 2 | 4 | 3 | 7 |
| **Total** | **38** | **57** | **62** | **50** | **77** | **51** | **85** |
| **Rank** | **7** | **4** | **3** | **6** | **2** | **5** | **1** |

The degree of similarities and differences in the way informants responded in ranking plants used to treat hepatitis B (*Dhibee Sinbiraa*) is shown by the dendrogram in Figure 11 after hierarchical cluster analysis of the result for the preference ranking excercise. As can be seen in this dendrogram, the respondents are clearly separated in two cluster levels, the first and deviating group consisting of R11, R14 and R5 and the rest of the respondents consisting of the second and major group. The deviation of the first group (i.e., R11, R14 and R5) from the majority of the respondents could be ascribed to the experience of traditional medication or area of specialization in healing the different ailments.

An attempt was made to assess the background of the three respondents regarding their responsibilities among their family members and nature of their occupation. R11, R14 and R5 are

farmers whose livelihood totally depends on agricultural activities. As a result they don't have enough time to provide full time service for patients and this might have resulted these informants to be relatively less experienced than the rest of the informants. Thus the relatively less experience of these informants to the traditional healing systems might have contributed to the variations in knowledge from the rest of the informants.

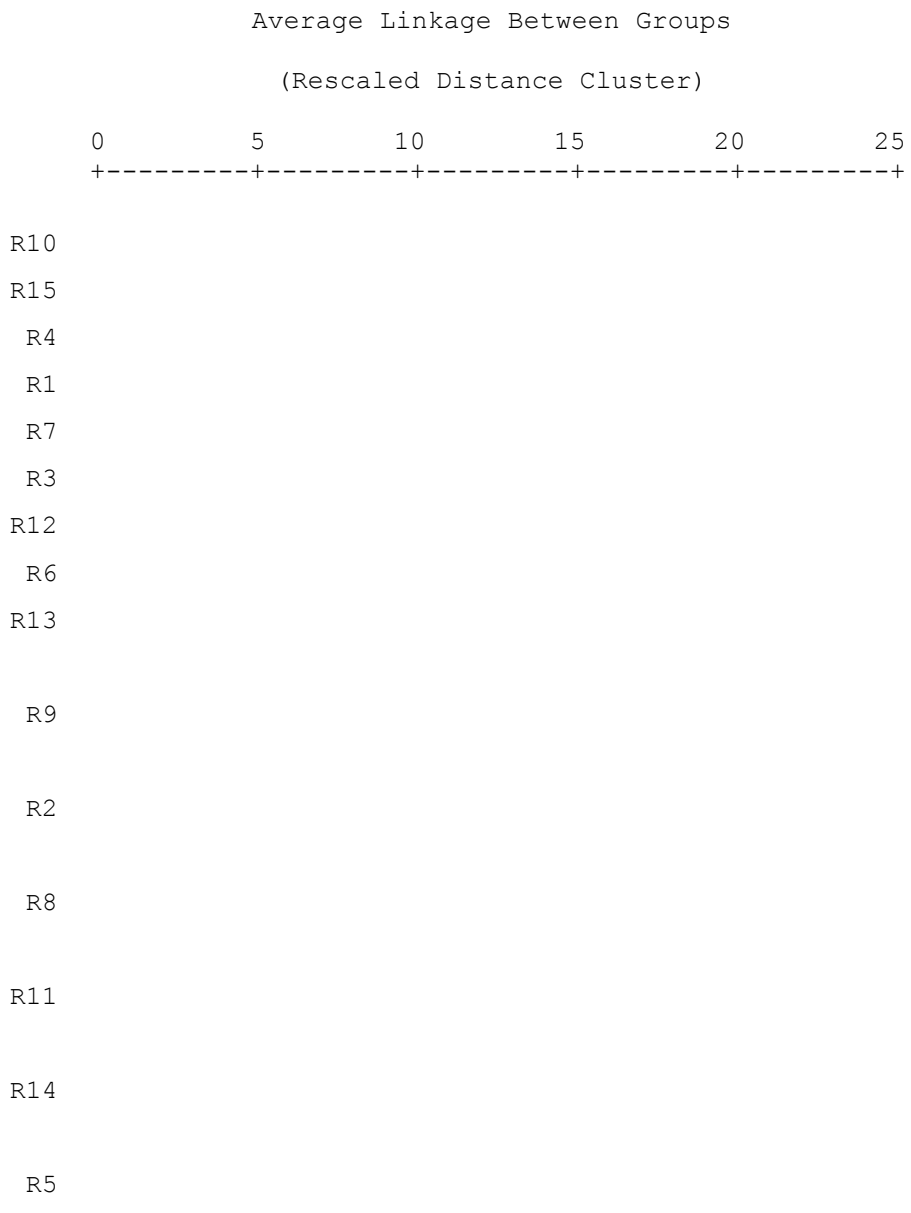


Figure 11. Information correspondence of informants on plants used to treat hepatitis B (*Dhibee Sinbiraa*)

Healers mainly diagnose patients through visual inspection (62.5%), through interviewing and visually inspecting (30%) and through interviewing patients (7.5%).

The traditional medicine practitioners have no traditionally adopted mechanism of preventing the majority of these diseases (76.25%) prior to infection. Of course they are using pretreatments for about 12.5% of the ailments. The other methods of prevention that are being applied for the smallest proportions of the ailments reported include avoiding to sit down on glowing stones, avoiding bad smells and wearing wet cloths, refraining from eating oil under direct exposition to sunlight, having faithful partner, isolating patients, and hand cleansing before eating.

## 6.3. Side effects of traditional medicines and common antidotes used

The majority of the respondents (about 90%) reported that the traditional medicines that they are preparing and applying to combat the various health defects have no noticeable side effects on patients. However, some of the respondents (10%) have genuinely informed noticeable side effects like vomiting, diarrhea and temporary unconsciousness that frequently occur while using traditional drugs against gonorrhea, rabies and hepatitis B. Temporary irritation and /or itching are other side effects usually observed on patients of hemorrhoids, eczema and scabies. Sneezing and /or coughing are common while healing pharingitis and tonsillitis cases and severe headache is often associated with the use of traditional medicines against *Rajoo*. The occurrence of side effects while using traditional drugs has also been reported in Mirutse Giday (1999).

According to the information obtained from about 10% of the informants, the major reason behind any noticeable side effects of the traditional drugs is the lack of precision on the dose of the medicines that they are prescribing for patients. Usually over-dose prescriptions are associated with serious side effects and /or death. It was understood during the semi-structured interviews that a woman at Dinsho passed away because of a traditional drug prescription by a

given practitioner without proper dosage. Most of the practitioners (70%) estimate the amount of medicines using various local measurement methods. They apply prepared medicines on skin diseases and related problems depending on the size of the infected wounds or sores. Tea cups, cans, coffee cups, *Jogs,* horns, spoons, *Tassa*, *Kubaya, Melekia*, water glasses, lids and forefinger are the usual equipments used by the medical practitioners to estimate the amount of traditional drugs. Handfuls, drops, plant leaf counting, seed counting and holding powder form among two fingers are also some of the common measurement methods used.

The frequency of use and length of hours, days or weeks also vary among the practitioners. Significant numbers (30%) of the informants once more do not have a means for estimating traditional medicines and are following random guesses. Of course, almost all of the traditional medications in Ethiopia lack precisions and standardization of dosages as can be seen from the studies made by Amare Getahun (1976), Mirutse Giday (1999), Bayafers Tamene (2002), Debela Hunde (2001) and Kebu Balemie *et al*. (2004).

Despite the fact that the use of traditional drugs are associated with some kinds of side effects, practitioners of the current study area are experienced in the provision of antidotes against the side effects. The common antidotes used against vomiting are for instance, *Besso* (Mixture of roasted barley flour, spices and cold water), coffee, milk and milk products like yogurt. Antidotes for itching and /or irritations are usually applying butter, drinking milk and soup. Honey is also used as an antidote for a number of traditional drug consequences.

## 6.4. Use diversity of medicinal plants

In this study a number of medicinal plants were found to be multipurpose species being utilized for a variety of uses. About 27.88% of the medicinal plant species are used as forage, 19.23% for fencing, and 17.31% for firewood. The other most common use of the medicinal plants is construction, accounting for 15.87%. The rest of the use diversities employ few of the medicinal plants (Table 5).

Table 5. The use of medicinal plants other than their medicinal value

| Uses | No | % |
|---|---|---|
| **Ceremony celebration** | 2 | 0.962 |
| **Construction** | 33 | 15.87 |
| **Fencing** | 40 | 19.23 |
| **Firewood** | 36 | 17.31 |
| **Detergent** | 2 | 0.962 |
| **Charcoal** | 5 | 2.404 |
| **Furniture** | 9 | 4.327 |
| **Food** | 5 | 2.404 |
| **Food spice** | 6 | 2.885 |
| **Forage** | 58 | 27.88 |
| **Fastener** | 1 | 0.481 |
| **House cleansing** | 4 | 1.923 |
| **Fishering** | 1 | 0.481 |
| **Making alcoholic drinks** | 3 | 1.442 |
| **Ornamental** | 1 | 0.481 |
| **Stimulant, commercial** | 2 | 0.962 |

Seven commonly reported multipurpose species and eight use diversities were involved in the direct matrix ranking excercise in order to evaluate their relative importance to the local people and the extent of the existing threats. Fifteen 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, 0 = not used) for each species. Accordingly, each key informant gave use values for the seven multipurpose medicinal plant species and average value of each use-diversity for a species was taken and the values of each species were summed up and ranked (Table 6).

As shown in Table 6, *Olea europaea, Hagenia abyssinica* and *Juniperus procera* were ranked as 1$^{st}$, 2$^{nd}$, and 3$^{rd}$ respectively and hence are the most preferred medicinal plants by the local people for various uses. These species are more predominantly used for firewood and construction purposes than their medicinal values. *Millettia ferruginea* (4$^{th}$) and *Pittosporum viridiflorum* (5$^{th}$) are the other multipurpose species used by the local people in a number of ways. *Millettia*

*ferruginea* is used more predominantly for construction and fencing purposes, and *Pittosporum viridiflorum* for firewood, construction and fencing purposes than for medicinal purposes.

Similarly, the values for use diversities across the selected species were summed up and ranked (Table 6). The result shows that the local people harvest the seven multipurpose species mainly for firewood (1st), construction (2nd) and medicinal (3rd) purposes. Thus the long-term survival of the top-ranked species is under question if the exploitation of these plants continues with the existing rate.

Table 6. Average score for direct matrix ranking of seven medicinal plant species based on their general use values (5=best, 4=very good, 3=good, 2=less used, 1=least used, 0=not used).

| **Species** | **Use Diversity** | | | | | | | | **Total** | **Rank** |
|---|---|---|---|---|---|---|---|---|---|---|
| | Firewood | Forage | Construction | Furniture | Food | Charcoal | Fencing | Medicine | | |
| *Hagenia abyssinica* | 5 | 2 | 5 | 3 | 0 | 4 | 4 | 4 | **27** | **2** |
| *Juniperus procera* | 5 | 2 | 4 | 3 | 0 | 4 | 5 | 3 | **26** | **3** |
| *Pittosporum viridiflorum* | 5 | 2 | 4 | 3 | 0 | 3 | 4 | 3 | **24** | **5** |
| *Olea europaea* subsp.*cuspidata* | 5 | 3 | 5 | 4 | 2 | 3 | 4 | 4 | 30 | 1 |
| *Myrica salicifolia* | 4 | 2 | 5 | 3 | 0 | 2 | 2 | 5 | **23** | **6** |
| *Salix mucronata* | 5 | 2 | 4 | 4 | 0 | 1 | 2 | 4 | **22** | **7** |
| *Millettia ferruginea* | 4 | 0 | 5 | 4 | 0 | 3 | 5 | 4 | **25** | **4** |
| **Total** | **33** | **13** | **32** | **24** | **2** | **20** | **26** | **27** | | |
| **Rank** | **1** | **7** | **2** | **5** | **8** | **6** | **4** | **3** | | |

## 6.5. Major threats to medicinal plants

Many medicinal plants in the study area are highly threatened with anthropogenic and natural factors. While conducting the semi-structured interviews, informants were asked to list the major threats to each medicinal plant and the result of analysis of this information is shown in Table 7. The majority of medicinal plants (122 species, 28.77%) are highly threatened with agricultural expansion. The impact of this factor can also be easily judged seeing the extensive barley and wheat cultivations in and around the park along the main track. Intensification of the agricultural

system like ploughing using heavy machines such as tractors, application of herbicides and other chemicals is also a disaster for a number of medicinal plants that exist as weeds or that grow on agricultural fields.

Deforestation for various purposes is the next severe threat that is responsible for the decline of about 103 (24.29%) medicinal plant species in the area. As observed during market days simply standing near a major road where many people use it to go to market, huge bunches of firewood were frequently transported to market places for sale. Very large numbers of stumps were also observed in the Bale Mountains National Park (Adelle forest) and many wood carriers were seen while cutting and collecting tree logs at this site. Illegal lumber productions and sales were also observed in villages and market places. Moreover, the local people are using indigenous tree species, most frequently *Juniperus procera,* for various construction purposes and fencing. These situations in combination with the ever-increasing human population pressure can easily show the extent of deforestation of woody species like *Juniperus procera* and *Hagenia abyssinica* by the local people. The effect of deforestation on medicinal plants is also reported in Mirutse Giday (1999). The third major factor affecting about 95 (22.41%) medicinal plant species is drought while the rest of the threats have reportedly affected smaller number of medicinal plant species.

The impact of trade was also evaluated indirectly by asking informants whether a given medicinal plant is marketable or not. Consequently, about 27.27% of the total medicinal plants were reportedly marketable whereas about 72.73% were not marketable. Thus, trade is not as such a pronounced threat for the majority of these medicinal plants. This outcome is in line with Dawit Abebe and Istifanos Hagos (1991), Mirutse Giday (1999) and Kebu Balemie *et al*. (2004).

Table 7. Percent of medicinal plants affected by the different threat factors

| Threat | Number of plants affected | Percent |
|---|---|---|
| Agricultural expansion | 122 | 28.77 |
| Deforestation | 103 | 24.29 |
| Drought | 95 | 22.41 |
| Over-harvesting | 28 | 6.60 |
| Overgrazing /Over-browsing | 28 | 6.60 |
| Fire | 24 | 5.66 |
| Frost | 13 | 3.07 |
| Weeding | 2 | 0.47 |
| Disease /fungal infections | 2 | 0.47 |
| Insect attach | 2 | 0.47 |
| Harvesting before flowering & fruiting | 2 | 0.47 |
| Herbicides | 1 | 0.24 |
| Rats eating the roots | 1 | 0.24 |
| Loss of indigenous knowledge | 1 | 0.24 |

Information with regard to the status of medicinal plants was also collected during the semi-structured interviews in four categories as abundant, fairly present (less abundant), rare, and very rare. About 90 (51.14%) of the medicinal plant species were reported to be abundant whereas about 50 species (28.41%) are fairly present (i.e., less abundant) in the area. Likewise, about 30 (17.05%) species of the total medicinal plants were reported as rare while 6 (3.41%) species are very rare. The presence of the Bale Mountains National Park might have been the major reason for the current availability of the medicinal plants reported as abundant and less abundant.

A preference ranking exercise was conducted involving fifteen key informants to identify the scarcest medicinal plant species and emphasize conservation efforts to these plants. Seven reportedly rare and very rare medicinal plants were considered for this purpose. Accordingly, each key informant assigned the highest value for the scarcest and the lowest value for the least scarce medicinal plant species. The result of this activity is given in Table 8. *Ornithogalum*

*tenuifolium* ranked first and hence is the scarcest medicinal plant in the study area. This species was not seen in the wild in the study area and its voucher specimen was collected from home garden. A practitioner, Shek Nuru Haji Hussen, reported that he brought this species from Sidamo and cultivated it in his home garden at Dinsho. *Withania somnifera* is the second scarcest medicinal plant followed by *Canthium oligocarpum*, *Millettia ferruginea, Pittosporum viridiflorum* and *Cucumis ficifolius.* The scarcity of these plants could be related to the high degree of threat they are facing due to one or a combination of the human induced and natural factors mentioned above. The least scarce of these seven rare medicinal plants is *Rubia cordifolia* indicating that this species is relatively easily accessible than the others.

Table 8. Preference ranking of seven medicinal plants based on their scarcity

| Species | *Ornithogalum tenuifolium* Delaroche | *Canthium oligocarpum Hiern* | *Pittosporum viridiflorum* Sims | *Withania somnifera* (L.) Dun. | *Rubia cordifolia* L. | *Millettia ferruginea* (Hochst.) Bak. | *Cucumis ficifolius* A. Rich. |
|---|---|---|---|---|---|---|---|
| **Respondents** | **A** | **B** | **C** | **D** | **E** | **F** | **G** |
| **R1** | 3 | 7 | 2 | 6 | 1 | 4 | 5 |
| **R2** | 7 | 3 | 6 | 5 | 1 | 4 | 2 |
| **R3** | 5 | 2 | 4 | 6 | 7 | 3 | 1 |
| **R4** | 5 | 4 | 6 | 7 | 1 | 3 | 2 |
| **R5** | 7 | 3 | 6 | 5 | 1 | 2 | 4 |
| **R6** | 5 | 7 | 1 | 3 | 2 | 4 | 6 |
| **R7** | 6 | 5 | 2 | 7 | 1 | 4 | 3 |
| **R8** | 6 | 3 | 5 | 7 | 1 | 4 | 2 |
| **R9** | 7 | 5 | 2 | 6 | 4 | 3 | 1 |
| **R10** | 4 | 3 | 5 | 2 | 6 | 7 | 1 |
| **R11** | 7 | 2 | 1 | 5 | 3 | 6 | 4 |
| **R12** | 5 | 7 | 2 | 1 | 4 | 6 | 3 |
| **R13** | 7 | 2 | 1 | 6 | 3 | 3 | 4 |
| **R14** | 6 | 5 | 2 | 7 | 3 | 1 | 4 |
| **R15** | 6 | 7 | 5 | 2 | 3 | 4 | 1 |
| **Total** | **86** | **65** | **50** | **75** | **41** | **58** | **43** |
| **Rank** | **1** | **3** | **5** | **2** | **7** | **4** | **6** |

## 6.6. Medicinal plant conservation efforts of the local people

About 44.19% of the informants interviewed have some kind of awareness in conserving some medicinal plant species that are relatively scarce in their surroundings. These informants are practicing some conservation activities like cultivation in and around home gardens of about 32.35% of the total medicinal plant species. They also provide advisory services to the community during informal and formal meetings and cultural celebrations so that the community

will refrain from destructive uses of these plants. *In situ* protection of plants (i.e., constructing small fences around them, refraining from excessive cutting and avoiding root removal), control and protection of fire, cultivation of some plants as live fence are also some of the admirable activities of these people. Moreover, some of them are keen to inform responsible bodies or authorities if some body is found cutting prohibited trees like *Hagenia abyssinica* and *Juniperus procera*.

The rest of the informants are not practicing any pronounced conservation effort. They simply go to the field, home garden, or farm land to collect medicinal plants as their need arises and don't bother about the long-term survival of these plants. Most of these informants give the reason that the medicinal plants are easily accessible in or near the BMNP and hence no need of personal effort to conserve these plants.

## 6.7. Beliefs and Indigenous Knowledge Transfer

Medical practitioners of the study area observe certain beliefs while collecting and applying medicinal plants. For instance, the act of sexual intercourse is totally prohibited and body cleansing is one of the prerequisites. Covering mouth with a clean sheet of cloth is another precondition. The perception of the local people with regard to the time of medicinal plant collection is very diverse. Consequently, there is no universally accepted fixed time for collection and this differs from person to person and hence is highly dependent on individual beliefs. Some say collection should be done before 4:00 p.m. Some others prefer the morning time up until 9:00 a.m. or afternoon after 4:00 p.m. The morning or night times are convincing for others. Still others argue that the best time of collection is early in the morning or early afternoons. Keeping the time for *Tahara* (i.e., time for washing genital organs before collection) is also applied in almost all the practitioners.

Moreover, a kind of *Kuran* praying ceremony is one portion of the healing procedure that is conducted for almost all of the patients, more particularly for evil eye, evil spirit and epilepsy patients. Calling the name of the plant is also strictly prohibited. Individuals without any knowledge of practicing traditional medicines are also not allowed to collect any sort of plant for

medicinal purposes. In addition, no one is allowed to cut any plant in places where *geda* systems are celebrated. Unless and otherwise all these belief-laws are respected the probability of being affected with *Jinni* (evil spirit) will be very high and the healing power of the medicinal plant collected will either decline or be totally lost. Everybody is thus aware of all these situations and is self-enforced not to act against these belief-laws.

The majority of these beliefs have an indirect contribution to the conservation of plants of medical importance since they limit excessive harvesting of these plants in one way or another. Thus these beliefs could be considered as the major parts of traditional medicinal plant conservation activities of the local people. These findings are in accordance with Debela Hunde (2001) and Kebu Balemie *et al*. (2004).

The majority of the local healers (95%) used to collect medicinal plants lonely with a great secrecy and no one is allowed to see except some family members during this activity. Accordingly most healers pass on their knowledge orally to an elect of their family member like their husband or wife and to an intelligent son or daughter. The selection of the elect is based upon his /her good conduct and ability of keeping all the secrecy with regard to the medicinal plant use knowledge. Only very few practitioners (2%) have the experience of teaching the indigenous medical knowledge and showing the medicinal plants to all members of their family including either wives or husbands. Some practitioners have reported that the indigenous knowledge will be passed onto elder sons or daughters if and only if they are willing to pay for the service. About 3% of the traditional medical practitioners are also not willing to pass on their plant use knowledge even to their families. The majority of these observations are common to some other places in Ethiopia (Amare Getahun, 1976; Mirutse Giday, 1999; Bayafers Tamene, 2000; Debela Hunde, 2001, and Kebu Balemie *et al*. 2004).

According to the information from most of the respondents (90%), the existing indigenous plant use knowledge transfer is mainly by word of mouths rather than through a well organized written script, and this by itself is a major factor for the fragmentation and loss of the indigenous knowledge system and eventually medicinal plants. Similar observation is also reported in Amare Getahun (1976).

According to traditional medical practitioners of the study area, modernization is another major factor for the decline of indigenous knowledge system in the area. Most of the children are now attending modern education and they don't want to know the traditional knowledge from their father, mother or other knowledgeable family member. They think that attending the indigenous plant use knowledge is backwardness and useless. The ignorance of such knowledge system by the new generation is thus a major crisis for the survival of important medicinal plant resources in the area. Comparable circumstances were reported in Mirutse Giday (1999).

## 6.8. Floristic Composition

A total of 230 plant species (Appendix XI) belonging to 157 genera and 58 families were identified in this study. Asteraceae is the most dominant plant family having 39 species, and Poaceae is the second with 30 species. The most dominant growth forms of these plants are herbs with 183 species (79%) followed by shrubs with 26 species (11%). The other growth forms include epiphytes with 9 species (3.9%), trees with 6 species (2.6%), herbaceous climbers with 5 species (2.2%) and lianas with 3 species (1.3%) (Table 9).

Out of the total plant species identified, a total of 63 species (35.8%) were found to have medicinal use.

Table 9. Number and percent of the growth forms of plants

| Growth form | No | % |
|---|---|---|
| Trees | 6 | 2.6 |
| Shrubs | 26 | 11 |
| Lianas | 3 | 1.3 |
| Herbaceous climbers | 5 | 2.2 |
| Herbs | 183 | 79 |
| Epiphytes | 9 | 3.9 |

| | | |
|---|---|---|
| Total number of species | **230** | 100 |

## 6.8.1. Plant community analysis

Analysis of vegetation data using TWINSPAN program revealed five clusters that could be recognized as plant community types (Appendix XV). One or a combination of dominant or characteristic species having high synoptic values in the type is/are used to name these plant community types (Table 10). The description and altitudinal distribution of these plant community types is given below.

1. ***Erica arborea*** **dominating type**

This community type is dominated by *Erica arborea* and is found at an altitudinal range of 3133 – 3408 m. Significant numbers of *Senecio ochrocarpus, Juniperus procera, Helichrysum splendidum, Ferula communis,* and *Kniphofia foliosa* are also found in this type. Species such as *Myrsine melanophloeos, Hagenia abyssinica, Solanum marginatum, Salvia merjamie, Echinops macrochaetus, Senecio ragazzii, and Carduus leptacanthus,* are common species where as *Hypericum revolutum, Helichrysum quartitianum, Solanum garae* and *Hypericum peplidifolium* are rare in this community type.

A total of 35 medicinal plant species were identified in this community type, some of which include *Achyranthes aspera, Clematis hirsuta, Geranium arabicum, Salvia nilotica, Silene macrosolen, Thymus schimperi, Sonchus bipontini, Zehneria scabra, Cynoglossum coeruleum, Satureja punctata,* and *Sedum baleensis.*

2. ***Juniperus procera – Hypericum revolutum – Myrsine melanophloeos – Hagenia abyssinica*** **type**

This community type lies at an altitudinal range of 3063 - 3373 m and *Juniperus procera* and *Hagenia abyssinica* trees mostly dominate the upper canopy. Very significant proportions of *Hypericum revolutum, Myrsine melanophloeos,* and *Kniphofia foliosa* are also found. Other common species that occur in the understory layer include: *Erica arborea, Euphorbia dumalis,*

*Rosa abyssinica, Solanum marginatum, Helichrysum splendidum, Ferula communis,* and *Salvia merjamie*.

Fourty four medicinal plant species were identified from this community type, among which are: *Pittosporum viridiflorum, Alchemilla abyssinica, Artemisia afra, Asparagus africanus, Agrocharis melanantha, Galium simense, Kalanchoe petitiana, Plantago africana, Rumex nepalensis, Rubus steudnerii, Thymus schimperi,* and *Solanum anguivi.*

### 3. *Hypericum revolutum – Myrsine melanophloeos – Hagenia abyssinica – Solanum marginatum* type

The altitudinal range of this community type lies between 3092 m and 3347 m and *Hypericum revolutum* and *Hagenia abyssinica* trees dominate its upper canopy. *Myrsine melanophloeos* and *Solanum marginatum* are also dominant species in the type. Other important species in this community type comprise: *Kniphofia foliosa, Kalanchoe petitiana, Discopodium eremanthum, Salvia merjamie, Senecio ragazzii, Euphorbia dumalis and Ferula communis*. Some species like *Erica arborea, Juniperus procera, Rosa abyssinica, Malva verticillata,* and *Echinops hoehnelli* occur infrequently in the community type.

In this community type, a total of 40 medicinal plant species were collected and identified. Some of these medicinal plants include: *Pittosporum viridiflorum, Achyranthes aspera, Agrocharis melanantha, Arisaema schimperianum, Carduus nyassanus, Crepis ruepellii, Galium simense, Geranium arabicum, Heracleum abyssinicum, Satureja punctata,* and *Cynoglossum amplifolium.*

### 4. *Artemisia afra – Nepeta azurea type*

This community type is found at an altitudinal range of 3015 – 3052 m and its upper layer is dominated by *Artemisia afra* and *Helichrysum splendidum*. Considerable numbers of *Nepeta azurea* exist in this community type and this species is highly associated with *Artemisia afra*. *Kniphofia foliosa* and *Ferula communis* are also common in this community. Plant species like

*Hypericum revolutum, Euphorbia depauperata, Hypericum peplidifolium, Astragalus atropilosulus,* and *Rubus erlangeri* are rarely seen as one walks across this community type.

A total of 25 medicinal plant species are present in this community type, few of which include: *Agrocharis melanantha, Carduus nyassanus, Cynoglossum coeruleum, Galium simense, Helichrysum gofense, Heracleum abyssinicum, Kniphofia isoetifolia, Lotus corniculatus, Rumex abyssinicus, Thalictrum rhyncocarpum,* and *Malva verticillata.*

### 5. *Ferula communis* community type

This community type occurs at an altitudinal range of 3008 – 3061 m and *Ferula communis* is the dominant species. Substantial numbers of *Salvia merjamie, Helichrysum splendidum, Kniphofia foliosa* and *Artemisia afra* are also present. *Euphorbia depauperata* and *Helichrysum foetidum* are other common species where as *Hypericum revolutum* and *Hypericum peplidifolium* are rare in this community type.

This community type consists of 24 medicinal plant species. Some of these medicinal plants comprise: *Alchemilla abyssinica, Asparagus africanus, Carduus nyassanus, Cynoglossum coeruleum, Geranium arabicum, Helichrysum gofense, Heracleum abyssinicum, Rubus steudnerii, Rumex nepalensis,* and *Haplocarpha rueppelii.*

Table 10 Synoptic table of species reaching a value of > = 0.1 in at least one community type

| **Cluster Number** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| **Cluster Size** | **11** | **36** | **22** | **11** | **9** |
| *Euphorbia dumalis* | 0 | 0.8 | 0.3 | 0.1 | 0 |
| *Malva verticillata* | 0 | 0 | 0.1 | 0.1 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| *Echinops hoehnelli* | 0 | 0 | 0.1 | 0 | 0 |
| *Discopodium eremanthum* | 0 | 0 | 0.7 | 0 | 0 |
| *Kalanchoe petitiana* | 0 | 0 | 0.9 | 0 | 0 |
| *Echinops macrochaetus* | 0.3 | 0 | 0 | 0 | 0 |
| *Senecio ochrocarpus* | 1.2 | 0 | 0 | 0 | 0 |
| *Helichrysum quartitianum* | 0.1 | 0 | 0 | 0 | 0 |
| *Carduus leptacanthus* | 0.2 | 0 | 0 | 0 | 0 |
| *Solanum garae* | 0.1 | 0 | 0 | 0 | 0 |
| *Erica arborea* | **8.0** | 0.9 | 0.1 | 0 | 0 |
| *Juniperus procera* | 0.8 | **4.9** | 0.1 | 0 | 0 |
| *Hypericum revolutum* | 0.1 | **4.9** | **5.1** | 0.1 | 0.1 |
| *Myrsine melanophloeos* | 0.3 | **4.7** | **3.7** | 0 | 0 |
| *Hagenia abyssinica* | 0.3 | **2.0** | **2.0** | 0 | 0 |
| *Solanum marginatum* | 0.3 | 0.4 | **3.1** | 0 | 0 |
| *Salvia merjamie* | 0.3 | 0.2 | 0.5 | 0 | 1.7 |
| *Kniphofia foliosa* | 0.4 | 2.8 | 1.2 | 1.4 | 1.3 |
| *Senecio ragazzii* | 0.3 | 0 | 0.3 | 0 | 0 |
| *Hypericum peplidifolium* | 0.1 | 0 | 0 | 0.1 | 0.1 |
| *Artemisia afra* | 0 | 0 | 0 | **4.3** | 1.2 |
| *Nepeta azurea* | 0 | 0 | 0 | **4.2** | 0 |
| *Helichrysum splendidum* | 0.6 | 0.4 | 0 | **2.5** | 1.8 |
| *Ferula communis* | 0.4 | 0.3 | 0.2 | 0.2 | **4.8** |
| *Rosa abyssinica* | 0.0 | 0.5 | 0.1 | 0 | 0 |
| *Euphorbia depauperata* | 0 | 0 | 0 | 0.1 | 0.3 |
| *Helichrysum foetidum* | 0 | 0 | 0 | 0 | 0.4 |
| *Astragalus atropilosulus* | 0 | 0 | 0 | 0.1 | 0 |
| *Rubus erlangeri* | 0 | 0 | 0 | 0.1 | 0 |

## 6.8.2. Vegetation structure analysis

### 6.8.2.1. Density of woody species

The density of woody species at the two sites i.e., Adelle and Boditi forests were calculated and compared as the number of individuals per hectare with DBH greater than 2 cm, DBH greater than 10 cm and greater than 20 cm (Table 11). This value at DBH greater than 2 cm is 898 individuals / ha for Adelle forest and 498 individuals / ha for Boditi forest. At DBH values of greater than 10 cm, the woody species density of Adelle forest is 432 individuals / ha, whereas it is 283 individuals / ha for Boditi forest. The density of woody species at DBH greater than 20 cm is 174 individuals / ha for Adelle forest while it is 125 individuals / ha for Boditi forest.

As can be seen from Table 11, the largest proportion of the woody species density of Adelle forest at DBH > 2 cm is contributed by *Myrsine melanophloeos* (51.93%). This is followed by *Hypericum revolutum* (16.2%) and the third is *Juniperus procera* (12.3%). At this DBH class, the largest proportion of woody species density at Boditi forest is contributed equally by *Hypericum revolutum* (38%) and *Myrsine melanophloeos* (38%), followed by *Erica arborea* (9%) and *Solanum marginatum* (5%).

Similarly the three species *Myrsine melanophloeos* (32%), *Hypericum revolutum* (30%) and *Juniperus procera* (26%) constitute the 1$^{st}$, 2$^{nd}$ and 3$^{rd}$ largest proportions respectively of woody species density at Adelle forest with the DBH class > 10 cm. Whereas at Boditi forest, the largest proportion at this DBH class is accounted for by *Hypericum revolutum* (46%) and the second and third are *Myrsine melanophloeos* (30%) and *Hagenia abyssinica* (7%) respectively.

At the DBH class > 20 cm, 49%, 35%, and 7% of the woody species density at Adelle forest is contributed by *Juniperus procera, Hypericum revolutum* and *Hagenia abyssinica* respectively. At the Boditi forest of the same DBH class on the other hand, the species accounting for the largest woody species density proportions comprise *Hypericum revolutum* (47%), *Myrsine melanophloeos* (20%) and *Hagenia abyssinica* (15%).

The density of tree species alone (Table 11) at the DBH class > 2 cm is 766 individuals / ha for Adelle forest and this consists of 85.3% of the total woody species density. This value for Boditi forest is 458 individuals / ha, comprising 92% of the total woody species density at this forest. Tree species density of Adelle forest at the DBH class >10 cm is 413 individuals / ha, accounting for 96% of the total woody species density. This value for Boditi forest at the same DBH class is

256 individuals / ha and this accounts for 91% of the total woody species density. Similarly at the DBH class > 20 cm, tree density of Adelle forest is 164 individuals / ha, comprising 94% of the density of woody species while that of Boditi forest is 114 individuals / ha and this accounts for 91% of the density of the woody species.

According to Grubb *et al*. (1963), the ratio of 'density at DBH class >10 cm' to 'density at DBH class >20 cm' can be used as a measure of the distribution of the different size classes. This ratio of trees for Adelle is 2.52 while it is 2.25 for Boditi (Table 11). These comparisons indicate that both Adelle and Boditi are predominated by more numbers of small sized individuals. Of course, the predominance of small sized individuals is slightly greater in Adelle than in Boditi. This predominance of small sized individuals is largely due to the high density of *Myrsine melanophloeos* at Adelle forest and *Hypericum revolutum* at Boditi forest. Similar conditions were seen at Dindin forest due to the predominance of *Olinia rochetiana* and *Myrsine africana* (Simon Shibru and Girma Balcha, 2004). Selective cutting of medium sized individuals for a variety of purposes, mainly for construction has also been another reason.

Table 11. Woody species density of Adelle & Boditi forests with DBH >2 cm, >10 cm and > 20 cm individuals (Ind.) / ha.

| | > 2cm | | | | >10 cm | | | | > 20cm | | | | >10/>20 cm | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Adelle | | Boditi | | Adelle | | Boditi | | Adelle | | Boditi | | Adelle | Boditi |
| **Species** | Ind./ha | **%** | Ind./ha | **%** | Ind./ha | **%** | Ind./ha | **%** | Ind./ha | **%** | Ind./ha | **%** | | |
| *Erica arborea** | 29.17 | **3** | 46.91 | **9** | 19.44 | **5** | 17.28 | **6** | 2.778 | **2** | 4.012 | **3** | 7.00 | 4.31 |
| *Hagenia abyssinica** | 12.85 | **1** | 20.37 | **4** | 12.85 | **3** | 18.52 | **7** | 12.85 | **7** | 18.52 | **15** | 1.00 | 1.00 |
| *Hypericum revolutum** | 145.5 | **16** | 190.4 | **38** | 128.5 | **30** | 129 | **46** | 60.76 | **35** | 59.26 | **47** | 2.11 | 2.18 |
| *Juniperus procera** | 110.4 | **12** | 7.716 | **2** | 110.4 | **26** | 6.173 | **2** | 85.42 | **49** | 6.173 | **5** | 1.29 | 1.00 |
| *Myrsine melanophloeos** | 466.3 | **52** | 191.7 | **38** | 139.9 | **32** | 84.57 | **30** | 0 | **0** | 25.62 | **20** | | 3.30 |
| *Pittosporum viridiflorum** | 1.736 | **0.19** | 0.617 | **0.12** | 1.736 | **0.4** | 0.617 | **0.22** | 1.736 | **1** | 0.617 | **0.5** | 1.00 | 1.00 |
| *Discopodium eremanthum* | 4.861 | **1** | 11.11 | **2** | 4.861 | **1** | 9.568 | **3** | 4.514 | **3** | 7.716 | **6** | 1.08 | 1.24 |
| *Rosa abyssinica* | 6.597 | **1** | 0.926 | **0.19** | 3.472 | **1** | 0.617 | **0.22** | 1.042 | **1** | 0 | **0** | 3.33 | |
| *Rubus steudnerii* | 75 | **8** | 0.309 | **0.06** | 0.346 | **0.08** | 0 | **0** | 0 | **0** | 0 | **0** | | |
| *Solanum garae* | 2.431 | **0.27** | 1.543 | **0.31** | 0 | **0** | 0 | **0** | 0 | **0** | 0 | **0** | | |
| *Solanum marginatum* | 42.01 | **5** | 25 | **5** | 9.375 | **2** | 16.05 | **6** | 4.938 | **3** | 3.395 | **3** | 1.90 | 4.73 |
| *Maytenus obscura* | 0.694 | **0.08** | 0 | **0** | 0.694 | **0.16** | 0 | **0** | 0 | **0** | 0 | **0** | | |
| *Solanum anguivi* | 0 | **0** | 0.617 | **0.12** | 0 | **0** | 0 | **0** | 0 | **0** | 0 | **0** | | |
| *Rubus apetalus* | 0 | **0** | 0.617 | **0.12** | 0 | **0** | 0.617 | **0.22** | 0 | **0** | 0 | **0** | | |
| ***Total*** | 898 | **100** | 498 | **100** | 432 | **100** | 283 | **100** | 174 | **100** | 125 | **100** | 2.48 | 2.26 |
| Total (Trees alone) | 766 | **85.3** | 458 | **92** | 413 | **96** | 256 | **91** | 164 | **94** | 114 | **91** | 2.52 | 2.25 |

* Tree species

### 6.8.2. 2. Diameter at Breast Height (DBH)

The percent DBH class distribution of woody species at Adelle and Boditi forests is shown in Figure 12. The general pattern of woody species distribution at the two forests along the different DBH classes is very close and assumes an inverted J shape. About 53.17% of the individuals at Adelle forest lie in the DBH class 2 – 10 cm whereas in the case of Boditi forest 50.84% of the individuals are found in this DBH class. The proportion of woody species in the DBH class 10 – 20 cm is almost similar at the two forests, Adelle forest with 26.07% and Boditi forest with 26.37%. The percentage of individuals at Adelle forest is less (11.23%) than that of Boditi forest (14.1%) in the DBH class 20 – 30 cm while it is slightly greater (5.78%) than that of Boditi forest (4.53%) at the DBH class 30 – 50 cm.

Comparison of the percentage of stems with DBH < 50 cm at the two forests bears very close figures, 96.55% for Adelle forest and 96.22% for Boditi forest. Likewise, the proportion of stems with DBH > 50 cm at Adelle forest is very similar (3.453%) but slightly less than that of Boditi forest (3.782%). As shown in these comparisons, both Adelle and Boditi are equipped with very large number of small sized individuals and very few large sized individuals. This indicates that Adelle and Boditi are found at an earlier secondary stage of development and have more or less a similar trend of development (i.e., at some time in the past they have been cleared and re-grown). This is mainly due to the occurrence of excessive cutting especially during the occupation of the main park area by people from Gojera and Sidamo immigrants between 1974 and 1991 (The National Herbarium, 2004).

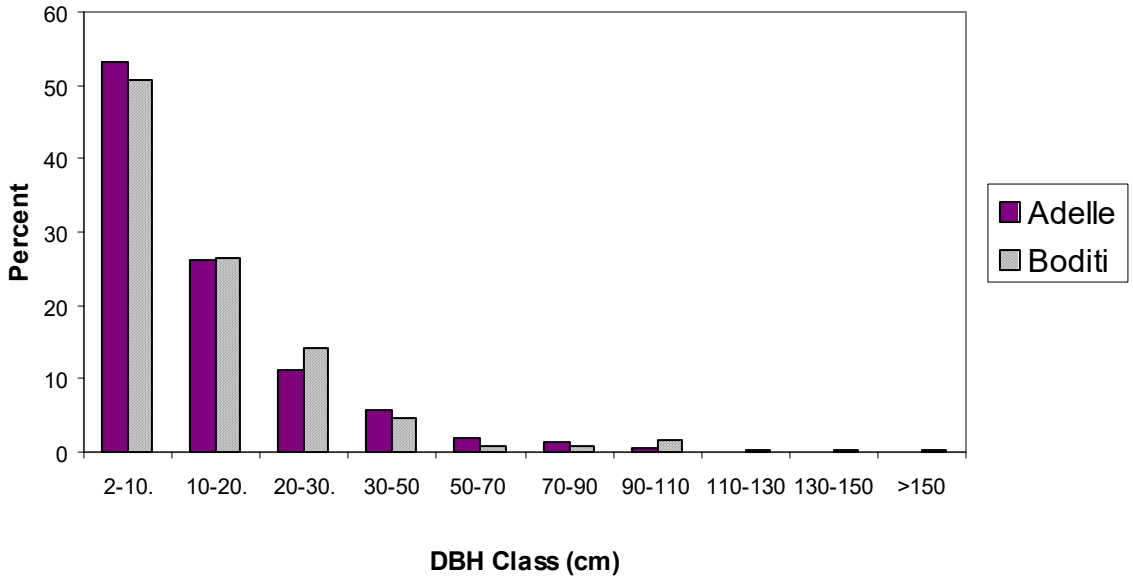



Figure 12. Percentage distribution of woody species at Adelle and Boditi forests along the different DBH classes

The DBH class distribution of individual tree species at the two forests is given in Table 12. As can be seen from this table, all of the individuals of *Myrsine melanophloeos* found at both Adelle and Boditi forests have DBH < 50 cm. All of the individuals of *Hypericum revolutum* found at Adelle forest and 99.413% of the individuals of this species occurring at Boditi forest also possess DBH < 50 cm. This has been so mainly due to the growth nature of the two species (i.e., *Myrsine melanophloeos* and *Hypericum revolutum*). In contrast, only 25.71% of the individuals of *Hagenia abyssinica* found at Adelle forest and 27.692% of the individuals of this species found at Boditi forest have DBH < 50 cm indicating its hampered regeneration. The equivalent values at this DBH class of *Juniperus procera* are 80.07% and 72.72% at Adelle and Boditi forests respectively.

Table 12. Percentage distribution of individual tree species along the various DBH classes at Adelle and Boditi forests

| **DBH class (cm)** | **2-10** | | **10-20** | | **20-30** | | **30-50** | | **50-70** | | **70-90** | | **90-110** | | **110-130** | | **130-150** | | **>150** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | Adelle | Boditi | Adelle | Boditi | Adelle | Boditi | Adelle | Boditi | Adelle | Boditi | Adelle | Boditi | Adelle | Boditi | Adelle | Boditi | Adelle | Boditi | Adelle | Boditi |
| *Erica arborea* | 35.29 | 72.7 | 49.02 | 27.3 | 15.69 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Hypericum revolutum* | 11.11 | 42.5 | 47.73 | 32 | 39.65 | 24.9 | 1.515 | 0 | 0 | 0.59 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Myrsine melanophloeos* | 79.8 | 67.5 | 20.12 | 25.5 | 0 | 6.81 | 0 | 0.19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Hagenia abyssinica* | 0 | 9.23 | 0 | 0 | 0 | 0 | 25.71 | 18.5 | 2.857 | 13.8 | 37.14 | 10.8 | 28.57 | 33.8 | 5.714 | 3.08 | 0 | 7.69 | 0 | 3.077 |
| *Juniperus procera* | 0 | 22.7 | 26.57 | 0 | 20.66 | 4.55 | 32.84 | 45.5 | 14.39 | 4.55 | 5.535 | 13.6 | 0 | 4.55 | 0 | 0 | 0 | 0 | 0 | 4.545 |
| *Pittosporum viridiflorum* | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

The highest DBH recorded was 222.82 cm and this belongs to the medicinal tree species, *Hagenia abyssinica* at Boditi. The second highest record at this forest is 206.9 cm and this once more belongs to the other medicinal tree species, *Juniperus procera*.

Taking into account the percentage distribution of *Juniperus procera* alone at the two forests, no individuals were seen at Adelle forest in the DBH class 2 – 10 cm indicating its hampered reproduction status while 22.7% of the individuals of this species found at Boditi forest exist in the 2 –10 cm DBH class. In contrast, 26.57% of the individuals of this species found at Adelle forest and no individuals at Boditi forest have DBH between 10 and 20 cm. About 20.66% and 4.55% of the individuals of this species found respectively at Adelle and Boditi forests possess DBH between 20 and 30 cm. The majority of the individuals of this species found at both forests have DBH between 30 and 50 cm. This figure is 32.84% for Adelle forest and 45.5% for Boditi forest.

### 6.8.2.3. Basal Area

The basal area in $m^2$/ha and percentage contribution of tree species was determined at the two forests and the result is given in Table 13. The total basal area of Adelle forest is 26.39 $m^2$/ha while that of Boditi forest is 23.34 $m^2$/ha. These are more or less similar figures indicating that both Adelle and Boditi are found in a similar trend of development. About 43.74% of the basal area at Adelle forest is contributed by *Juniperus procera* whereas 56.65% of the basal area at Boditi forest is contributed by *Hagenia abyssinica*. These are followed at Adelle forest by *Hagenia abyssinica* (25.42%) and at Boditi forest by *Hypericum revolutum* (19.51%). This implies that the highest dominance at Adelle is possessed by *Juniperus procera* whereas *Hagenia abyssinica* constitutes the highest dominance at Boditi. Thus, these two species have more numbers of large sized individuals than the other species. *Pittosporum viridiflorum* has the least input to the total basal area at both Adelle (0.22%) and Boditi (1.11%) forests.

Table 13. Basal area (BA) in $m^2$/ha and percentage input of tree species at Adelle and Boditi forests

| Species | Adelle | | Boditi | |
|---|---|---|---|---|
| | **BA ($m^2$/ha)** | **%** | **BA ($m^2$/ha)** | **%** |
| *Juniperus procera* | 11.54 | 43.74 | 2.29 | 9.83 |
| *Erica arborea* | 0.37 | 1.40 | 0.68 | 2.90 |
| *Hagenia abyssinica* | 6.71 | 25.42 | 13.22 | 56.65 |
| *Hypericum revolutum* | 4.53 | 17.15 | 4.55 | 19.51 |
| *Myrsine melanophloeos* | 3.19 | 12.08 | 2.33 | 10.00 |
| *Pittosporum viridiflorum* | 0.06 | 0.22 | 0.26 | 1.11 |
| ***Total*** | 26.39 | 100 | 23.34 | 100 |

## 6.8.2.4. Frequency

The percent frequency of tree species at Adelle and Boditi forests is shown in Table 14 for comparison. *Hypericum revolutum* and *Myrsine melanophloeos* are the most frequent tree species each occurring in 90.63% of the total plots sampled at Adelle forest. *Hypericum revolutum* is also the most frequent species occurring in 75% of the total plots sampled at Boditi forest. These are followed by *Juniperus procera* with 84.38% frequency of occurrence at Adelle forest and *Hagenia abyssinica* and *Myrsine melanophloeos* each having 63.89% frequency of occurrence at Boditi forest. *Pittosporum viridiflorum* is the least frequent of all the tree species with 3.13% and 2.78% frequency of occurrence respectively at both Adelle and Boditi forests.

Table 14. Percent frequency (**% F**) of tree species at Adelle and Boditi forests

| Species | **Adelle** (32plots) | | **Boditi** (36plots) | |
|---|---|---|---|---|
| | **No. of plots present in** | **% F** | **No. of plots present in** | **% F** |
| *Erica arborea* | 14 | 43.75 | 20 | 55.56 |
| *Myrsine melanophloeos* | 29 | 90.63 | 23 | 63.89 |
| *Hagenia abyssinica* | 13 | 40.63 | 23 | 63.89 |
| *Hypericum revolutum* | 29 | 90.63 | 27 | 75 |
| *Juniperus procera* | 27 | 84.38 | 13 | 36.11 |
| *Pittosporum viridiflorum* | 1 | 3.13 | 1 | 2.78 |

The frequency of occurrence for medicinal plants encountered among the total floristic composition is also given in Appendix XIII. *Hypericum revolutum* with 90.63%, *Alchemilla abyssinica* with 80.56% and *Galium simense* with 95.45% frequency of occurrence are the most frequent medicinal plant species respectively at Adelle, Boditi and Gaysay.

### 6.8.2.5. Importance Value Index (I.V.I.)

The importance value index of tree species was determined at Adelle and Boditi forests and the outcome is shown in Table 15. The results of the calculation of importance value index helped to identify the dominant tree species at Adelle and Boditi forests. At Adelle forest, *Myrsine melanophloeos* exhibited the highest importance value index (98.62) followed by *Juniperus procera* (82.04), *Hypericum revolutum* (61.81) and *Hagenia abyssinica* (38.6). Thus *Myrsine melanophloeos* and *Juniperus procera* are the dominant tree species in this forest. The highest importance value index at Boditi forest on the other hand is that of *Hypericum revolutum* (86.32) followed by *Hagenia abyssinica* (82.59), *Myrsine melanophloeos* (73.34) and *Erica arborea* (31.83). Consequently, the dominant tree species at Boditi forest are *Hypericum revolutum* and *Hagenia abyssinica. Pittosporum viridiflorum* is the least dominant tree species at both forests because it has the least relative dominance, relative density and relative frequency (Table 15).

Table 15. Importance value index (I.V.I.) of tree species at Adelle and Boditi forests

| | **Relative Dominance** | | **Relative Density** | | **Relative Frequency** | | **I.V.I.** | |
|---|---|---|---|---|---|---|---|---|
| **Species** | **Adelle** | **Boditi** | **Adelle** | **Boditi** | **Adelle** | **Boditi** | **Adelle** | **Boditi** |
| *Juniperus procera* | 43.74 | 9.83 | 14.41 | 1.68 | 23.89 | 12.15 | 82.04 | 23.66 |
| *Erica arborea* | 1.40 | 2.90 | 3.81 | 10.24 | 12.39 | 18.69 | 17.6 | 31.83 |
| *Hagenia abyssinica* | 25.42 | 56.65 | 1.68 | 4.45 | 11.51 | 21.50 | 38.6 | 82.59 |
| *Hypericum revolutum* | 17.15 | 19.51 | 18.99 | 41.58 | 25.66 | 25.23 | 61.81 | 86.32 |
| *Myrsine melanophloeos* | 12.08 | 10.00 | 60.87 | 41.85 | 25.66 | 21.50 | 98.62 | 73.34 |
| *Pittosporum viridiflorum* | 0.22 | 1.11 | 0.23 | 0.14 | 0.89 | 0.94 | 1.34 | 2.18 |
| ***Total*** | 100 | 100 | 100 | 100 | 100 | 100 | 300 | 300 |

### 6.8.2.6. Population structure

The population structure of six tree species was determined using their relative density at the various DBH classes. Consequently, four representative patterns were detected at both Adelle and Boditi forests (Figure 13, A-D). The first pattern indicates good reproduction but bad recruitment potential and is shown by the population structure of *Myrsine melanophloes* (Figure 13A). The second pattern, exemplified by *Juniperus procera* at Boditi forest (Figure 13B), indicates bad reproduction and discontinuous recruitment into adult. An indicative of bad reproduction but good recruitment into adult is found in the third pattern and this is shown by *Juniperus procera* at Adelle (Figure 13 B) and *Hypericum revolutum* at both Adelle and Boditi (Figure 13C). The fourth pattern where species are no longer reproducing but are represented with big trees only is clearly detected in the population structure of *Hagenia abyssinica* (Figure 13D).

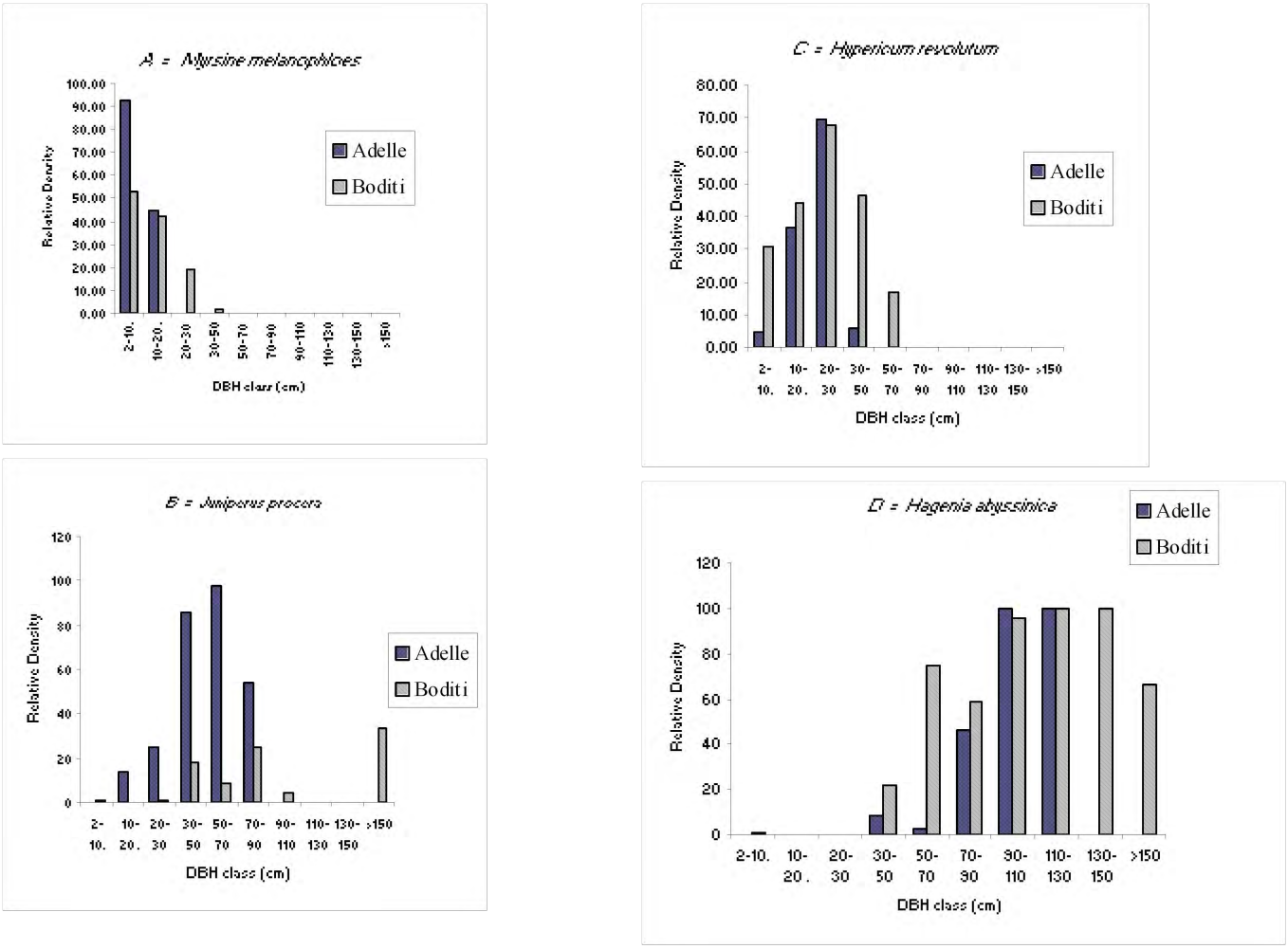



Figure 13 (A-D). Population structure of representative tree species at Adelle and Boditi forests

According to the I.V.I. information, *Myrsine melanophloeos* was found to be the most dominant tree species at Adelle forest. However, when the population structure of this species is critically evaluated at the different DBH classes, it is found only at the 2-10 cm and 10-20 cm DBH classes and is absent in the higher DBH classes. Of course, its largest density is in the DBH class 2-10 cm. The absence of this species at the higher DBH classes is due to the growth nature of the species. The relative density of this species is larger at Adelle forest than at Boditi forest in the first two DBH classes. Nevertheless, this species is found at the next two higher DBH classes (20-30 cm and 30-50 cm) in a decreasing manner at Boditi forest whereas it is totally absent at Adelle forest with these DBH classes (Figure 13A). The absence of this species at Adelle in the

20 – 30 cm and 30 – 50 cm diameter classes might have been due to selective cutting of individuals of the species for construction and fencing purposes.

The other most dominant tree species at Adelle forest is *Juniperus procera*. This species has its highest relative density in the DBH class 50-70 cm at this forest and is absent in the first DBH class (2-10 cm). The absence of this species in the first diameter class indicates its poor regeneration capacity. The population structure of this species assumes a bell-shaped distribution with very few individuals at the lower DBH classes, high number of individuals at the middle DBH classes and very few individuals again at the higher DBH classes. The relatively smaller proportions of this species in the DBH classes 10-20 cm and 20-30 cm is due to selective removal of individuals for various purposes, mainly for construction. Significant numbers of stumps were observed during data collection. This species is almost absent at Boditi forest but few individuals were encountered at the DBH classes 2-10 cm, 90-110 cm and > 150 cm in which case it is absent at Adelle forest. This implies that the species has a bad reproduction status and discontinuous recruitment into adult at Boditi forest (Figure 13B). The major reason for the relative absence of this species at Boditi forest as compared to Adelle forest might have been the difference in the moisture content of the two forests, which inurn is due to the position of the two mountains. Adelle is situated on the leeward side and is relatively dry while Boditi is situated on the windward side and receives wet air. Demel Teketay (1999) mentioned this species as one of the characteristic species in the dry Afromontane forests of the country. This implies that the species prefers relatively dry montane areas like Adelle forest than wet areas like Boditi forest.

*Hypericum revolutum* is the most dominant tree species at Boditi forest. The relative density of this species has an increasing trend from the first DBH class up to the 20-30 cm DBH class and a decreasing trend from this point towards the higher DBH classes both at Boditi and Adelle forests (Figure 13C). The regeneration capacity of this species is relatively better than *Juniperus procera* and *Hagenia abyssinica*.

The second most dominant tree species at Boditi forest is *Hagenia abyssinica*. This species is almost absent in the lower DBH classes at both forests. The available individuals of this species are relatively matured ones and this is true more particularly at Boditi forest than at Adelle forest

(Figure 13D). This species is thus the one with the worst reproduction status than the others. This might have happened due to the stagnated and /or retarded reproductive capacities of the old-aged individuals of the species.

## 6.9. The rate of plant endemism in the study area

Among the plants collected both during the floristic composition and ethnomedicinal investigations, 36 were found to be endemic to Ethiopia (Appendix XIV). One of the species (*Sedum baleensis*) is strictly endemic to the Bale Mountains. These were known to be endemic after comparison of the whole species with the list of endemic species in The National Herbarium (2004). The local people use 20 of these endemic species for the treatment of different human and livestock ailments. Species like *Millettia ferruginea, Erythrina brucei,* and *Thymus schimperi* are multipurpose species being utilized for a variety of uses besides their medicinal values. Their multifaceted utilization by the local people is an indicative of the degree of threat they are facing.

These results are not as such exaggerated as the Bale floristic region is known to consist of about 184 endemic species 30 of which are strictly endemic to Bale (The National Herbarium, 2004).

# 7. Conclusion

For the ethnomedicinal investigation, a total of 16 kebeles were considered from the three districts (Adaba, Sinana Dinsho and Goba) found in and around the Bale Mountains National Park and a total of 176 medicinal plants and their associated indigenous knowledge were documented after consulting about 49 traditional medicine practitioners. Most of these plants are used to treat human ailments only followed by both human and livestock ailments while some are used to treat livestock ailments only. Practitioners of the Bale zone at the three districts are thus very rich in indigenous plant use and management knowledge.

The majority of these plants are collected from wild and the most frequently utilized growth forms for medicinal purposes are herbs followed by shrubs. Regarding plant parts used, the local people mostly harvest leaves for medicine preparations. The use of leaves for medicinal purpose is often regarded as sustainable utilization. Nevertheless, the second most utilized plant parts are roots and these usually pose serious danger for the long-term survival of medicinal plants.

Fresh materials are mostly preferred for the preparation and application of traditional drugs and the most frequently applied methods of medicine preparations include crushing, concoction and decoction. The prepared medicines are mostly administered through oral and dermal routes. Thus drinking the prepared medicines is the most recurrently used method of traditional drug application.

Out of the 74 human and 25 livestock ailments reported, hepatitis B (*Dhibee Sinbiraa*), gonorrhea, *Naqarsa* and *Qilensa* are the most frequently reported human health defects whereas blackleg, *Darissaa*, hepatitis (*Dhukuba Alati*), diarrhea (Albati) and nose swelling in mules (*Chachabsa*) are the commonest in livestock.

A difference in the degree of exposure and area of specialization was detected among some of the informants. Most informants responded that their prepared medicines are devoid of any noticeable side effects. However, some of them have genuinely reported some side effects like vomiting, diarrhea and temporary unconsciousness when traditional drugs are used against

gonorrhea, rabies and hepatitis B. These side effects are usually observed due to lack of precisions in dosages.

The major threats to these medicinal plants are broadly categorized as anthropogenic and natural factors. Agricultural expansion and intensification, deforestation for various purposes and recurrent drought for herbaceous species are the most important threats for medicinal plants of the study area.

Nearly half of the informants consulted have developed good knowledge of conserving medicinal plants involving activities like cultivation, and *in situ* protection. Moreover, a number of traditional beliefs in the area were found to be useful indigenous conservation and management systems. However, these traditions are being neglected by the new generation and their long-term continuity is under question.

Indigenous plant use knowledge in the study area is passed onto some member(s) of families mainly in word of mouths. This is thus prone to a very high degree of fragmentation and /or loss of the knowledge. The situation is aggravated by modernization being one factor for the ignorance of traditional medicine among the young generation.

Analysis of the floristic composition of the study area revealed a total of 230 plant species. Sixty three of these species were reported as used medicinally by the local people to treat some kind of ailments. Five clusters were recognized from the analysis of vegetation data using the TWINSPAN program. The highest number of medicinal plant species (44) was found in the *Juniperus procera – Hypericum revolutum – Myrsine melanophloeos – Hagenia abyssinica* community type at the altitudinal range of 3063 – 3373 m. The next highest number (40) was found in the *Hypericum revolutum – Myrsine melanophloeos – Hagenia abyssinica – Solanum marginatum* community type whose altitudinal range is 3092 – 3347 m.

Comparison of Adelle and Boditi forests showed tree density of Adelle to be greater than that of Boditi. Both of these forests are however predominated by large numbers of small sized individuals indicating the occurrence of excessive cutting of selected size classes some time in

the past. The basal area of Adelle is more or less close to that of Boditi. Thus both Adelle and Boditi are found at an earlier secondary stage of development (i.e., at some time in the past they have been cleared and re-grown) and have more or less a similar trend of development.

As can be seen from the importance value index of tree species, *Myrsine melanophloeos* and *Juniperus procera* are the most dominant tree species at Adelle. The most dominant tree species at Boditi forest on the other hand are *Hypericum revolutum* and *Hagenia abyssinica*. The population structures of these species were constructed in terms of their relative densities across the various diameter classes. Consequently, these structures show that *Hagenia abyssinica* and *Juniperus procera* have very poor regeneration capacities. Surprisingly enough, these two medicinal tree species are two of the most preferred multipurpose species for various uses. The two aspects are thus indicators for the decline and /or loss of the population of these tree species in the near future.

Another interesting phenomenon is that *Juniperus procera* is almost absent at Boditi forest while it is one of the most dominant tree species at Adelle forest. A moisture difference as a result of the position of the two mountains might have been the major reason for this.

# 8. Recommendation

It is generally agreed that sustainable utilization of medicinal plants is compulsory to conserve the rich biological resource of the area and to ensure the long-term healthcare coverage of the local people (The National Herbarium, 2004). Thus the following recommendations are forwarded to address these problems.

Detailed investigation on the regeneration ecology or reproduction biology of *Hagenia abyssinica* and *Juniperus procera* is mandatory since these economically, ecologically and medically important species are not well regenerating currently. A very well developed nursery should also be established to compensate their retarded regeneration capacity.

The indigenous plant use knowledge of the local people should be integrated into school curricula in order to rehabilitate the rapidly declining traditional knowledge through creation of awareness among the youth generation.

The local people should be involved while developing any conservation management plans and their indigenous knowledge of traditional management should also be integrated. They should also get some sort of incentives so that they will consider the park as their own property and give particular attention in conserving the park.

Establishment of nurseries and field gene banks for the cultivation of medicinal plants that are scarce in the area (eg. *Ornithogalum tenuifolium, Withania somnifera, Canthium oligocarpum, Milletia ferruginea, Pittosporum viridiflorum, Cucumis ficifolius* and *Rubia cordifolia)* or have retarded reproduction rates is again vital. Awareness of the traditional medicine practitioners should also be raised so that they will contribute cultivating such rare plants around their home gardens.

Some of the plants were found to be popular among the traditional medicine practitioners (Appendix II). The top six most frequently reported medicinal plants that are expected to have a very high potential for new drug discovery include: *Allium sativum, Rumex nepalensis, Clematis*

*hirsuta, Verbascum sinaiticum, Withania somnifera* and *Cucumis ficifolius.* Thus, pharmacological testing of the active ingredients (drug chemical contents) of these plants is essential taking into consideration the intellectual property rights of the local traditional medicine practitioners.

Raising the awareness of medicine practitioners through formal or informal education systems regarding the dosage or limit of prepared medicines for application is again crucial.

The relative absence of *Juniperus procera* at Boditi forest is really amazing and this by itself requires detailed and independent study.

The traditional medication system should be integrated with the modern healthcare system in order to ensure effective primary healthcare coverage of the local people.

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**Appendix I continued**

| | | | |
|---|---|---|---|
| *Cineraria deltoidea* Sond. | Asteraceae | | 123 |
| *Cissus adenocaulis* Steud. ex A. Rich. | Vitaceae | Qorsa | 13 |
| *Clematis hirsuta* Perr. & Guill. | Ranunculaceae | Feedii / Gale Hinesa | 26 |
| *Clerodendrum myricoides* (Hochst.) Vatke | Lamiaceae | Misirich | 70 |
| *Clutia abyssinica* Jaub. & Spach. | Euphorbiaceae | Muka Foni | 9 |
| *Commelina foliacea* Chiov. | Commelinaceae | Harmala (Or.), Wuha Aqur (Amh) | 78 |
| *Convolvulus kilimandschari* Engl. | Convolvulaceae | Aserkush Tebetebkush | 175 |
| *Crepis rueppellii* Sch. Bip. | Asteraceae | Mucharae, Kartassa/ Mucha Rabe | 45 |
| *Crinum abyssinicum* Hochst. ex A. Rich. | Amryllidaceae | Murquffaa / Choppii | 60 |
| *Crotalaria rosenii* (Pax) Milne-Redh. ex Polhill | Fabaceae | Shashamane | 15 |
| *Crotalaria agatiflora* Schweinf. | Fabaceae | Shashamane | 146 |
| *Cucumis ficifolius* A. Rich. | Cucurbitaceae | Hanchote | 138 |
| *Cupressus lusitanica* Mill | Cuprussaceae | Hindesa | 98 |
| *Cyathula polycephala* Bak. | Amaranthaceae | Hatcho | 113 |
| *Cycniopsis humifusa* (Forssk.) Sengl. | Scrophulariaceae | *Qorsa alati* | 61 |
| *Cymbopogon citratus* (DC.) Stapf | Poaceae | Iticho (Or.), Tejisar (Amh) | 158 |
| *Cynoglossum amplifolium* Hochst.ex A. Rich. | Boraginaceae | Qarchaba, Yemich Medihanit | 75 |
| *Cynoglossum coeruleum* Hochst. | Boraginaceae | Qarchaba, Dingetegna, Mathane, Maxxune | 74 |
| *Datura stramonium* L. | Solanaceae | Bengi | 165 |
| *Discopodium eremanthum* Chiov. | Solanaceae | Merero | 67 |
| *Dodonea anguistifolia* L.f. * | Sapindaceae | Dhitecha (Or.), kitkita (Amh) | 40 |
| *Dorstenia barnimiana* Schweinf. | Moraceae | | 120 |
| *Dovyalis abyssinica* (A. Rich.) Warb. | Flacourtiaceae | Koshmo | 22 |
| *Dryopteris inaequalis* (Schlecht.) Kuntze | Aspidiaceae | Bul'aa /Kumbuta /Okotu | 73 |
| *Erythrina brucei* Schweinf. | Fabaceae | Walena | 140 |
| *Eucalyptus globulus* Labill. | Myrtaceae | | 55 |
| *Eucalyptus saligna* Smith | Myrtaceae | Barzafi | 97 |
| *Euphorbia depauperata* A. Rich. | Euphorbiaceae | Guri, Gurru, Gura | 19 |
| *Euphorbia dumalis* S. Carter | Euphorbiaceae | Hanano, Guri | 20 |
| *Euphorbia lathyris* L. | Euphorbiaceae | Ambuluk /Amplo | 118 |
| *Euphorbia schimperiana* Scheele | Euphorbiaceae | Guri | 117 |
| *Ferula communis* L. | Apiaceae | Ginda | 34 |
| *Ficus palmata* Forssk. | Moraceae | Lugo | 103 |
| *Foeniculum vulgare* Miller. | Apiaceae | Ensilal / Alaqa Merga | 128 |
| *Galinsoga parviflora* Cav. | Asteraceae | Qubdu (Qundo Berbere) | 125 |
| *Galium simense* Fresen. | Rubiaceae | Jiddha (Ashikit) | 135 |
| *Geranium arabicum* Forssk. | Geraniaceae | Qinta, Qorsa-Guracha | 23 |

**Appendix I continued**

| | | | |
|---|---|---|---|
| *Gladiolus dalenii* Van Geel | Iridaceae | Kalade | 179 |
| *Gomphocarpus fruticosus* (L.) Ait. f. | Asclepiadaceae | Anano | 116 |
| *Hagenia abyssinica* (Bruce) J.F. Gmel. | Rosaceae | Hexxo | 51 |
| *Haplocarpha rueppellii* (Sch. Bip.) Beauv. | Asteraceae | | 121 |
| *Haplosciadium abyssinicum* Hochst. | Apiaceae | | 129 |
| *Helichrysum gofense* Cufod. | Asteraceae | | 43 |
| *Helichrysum traversii* Chiov. | Asteraceae | | 5 |
| *Heracleum abyssinicum* (Boiss.) Norman | Apiaceae | Bunkaka Hidda | 11 |
| *Heteromorpha trifoliata* (Wendel.) Eckl. & Zeyh. | Apiaceae | Hare Hanga | 127 |
| *Hypericum revolutum* Vahl | Hypericaceae | Garamba | 27 |
| *Ilex mitis* (L.) Radlk. | Aquifoliaceae | | 7 |
| *Impatiens ethiopica* Grey-Wilson | Balsaminaceae | | 30 |
| *Inula confertiflora* A. Rich. | Asteraceae | Haxxawii | 39 |
| *Juniperus procera* L. | Cuprussaceae | Hindesa Adi | 53 |
| *Justicia schimperiana* (Hochst. ex Nees) T. Anders. | Acanthaceae | Dhumuga /Sensel | 93 |
| *Kalanchoe laciniata* (L.) DC. | Crassulaceae | Anchura | 144 |
| *Kalanchoe petitiana* A. Rich. | Crassulaceae | Anchura | 28 |
| *Kniphofia foliosa* Hochst. | Asphodelaceae | Lela | 54 |
| *Kniphofia isoetifolia* Steud. ex Hochst. | Asphodelaceae | Lela Xixiqoo | 316 |
| *Launea intybacea* (Jacq.) Beauv. | Asteraceae | Korsa Sheka | 1 |
| *Leonotis ocymifolia* (Burm.f.) Iwarsson | Lamiaceae | Urgo | 65 |
| *Linum usitatissimum* L. | Linaceae | Telba | 17 |
| *Lippia adoensis* Hochst. ex. Walp. | Verbenaceae | Sukahi | 76 |
| *Lobelia rhynchopetalum* Hemsl. | Lobeliaceae | Tarura | 160 |
| *Lotus corniculatus* L. | Fabaceae | Garasita / Loya | 83 |
| *Lycopersicon esculentum* (L.) Mill. | Solanaceae | Timatimo | 166 |
| *Maesa lanceolata* Forssk. | Myrsinaceae | Abeyi | 52 |
| *Malva verticillata* L. | Malvaceae | Lut, Lita, Littii | 136 |
| *Maytenus arbutifolia* (A. Rich.) Wilczek | Celastraceae | | 152 |
| *Maytenus gracilipes* (Welw. ex Oliv.) Exell | Celastraceae | Kombolcha | 90 |
| *Melilotus suaveolens* Ledeb. | Fabaceae | Chungugi / Hargoge | 111 |
| *Millettia ferruginea* (Hochst.) Bak. | Fabaceae | Birbira | 141 |
| *Myosotis vestergrenii* Stroh. | Boraginaceae | Dingetegna | 161 |
| *Myrica salicifolia* A. Rich. | Myricaceae | Xonna | 25 |
| *Nicotiana tabaccum* L. | Solanaceae | Tambo (tambaho) | 77 |
| *Nigella sativa* L. | Ranunculaceae | Habsuda Guracha | 100 |
| *Nuxia congesta* R. Br. ex Fresen. | Loganiaceae | Bitena | 89 |
| *Ocimum lamifolium* Hochst. | Lamiaceae | Qorsa Alati | 178 |
| *Oenanthe procumbens* (Wolff) Norman | Apiaceae | Bunkaka Hidda | 11 |

**Appendix I continued**

| | | | |
|---|---|---|---|
| *Oldenlandia monanthos* (A. Rich.) Hiern | Rubiaceae | Matane ilbisa | 148 |
| *Olea europaea* L. subsp. *cuspidata* (Wall. ex G.Don) Cif. | Oleaceae | Ejersa | 95 |
| *Olinia rochetiana* A. Juss. | Oliniaceae | Gunnaa | 32 |
| *Opuntia ficus-indica* (L.) Miller | Cactaceae | Beles | 133 |
| *Ornithogalum tenuifolium* Delaroche | Hyacinathaceae | Kuras (Arabic) | 180 |
| *Osyris quadripartita* Decn. | Santalaceae | Karo | 88 |
| *Otostegia erlangeri* Gürke | Lamiaceae | Demboba | 168 |
| *Peperomia abyssinica* Mig. | Piperaceae | Rafu Osole | 108 |
| *Peperomia tetraphylla* (Forst.) Hook. ex Arn. | Piperaceae | | 8 |
| *Phytolacca dodecandra* L'Hérit. | Phytolaccaceae | Handode (Or.), Yemehan Endod (Amh) | 174 |
| *Pittosporum viridiflorum* Sims | Pittosporaceae | Ara | 249 |
| *Plantago africana* Verdc. | Plantaginaceae | Baxxicha | 63 |
| *Plantago lanceolata* L. | Plantaginaceae | Sandabo | 62 |
| *Plectrantus barbatus* Andrews | Lamiaceae | Damakessie | 169 |
| *Polycarpon tetraphyllum* (L.) L. | Caryophyllaceae | Lalessa | 109 |
| *Polygala sphenoptera* Fresen. | Polygalaceae | | 6 |
| *Polygala steudneri* Chod. | Polygalaceae | | 102 |
| *Potentilla dentata* Forssk. | Rosaceae | Kinta | 86 |
| *Prenanthes subpeltata* Stebbins | Asteraceae | Anano | 82 |
| *Ranunculus multifidus* Forssk. | Ranunculaceae | Qarxxassa, Sherif | 149 |
| *Ranunculus simensis* Fresen. | Ranunculaceae | Kinta | 85 |
| *Rhamnus prinoides* L'Herit. | Rhamnaceae | Gesho | 143 |
| *Rhamnus staddo* A. Rich. | Rhamnaceae | Keddida | 24 |
| *Rosa abyssinica* Lindley | Rosaceae | Gora | 142 |
| *Rubia cordifolia* L. | Rubiaceae | Anqis | 147 |
| *Rubus steudneri* Schwienf. | Rosaceae | Gora | 14 |
| *Rubus volkensii* Engl. | Rosaceae | Hagena | 10 |
| *Rumex abyssinicus* Jacq. | Polygonaceae | Kure, Dubara /Hoficho (hexxoo) | 31 |
| *Rumex nepalensis* Spreng. | Polygonaceae | Shabbee, Tulti | 29 |
| *Ruta chalepensis* L. | Rutaceae | Siliti | 21 |
| *Salix mucronata* Willd. | Salicaceae | Alelitu | 139 |
| *Salvia merjamie* Forssk. | Lamiaceae | Okotu/ Okota | 162 |
| *Salvia nilotica* Jacq. | Lamiaceae | Merga, Sayneqel | 64 |
| *Satureja pseudosimensis* Brenan | Lamiaceae | | 164 |
| *Satureja punctata* (Benth.) Briq. | Lamiaceae | Yemich medihanit | 172 |
| *Schefflera volkensii* (Engl.) Harms | Araliaceae | Ansha | 33 |
| *Sedum baleensis* M.Gilbert | Crassulaceae | Buri | 145 |

**Appendix I continued**

| | | | |
|---|---|---|---|
| *Senecio fresenii* Sch. Bip. ex Oliv & Hiern | Asteraceae | | 41 |
| *Senecio myriocephalus* Sch. Bip. ex A. Rich. | Asteraceae | Agadena | 119 |
| *Senecio ragazzii* Chiov. | Asteraceae | Beredu | 4 |
| *Senecio syringifolius* O. Haffm. | Asteraceae | Lukan Luko | 122 |
| *Sida schimperiana* Hochst. ex A. Rich. | Malvaceae | Korsa Shotelay /Haxxarnur | 134 |
| *Sideroxylon oxyacanthum* Baill. | Sapotaceae | Faraqassa | 151 |
| *Silene macrosolen* A. Rich. | Caryophyllaceae | Wagarti | 16 |
| *Solanecio angulatus* (Vahl) C. Jeffrey | Asteraceae | Raffu, Rafu Osole | 47 |
| *Solanecio gigas* (Vatke) C. Jeffrey | Asteraceae | | 3 |
| *Solanum adoense* Hochst. ex A. Rich. | Solanaceae | Hiddi | 167 |
| *Solanum anguivi* Lam. | Solanaceae | Kore, Mujule Worabesa | 69 |
| *Solanum incanum* L. | Solanaceae | | 42 |
| *Solanum marginatum* L.f. | Solanaceae | Hiddi | 68 |
| *Sonchus bipontini* Asch. | Asteraceae | Raafu Simbra / Feyisso / kartassa | 81 |
| *Stephania abyssinica* (Dill. & Rich.) Walp. | Menispermaceae | Kalala | 37 |
| *Tagetes minuta* L. | Asteraceae | Hada Gola | 84 |
| *Thalictrum rhynchocarpum* Dil. & A. Rich. | Ranunculaceae | Sire-Bizu | 107 |
| *Thymus schimperi* Ronniger | Lamiaceae | Tosigni | 87 |
| *Trichilia prieuriana* A. Juss. | Meliaceae | Anonu | 156 |
| *Umbilicus botryoides* A. Rich. | Crassulaceae | Darara | 92 |
| *Verbascum sinaiticum* Benth. | Scrophulariaceae | Abokena | 59 |
| *Verbena officinalis* L. | Verbenaceae | Dargu / Atochi | 163 |
| *Vernonia amygdalina* Del. | Asteraceae | Aebicha | 115 |
| *Vernonia hymenolepis* A. Rich. | Asteraceae | Agadena | 48 |
| *Vernonia myrantha* Hook.f. | Asteraceae | Rangii | 38 |
| *Veronica gunae* Schweinf. ex Fries | Scrophulariaceae | | 159 |
| *Withania somnifera* (L.) Dun. in DC. | Solanaceae | Hunzo, Hunso, Hide-Buda | 66 |
| *Zehneria scabra* (Linn.f.) Sond. | Cucurbitaceae | Harolla / Etse sabek | 124 |

**Appendix II**. Informant consensus (N.In), the number of times medicinal plants are informed (FBI) and number of diseases treated (N.D.)

| **Scientific name** | **FBI** | **%** | **N.In** | **%** | **N.D.** | **%** |
|---|---|---|---|---|---|---|
| *Achyranthes aspera* L. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Acmella caulirhiza* Del. | 2 | 0.3 | 1 | 2 | 2 | 2.2 |
| *Ageratum conyzoides* L. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Agrocharis incognita* (Norman) Heyw. & Jury | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Agrocharis melanantha* Hochst. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |

**Appendix II continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| *Ajuga alba* (Gurke) Robyns | 4 | 0.6 | 4 | 8.2 | 4 | 4.4 |
| *Alchemilla abyssinica* Fresen. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Alchemilla haumannii* Rothm. | 2 | 0.3 | 1 | 2 | 2 | 2.2 |
| *Allium sativum* L. | 29 | 4 | 16 | 33 | 20 | 22 |
| *Aloe macrocarpa* Tod. | 5 | 0.7 | 5 | 10 | 4 | 4.4 |
| *Amaranthus caudatus* L. | 3 | 0.4 | 1 | 2 | 3 | 3.3 |
| *Anethum graveolens* L. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Anthemis tigreensis* J.Gay ex A. Rich. | 4 | 0.6 | 3 | 6.1 | 4 | 4.4 |
| *Anthriscus sylvestris* (L.) Hoffm. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Arisaema schimperianum* Schott | 4 | 0.6 | 2 | 4.1 | 4 | 4.4 |
| *Artemisia abyssinica Sch. Bip. ex A. Rich.* | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Artemisia afra* Jacq. ex Willd. | 3 | 0.4 | 3 | 6.1 | 3 | 3.3 |
| *Artemisia absinthium* L. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Asparagus africanus* Lam. | 13 | 1.8 | 11 | 22 | 10 | 11 |
| *Asparagus setaceus* (Kunth) Jessap | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Asplenium aethiopicum* (Burm.f.) Becherer | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Asplenium monanthes* L. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Asystasia excellens* Lindau | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Basananthe hanningtoniana* (Mast.) W.J. de Wilde | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Bersama abyssinica* Fresen. | 4 | 0.6 | 3 | 6.1 | 4 | 4.4 |
| *Berula erecta (Hudson)* Coville | 2 | 0.3 | 1 | 2 | 2 | 2.2 |
| *Bidens macroptera* (Sch. Bip. ex Chiov.) Mesfin | 2 | 0.3 | 1 | 2 | 2 | 2.2 |
| *Calpurnia aurea* (Ait.) Benth. | 5 | 0.7 | 4 | 8.2 | 4 | 4.4 |
| *Canthium oligocarpum* Hiern | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Carduus nyassanus* (S. Moore) R.E. Fries | 7 | 1 | 6 | 12 | 7 | 7.69 |
| *Carica papaya* L. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Cassipourea malosana* (Baker) Alston | 4 | 0.6 | 4 | 8.2 | 2 | 2.2 |
| *Catha edulis* (Vahl) Forssk.ex Endl. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Cheilanthes farinosa* (Forssk.) Kaulf. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Chenopodium scraderianum* Schult. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Cineraria deltoidea* Sond. | 3 | 0.4 | 2 | 4.1 | 3 | 3.3 |
| Cissus adenocaulis Steud. ex A. Rich. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Clematis hirsuta* Perr. & Guill. | 23 | 3.2 | 17 | 35 | 12 | 13.2 |
| *Clerodendrum myricoides* (Hochst.) R.Br. ex Vatke | 10 | 1.4 | 7 | 14 | 7 | 7.69 |
| *Clutia abyssinica* Jaub. & Spach | 8 | 1.1 | 8 | 16 | 5 | 5.49 |
| *Commelina foliacea* Chiov. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Convolvulus kilimandschari* Engl. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Crepis ruepellii* Sch. Bip. | 6 | 0.8 | 4 | 8.2 | 6 | 6.59 |
| *Crinum abyssinicum* Hochst.ex A. Rich. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Crotalaria rosenii* (Pax) Milne-Redh. ex Polhill | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Crotalaria agatiflora* Schweinf. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Cucumis ficifolius* A. Rich. | 17 | 2.4 | 10 | 20 | 11 | 12.1 |
| *Cupressus lusitanica* Mill. | 3 | 0.4 | 3 | 6.1 | 3 | 3.3 |
| *Cyathula polycephala* Bak. | 12 | 1.7 | 8 | 16 | 5 | 5.49 |

**Appendix II continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| *Cycniopsis humifusa* (Forssk.) Sengl. | 3 | 0.4 | 3 | 6.1 | 1 | 1.1 |
| *Cymbopogon citratus* (DC.) Stapf | 3 | 0.4 | 3 | 6.1 | 4 | 4.4 |
| *Cynoglossum amplifolium* Hochst.ex A. Rich. | 4 | 0.6 | 4 | 8.2 | 3 | 3.3 |
| *Cynoglossum coeruleum* Hochst. | 9 | 1.3 | 7 | 14 | 8 | 8.79 |
| *Datura stramonium* L. | 4 | 0.6 | 4 | 8.2 | 2 | 2.2 |
| *Discopodium eremanthum* Chiov. | 7 | 1 | 7 | 14 | 7 | 7.69 |
| *Dodonaea anguistifolia* L.f. | 3 | 0.4 | 2 | 4.1 | 3 | 3.3 |
| *Dorstenia barnimiana* Schweinf. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Dovyalis abyssinica* (A. Rich.) Warb. | 3 | 0.4 | 3 | 6.1 | 3 | 3.3 |
| *Dryopteris inaequalis* (Schlecht.) Kuntze | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Erythrina brucei* Schweinf. | 4 | 0.6 | 3 | 6.1 | 4 | 4.4 |
| *Eucalyptus globulus* Labill. | 7 | 1 | 5 | 10 | 6 | 6.59 |
| *Eucalyptus saligna* Smith | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Euphorbia depauperata* A. Rich. | 3 | 0.4 | 3 | 6.1 | 3 | 3.3 |
| *Euphorbia dumalis* S.Carter | 3 | 0.4 | 3 | 6.1 | 1 | 1.1 |
| *Euphorbia lathyris* L. | 6 | 0.8 | 2 | 4.1 | 5 | 5.49 |
| *Euphorbia schimperiana* Scheele | 6 | 0.8 | 6 | 12 | 5 | 5.49 |
| *Ferula communis* L. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Ficus palmata* Forssk. | 6 | 0.8 | 6 | 12 | 6 | 6.59 |
| *Foeniculum vulgare* Miller | 4 | 0.6 | 4 | 8.2 | 4 | 4.4 |
| *Galinsoga parviflora* Cav. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Galium simense* Fresen. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Geranium arabicum* Forssk. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Gladiolus dalenii* Van Geel | 2 | 0.3 | 1 | 2 | 2 | 2.2 |
| *Gomphocarpus fruticosus* (L.) Ait. f. | 3 | 0.4 | 1 | 2 | 3 | 3.3 |
| *Hagenia abyssinica* (Bruce) J.F. Gmel. | 12 | 1.7 | 11 | 22 | 10 | 11 |
| *Haplocarpha rueppellii* (Sch. Bip.) Beauv. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Haplosciadium abyssinicum* Hochst. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Helichrysum gofense* Cufod. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Helichrysum traversii* Chiov. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Heracleum abyssinicum* (Boiss.) Norman | 4 | 0.6 | 2 | 4.1 | 4 | 4.4 |
| *Heteromorpha trifoliata* (Wendel.) Eckl. & Zeyh. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Hypericum revolutum* Vahl | 3 | 0.4 | 3 | 6.1 | 1 | 1.1 |
| *Ilex mitis* (L.) Radlk. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Impatiens aethiopiaca* Gray-Wilson | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Inula confertiflora* A. Rich. | 8 | 1.1 | 5 | 10 | 7 | 7.69 |
| *Juniperus procera* L. | 4 | 0.6 | 4 | 8.2 | 3 | 3.3 |
| *Justicia schimperiana* (Hochst. ex Nees) T. Anders. | 3 | 0.4 | 3 | 6.1 | 2 | 2.2 |
| *Kalanchoe laciniata* (L.) DC. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Kalanchoe petitiana* A. Rich. | 11 | 1.5 | 8 | 16 | 9 | 9.89 |
| *Kniphofia foliosa* Hochst. | 5 | 0.7 | 4 | 8.2 | 4 | 4.4 |
| *Kniphofia isoetifolia* Steud. ex Hochst. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Launea intybacea* (Jacq.) Beauv. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Leonotis ocymifolia* (Burm.f.) Iwarsson | 14 | 1.9 | 12 | 24 | 11 | 12.1 |

**Appendix II continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| *Linum usitatissimum* L. | 3 | 0.4 | 3 | 6.1 | 3 | 3.3 |
| *Lippia adoensis* Hochst. ex Walp. | 4 | 0.6 | 4 | 8.2 | 3 | 3.3 |
| *Lobelia rhynchopetalum* Hemsl. | 1 | 0.1 | 1 | 2 | 2 | 2.2 |
| *Lotus corniculatus* L. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Lycopersicon esculentum* (L.) Mill. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Maesa lanceolata* Forssk. | 4 | 0.6 | 3 | 6.1 | 3 | 3.3 |
| *Malva verticillata* L. | 3 | 0.4 | 2 | 4.1 | 3 | 3.3 |
| *Maytenus arbutifolia* (A. Rich.) Wilczek | | 0 | | 0 | 2 | 2.2 |
| *Maytenus gracilipes* (Welw.ex Oliv.) Exell | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Melilotus suaveolens* Ledeb. | 2 | 0.3 | 2 | 4.1 | 1 | 1.1 |
| *Millettia ferruginea* (Hochst.) Bak. | | 0 | | 0 | 2 | 2.2 |
| *Myosotis vestergrenii* Stroh | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Myrica salicifolia* A. Rich. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Nicotiana tabacum* L. | 6 | 0.8 | 4 | 8.2 | 4 | 4.4 |
| *Nigella sativa* L. | 11 | 1.5 | 9 | 18 | 8 | 8.79 |
| *Nuxia congesta* R. Br. ex Fresen. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Ocimum lamifolium* Hochst. | 4 | 0.6 | 4 | 8.2 | 2 | 2.2 |
| *Oenanthe procumbens* (Wolff) Norman | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Oldenlandia monanthos* (A. Rich.) Hiern | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Olea europaea* L. subsp. *cuspidata* (Wall. ex G.Don) Cif. | 13 | 1.8 | 10 | 20 | 6 | 6.59 |
| *Olinia rochetiana* A. Juss. | 5 | 0.7 | 10 | 20 | 5 | 5.49 |
| *Opuntia ficus-indica* (L.) Miller | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Ornithogalum tenuifolium* Delaroche | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Osyris quadripartita* Decn. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Otostegia erlangeri* Gürke | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Peperomia abyssinica* Mig. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Peperomia tetraphyla* (Foster) Hook. & Arn. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Phytolaca dodecandra* L'Hérit. | 7 | 1 | 5 | 10 | 5 | 5.49 |
| *Pittosporum viridiflorum* Sims | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Plantago africana* Verde | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Plantago lanceolata* L. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Plectrantus barbatus* Group | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Polycarpon tetraphyllum* (L.) L. | 2 | 0.3 | 1 | 2 | 2 | 2.2 |
| *Polygala sphenoptera* Fresen. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Polygala steudneri* Chod. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Prenanthes subpeltata* Stebbins | 5 | 0.7 | 1 | 2 | 5 | 5.49 |
| *Ranunculus multifidus* Forssk. | 5 | 0.7 | 3 | 6.1 | 5 | 5.49 |
| *Ranunculus simensis* Fresen. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Rhamnus prinoides* L'Herit. | 4 | 0.6 | 4 | 8.2 | 4 | 4.4 |
| *Rhamnus staddo* A. Rich. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Rosa abyssinica* Lindley | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Rubia cordifolia* L. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Rubus steudneri* Schwienf. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Rubus volkensii* Engl. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |

**Appendix II continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| *Rumex abyssinicus* Jacq. | 11 | 1.5 | 9 | 18 | 6 | 6.59 |
| *Rumex nepalensis* Spreng. | 27 | 3.8 | 16 | 33 | 15 | 16.5 |
| *Ruta chalapensis* L | 5 | 0.7 | 4 | 8.2 | 4 | 4.4 |
| *Salix mucronata* Willd. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Salvia merjamie* Forssk. | 7 | 1 | 6 | 12 | 5 | 5.49 |
| *Salvia nilotica* Jacq. | 3 | 0.4 | 2 | 4.1 | 3 | 3.3 |
| *Satureja pseudosimensis* Brenan | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Satureja punctata* (Benth.) Briq. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Schefflera volkensii* (Engl.) Harms | 4 | 0.6 | 4 | 8.2 | 3 | 3.3 |
| *Sedum baleensis* M.Gilbert | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Senecio fresenii* Sch. Bip. ex Oliv. & Hiern | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Senecio myriocephalus* Sch. Bip. ex A. Rich. | 2 | 0.3 | 1 | 2 | 2 | 2.2 |
| *Senecio ragazzii* Chiov. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Senecio syringifolius* O. Haffm. | 4 | 0.6 | 4 | 8.2 | 1 | 1.1 |
| *Sida schimperiana* Hochst. ex A. Rich. | 6 | 0.8 | 4 | 8.2 | 5 | 5.49 |
| *Sideroxylon oxyacanthum* Baill. | 16 | 2.2 | 13 | 27 | 3 | 3.3 |
| *Silene macrosolen* A. Rich. | 16 | 2.2 | 8 | 16 | 12 | 13.2 |
| *Solanecio angulatus* (Vahl) C. Jeffrey | 8 | 1.1 | 8 | 16 | 6 | 6.59 |
| *Solanecio gigas* (Vatke) C. Jeffrey | 8 | 1.1 | 6 | 12 | 1 | 1.1 |
| *Solanum adoense* Hochst. ex A. Rich. | 8 | 1.1 | 6 | 12 | 3 | 3.3 |
| *Solanum anguivi* Lam. | 8 | 1.1 | 3 | 6.1 | 6 | 6.59 |
| *Solanum incanum* L. | 5 | 0.7 | 3 | 6.1 | 5 | 5.49 |
| *Solanum marginatum* L.f. | 7 | 1 | 5 | 10 | 7 | 7.69 |
| *Sonchus bipontini* Asch. | 7 | 1 | 5 | 10 | 7 | 7.69 |
| *Stephania abyssinica* (Dillon & A. Rich.) | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Tagetes minuta* L. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Thalictrum rhynchocarpum* Dill. & A. Rich. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Thymus schimperi* Ronniger | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Trichilia prieuriana* A. Juss. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Umbilicus botryoides* A. Rich. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Verbascum sinaiticum* Benth. | 21 | 2.9 | 15 | 31 | 14 | 15.4 |
| *Verbena officinalis* L. | 2 | 0.3 | 2 | 4.1 | 2 | 2.2 |
| *Vernonia amygdalina* Del. | 13 | 1.8 | 10 | 20 | 9 | 9.89 |
| *Vernonia hymenolepis* A. Rich. | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Vernonia myrantha* Hook.f. | 3 | 0.4 | 2 | 4.1 | 3 | 3.3 |
| *Veronica gunae* Schweinf. ex Fries | 1 | 0.1 | 1 | 2 | 1 | 1.1 |
| *Withania somnifera* (L.) Dun. | 17 | 2.4 | 13 | 27 | 10 | 11 |
| *Zehneria scabra* (Linn.f.) Sond. | 8 | 1.1 | 7 | 14 | 7 | 7.69 |

**Appendix III**. List of medicinal plants used for human, scientific name, family, local name, growth form, collection number, status, disease treated, part used, form used, methods of preparation and application, and route of administration

**Key**: Status (Sta), plant part used (PU), form used (FU), methods of preparation and aplication (MPAP), route of administration (RA), concoction (Co), decoction (De), steam bath (StB), smoke bath (SmB), chewing (Che), crushing (Cr), powdering (Pw), pounding (P), crushing and homogenizing with water (chw), squizing (Sq), burning (B), stem cut (St.cu), drinking (Dr), painting (Pa), washing (Wa), tying (Ty), dropping (Dro), swallowing or direct eating (Swa), chewing and swallowing juice (Csw), tooth brushing (Tb), smelling (Sm), whole part (Wh), flower (Fl), fruits (Fr), seeds (Se), stem bark (Sb), root bark (Rb), stem internal bark (Sib), stem exudate (Ste), stem oil (So), stem (St), root (R), bulb (Bu), leaves (L), dried (D), fresh (F), fresh or dried (FD), dermal (Der), auricular (Au), optical (Op), intraveinus (In), nasal (N), oral (O), abundant (A), rare (Ra), very rare (VR), fairly present (F)
GF [growth form], H [herb], S [shrub], T [tree], Li [liana], H(clim) [herbaceous climber], E[epiphyte]

| **Scientific name** | **Sta** | **Family** | **GF** | **Local name** | **Coll. No.** | **Human Disease** | **PU** | **FU** | **MPAP** | **RA** |
|---|---|---|---|---|---|---|---|---|---|---|
| *Acmella caulirhiza* Del. | A | Asteraceae | H | | 110 | Dhibe Tiru (Liver diseae) | Wh | FD | Co, chw, Cr, Pw, Dr | O |
| | | | | | | Rajoo | Wh | FD | Co, Cr, Pw, Dr | O |
| *Ageratum conyzoides* L. | F | Asteraceae | H | | 126 | Hemorrhage | L | F | Cr, StB | Der |
| | | | | | | Qora (Cold) | L | F | Cr, StB | Der |
| *Agrocharis incognita* (Norman) Heyw. & Jury | A | Apiaceae | H | Shishunka | 35 | Muje | R | D | Pw,Ty | Der |
| *Ajuga alba* (Gurke) Robyns | Ra | Lamiaceae | H | Anamuro | 171 | Dhibe Gura (Earache) | L | F | Sq, Dro | Au |
| | | | | | | Dhibe Sere (Rabies) | L | FD | P, chw, Dr | O |
| | | | | | | Ascariasis | L | D | De, Dr | O |
| | | | | | | Qufa (common cold) | L | D | Co, Cr, Swa | O |
| *Alchemilla haumannii* Rothm. | A | Rosaceae | H | Endrif | 96 | Agano (Dingetegna) (Acute stomach illness) | L | F | Csw | O |
| | | | | | | Sore (Infected wound) | L | F | Cr, Ty | Der |
| *Aloe macrocarpa* Tod. | F | Aloaceae | S | Hargissa/Qore | 170 | Kurmuman (Kintarot) [Haemorrhoid] | L | F | Co, Cr, Pa | Der |
| | | | | | | Dhibe Eja (Eye problem) | Ste | F | St.cu, Dro | Op |
| | | | | | | Kurmuman (Kintarot) [Haemorrhoid] | So | F | Co, Sq, Pa | Der |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | R | FD | Co, Cr, chw, Dr | O |
| | | | | | | Forefor (dermatophytes) (Dandruff) | Ste | F | Co, St.cu, Pa | Der |

**Appendix III continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Amaranthus caudatus* L. | F | Amaranthaceae | H | Bertefi | 150 | Dhibe Tiru (Liver diseae) | Se | D | Co, Cr, Pw, chw, Dr | O |
| | | | | | | Kidney disease | Se | F | Co, De, Dr | O |
| | | | | | | Dubarraa (Amoebiasis) | Se | D | Co, Swa | O |
| *Anethum graveolens* L. | Ra | Apiaceae | H | Komna | 101 | Kidney disease | L | FD | De, P, Dr | O |
| *Anthemis tigreensis* J.Gay ex A. Rich. | A | Asteraceae | H | Sifay | 2 | Dhibe Sere (Rabies) | R | F | Co, Cr, chw, Dr | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | R | FD | Co, Cr, chw, Dr | O |
| | | | | | | Dubarraa (Amoebiasis) | R | FD | Cr, Pw, Swa | O |
| | | | | | | Dhukuba Dhudha | R | F | Co, De, Cr, Dr | O |
| *Anthriscus sylvestris* (L.) Hoffm. | A | Apiaceae | H | Bossoqua | 36 | Agano (Dingetegna) (Acute stomach illness) | R | F | Cr, Csw | O |
| *Arisaema schimperianum* Schott | F | Araceae | H | Amoch (Amh) | 173 | TB | R | FD | Co, Cr, Pw | Der |
| | | | | | | Robii (Fungal infection) [Ringworm] | R | F | Co, Cr, Pa | Der |
| | | | | | | Naqarsa | R | D | Cr, Ty | Der |
| | | | | | | Dhibe Tiru (Liver diseae) | Fr, L | D | Co, Cr, chw, Dr | O |
| *Artemisia afra* Jacq. ex Willd. | A | Asteraceae | S | Chuqune | 56 | Buda (stress) [Evil eye] | L | D | SmB | Der |
| | | | | | | Michi (Febrile illness) | L | F | Cr, Pa | Der |
| | | | | | | Dhibe Qabana (Epilepsy) | L, R, Sb | F | Co, Cr, Sq | N |
| *Asparagus setaceus* (Kunth) Jessap | F | Asparagaceae | S | Zeriti | 79 | Naqarsa | L | FD | Cr | Der |
| | | | | | | Dhibe Sere (Rabies) | R | F | Co, Cr, chw, Dr | O |
| *Asystasia excellens* Lindau | VR | Acanthaceae | S | Dhumuga | 177 | Dhibee Sinbiraa (Hepatitis B) | L | D | Co, Cr, chw, Dr | O |
| *Bidens macroptera* (Sch. Bip. ex Chiov.) Mesfin | F | Asteraceae | H | Kello | 44 | Dhibe Tiru (Liver diseae) | R | FD | Cr, Pw, chw, Dr | O |
| | | | | | | Rajoo | R | FD | Co, Cr, Dr | O |
| *Canthium oligocarpum* Hiern | VR | Rubiaceae | S | Amshiqa | 12 | Sibiji (Chife) [Eczema] | L | F | Cr, Ty | Der |
| *Carica papaya* L. | Ra | Caricaceae | S | Papaye | 101 | Dhibe somba (Lung disease) | R | D | Cr, Pw, chw, Dr | O |
| | | | | | | Dhibe Tiru (Liver diseae) | R | FD | P, Sq, Dr | O |

**Appendix III continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Cassipourea malosana* (Baker) Alston | Ra | Rhizophoraceae | S | Muka Dadi | 176 | Harassa (Qilensa) [Yebird Beshita] | Tw | F | Co, De, Cr | Der |
| | | | | | | Qora (Cold) | R | F | Co, De, Wa | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, Cr, StB | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, De, Cr | O, Der |
| *Catha edulis* (Vahl) Forssk. ex Endl. | Ra | Celastraceae | S | Chat | 99 | Kambussa | L | FD | Co, P, chw, Dr | O |
| *Chenopodium scraderianum* Schult. | A | Chenopodiaceae | H | Kimo | 131 | Funana (nosebleed) | L | D | Pw | N |
| *Cineraria deltoidea* Sond. | A | Asteraceae | H | | 123 | Naqarsa | L | FD | Cr | Der |
| | | | | | | Dhibe Tiru (Liver diseae) | Wh | FD | Co, Pw, chw, Dr | O |
| | | | | | | Rajoo | Wh | FD | Co, Cr, Dr | O |
| Cissus adenocaulis Steud. ex A. Rich. | VR | Vitaceae | H(climb) | Qorsa | 13 | Intestinal worms | R | F | Co, P, chw, Dr | O |
| *Clerodendrum myricoides* (Hochst.) R.Br. ex Vatke | F | Verbenaceae | S | Marasisa | 70 | Dhibe Laffaa (Evil spirit) | R, L | F | Co, Cr, Csw | O |
| | | | | | | Hilicani (toothache) | R | FD | Csw | O |
| | | | | | | Bowo (Headache) | R | D | P, StB | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, De | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | Tw | F | Co, De, Cr | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, Cr, StB | Der |
| | | | | | | Dhibe Laffaa (Evil spirit) | L | F | Co, Cr, Pw | O |
| | | | | | | Dhibe Tiru (Liver diseae) | Fr | D | Co, Cr, Pw, chw, Dr | O |
| | | | | | | Epilepsy | L | F | Co, StB | Der |
| | | | | | | Dry cough | Rb | FD | De, Dr | O |
| *Commelina foliacea* Chiov. | A | Commelinaceae | H | Harmala | 78 | Headache & oral sore of children | R | F | Che | N |
| *Convolvulus kilimandschari* Engl. | F | Convolvulaceae | Li | Aserkush Tebetebkush (Amh) | 175 | Dhibe Sere (Rabies) | R | F | Co, Pw, Dr | O |
| *Crinum abyssinicum* Hochst. ex A. Rich. | F | Amaryllidaceae | H | Chopi | 60 | Dhullaa (Bugunj) (Skin infection) | R | F | Ty | Der |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | R | FD | Co, chw, Cr, Dr | O |
| *Crotalaria rosenii* (Pax) Milne-Redh. ex Polhill | F | Fabaceae | S | Shashamane | 15 | Hobati (Retained placenta) | L | F | De, Dr | O |
| *Crotalaria agatiflora* Schweinf. | F | Fabaceae | S | Shashamane | *146* | Hobati (Retained placenta) | L | F | *De, Dr* | O |

**Appendix III continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Cynoglossum amplifolium* Hochst.ex A. Rich. | A | Boraginaceae | H | Kerchaba | 75 | Bowo (Headache) | R, L | FD | Csw | O, Der |
| | | | | | | Michi (Febrile illness) | L | F | Sq | N, Der |
| | | | | | | Buda (stress) [Evil eye] | R | D | Co, Cr, Pw, chw, Dr | O |
| | | | | | | Michi (Febrile illness) | L | FD | De, Cr, Dr | O |
| *Datura stramonium* L. | F | Solanaceae | H | Bengi | 165 | Hilicani (toothache) | Se | F | Co, P | O |
| | | | | | | Hilicani (toothache) | Se | FD | B | O |
| | | | | | | Baki (Barile)= Quaqucha [Tinea versicolor] | L | F | Cr, Pa | Der |
| | | | | | | Baki (Barile)= Quaqucha [Tinea versicolor] | Se | D | Co, Pw, Ty | Der |
| *Dodonaea anguistifolia* L.f. | Ra | Sapindaceae | S | Dhitecha | 40 | Muje | L | D | Co, P, Ty | Der |
| | | | | | | Bochore (Skin disease) | L | D | Pw | Der |
| | | | | | | Darabaftu (Almaz balecira) [Herpes Zoster] | L | D | Pw | Der |
| *Dorstenia barnimiana* Schweinf. | Ra | Moraceae | H | | 120 | Qora (Cold) | R | F | StB | Der |
| *Dovyalis abyssinica* (A. Rich.) Warb. | F | Flacourtiaceae | S | Koshimo | 22 | Buda (stress) [Evil eye] | R | FD | Co, P, StB | Der |
| | | | | | | Hobati (Retained placenta) | L | F | De, P, Dr | O |
| | | | | | | Garaa Ciniinnaa/Garaa kaasaa (Stomach pain) | Sb,Tw, Fl, Fr, Se | FD | Cr, chw, Dr | O |
| *Eucalyptus globulus* Labill. | A | Myrtaceae | T | Bahirzafi | 55 | Constipation | L | F | Cr, Swa | O |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | L | F | Co, Csw | O |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, StB | Der |
| | | | | | | Typhoid | L | F | Co, Cr, chw, Dr | O |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | Fl | FD | Co, Cr, Csw | O |
| | | | | | | Michi (Febrile illness) | L | F | Csw | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | L | F | Co, Csw | O |
| *Eucalyptus saligna* Smith | A | Myrtaceae | T | Barzafi | 97 | Michi (Febrile illness) | Fr | FD | Cr, B, SmB | Der |

**Appendix III continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Euphorbia depauperata* A. Rich. | A | Euphorbiaceae | H | Gura Jarsa | 19 | Dhibee Sinbiraa (Hepatitis B) | R, L | FD | Co, Cr, Dr | O |
| | | | | | | Chobto (Gonorrhoea) | R | F | De, Cr, Dr | O |
| | | | | | | Ascariasis | R, Sb | F | De, Cr, Dr | O |
| *Euphorbia dumalis* S.Carter | A | Euphorbiaceae | S | Gurii | 20 | Chobto (Gonorrhoea) | Sb | D | Pw, chw, Dr | O |
| | | | | | | Chobto (Gonorrhoea) | R | F | De, Cr, Dr | O |
| | | | | | | Chobto (Gonorrhoea) | R | F | Co, Cr, Swa | O |
| *Euphorbia lathyris* L. | F | Euphorbiaceae | H | Ambuluk | 118 | Dhibee Sinbiraa (Hepatitis B) | Fr(Se) | FD | Cr, Pw, Swa | O |
| | | | | | | Chobto (Gonorrhoea) | Se | FD | Cr, Swa | O |
| | | | | | | Dhibe Tiru (Liver diseae) | Se | FD | P, chw, Dr | O |
| | | | | | | Bile (Jaundice) | Se | F | Csw, Swa | O |
| | | | | | | Intestinal worms | Se | F | Cr, P, Swa | O |
| | | | | | | Chobto (Gonorrhoea) | Se | F | Cr, Swa | O |
| *Ferula communis* L. | A | Apiaceae | H | Gnida | 34 | Dhibe Tiru (Liver diseae) | R | F | De, Dr | O |
| *Foeniculum vulgare* Miller | Ra | Apiaceae | H | Ensilal | 128 | Funana (nosebleed) | L | F | Co, Cr, Sq | N |
| | | | | | | Chobto (Gonorrhoea) | L | FD | Co, De, Cr, Dr | O |
| | | | | | | Kidney disease | L | F | Co, De, Dr | O |
| | | | | | | Naqarsa | L | D | Co, Cr, B | Der |
| *Galinsoga parviflora* Cav. | A | Asteraceae | H | Gubdu | 125 | Hilicani (toothache) | Se | F | Co, P | O |
| | | | | | | Qufa (common cold) | Fr | D | Co, De, Cr, Dr | O |
| *Galium simense* Fresen. | A | Rubiaceae | H | Jiddha | 135 | Abdominal irritation (Gastritis) | R | FD | Csw | O |
| *Geranium arabicum* Forssk. | A | Geraniaceae | H | Qorsa Guracha /Kinta | 23 | Agano (Dingetegna) (Acute stomach illness) | R | F | Cr, Csw | O |
| | | | | | | Naqarsa | R | F | Co, Cr, Ty | Der |
| *Gladiolus dalenii* Van Geel | Ra | Iridaceae | H | Kelede | 179 | Wugat (Stabbing Pain) | R | FD | P, chw, Dr | O |
| | | | | | | Chobto (Gonorrhoea) | R | FD | Cr, chw, Dr | O |
| *Haplocarpha rueppellii* (Sch. Bip.) Beauv. | F | Asteraceae | H | | 121 | Kambussa | R | FD | Co, P, Dr | O |
| *Helichrysum gofense* Cufod. | A | Asteraceae | H | Irisha | 43 | Bowo (Headache) | L | F | Co, Cr, StB | Der |
| | | | | | | Dhibe Laffaa (Evil spirit) | L, St, R | F | Co, Cr, StB | O, Der |
| *Helichrysum traversii* Chiov. | A | Asteraceae | S | | 5 | Harassa (Qilensa) [Yebird Beshita] | St | F | Co, Cr, SmB | Der |

**Appendix III continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Heracleum abyssinicum* (Boiss.) Norman | A | Apiaceae | H | Bobonka | 130 | Rajoo | R | FD | Co, Cr, Dr | O |
| | | | | Bunkaka Hida | 11 | Dhibe Laffaa (Evil spirit) | L | F | Cr, B, SmB | O |
| | | | | Anshoshiraa | 11 | Sibiji (Chife) [Eczema] | R, L, Fl | D | Co, Cr, Pw, Pa | Der |
| | | | | Bunkaka Hida | 130 | Agano (Dingetegna) (Acute stomach illness) | R, L | FD | Cr, Csw | O |
| *Heteromorpha trifoliata* (Wendel.) Eckl. & Zeyh. | A | Apiaceae | S | Hare Hanqa | 127 | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, Cr | O |
| *Hypericum revolutum* Vahl | A | Hypericaceae | S | Garamba | 27 | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, StB | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, Cr, StB | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, De, Cr, Wa | Der |
| *Ilex mitis* (L.) Radlk. | F | Aquifoliaceae | S | | 7 | Harassa (Qilensa) [Yebird Beshita] | L, Sb | F | Co, Cr, StB | Der |
| *Impatiens aethiopiaca* Gray-Wilson | F | Balsaminaceae | H | Anshoshila | 30 | Chobto (Gonorrhoea) | R | F | Cr, Pa | Der |
| *Justicia schimperiana* (Hochst. ex Nees) T. Anders. | A | Acanthaceae | S | Sensel | 93 | Dhibee Sinbiraa (Hepatitis B) | L | F | Cr, Sq, chw, Dr | O |
| | | | | | | Buda (stress) [Evil eye] | L | D | Pw | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | L | D | Co, Cr, chw, Dr | O |
| | | | | | | Qonqo (Tonsilitis) | R | F | P | N |
| *Kniphofia isoetifolia* Steud. ex Hochst. | F | Asphodelaceae | H | Shinshile | 316 | Chobto (Gonorrhoea) | R | FD | Co, Cr, Dr | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | R | FD | Co, De, Cr, Dr | O |
| *Launea intybacea* (Jacq.) Beauv. | A | Asteraceae | H | Korsa Sheka | 1 | Dubarraa (Amoebiasis) | R, L | FD | De, Dr | O |
| *Linum usitatissimum* L. | A | Linaceae | H | Telba (Amh) | 17 | Hobati (Retained placenta) | Se | D | Co, De, P | O |
| | | | | | | Kurtmat (Spasm) | Se | F | P, Pa | Der |
| | | | | | | Dhullaa (Bugunj) (Skin infection) | Se | D | Co, Pw, Ty | Der |
| *Lippia adoensis* Hochst. ex Walp. | F | Verbenaceae | S | Sukahi | 76 | Constipation | L | F | P, Dr | O |
| *Lippia adoensis* Hochst. ex Walp. | F | Verbenaceae | S | Sukayee | 76 | Agano (Dingetegna) (Acute stomach illness) | L | FD | Co, Cr, Csw | O |
| | | | | | | Garaa Ciniinnaa/Garaa kaasaa (Stomach pain) | L | FD | Cr, Pw, Swa | O |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | R, L | FD | Cr, Csw | O |

**Appendix III continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Lycopersicon esculentum* (L.) Mill. | F | Solanaceae | H | Timatimo | 166 | Chobto (Gonorrhoea) | L | FD | Co, De, Cr, Dr | O |
| | | | | | | Kidney disease | L | F | Co, De, Dr | O |
| *Malva verticillata* L. | A | Malvaceae | H | Lita | 136 | Bowo (Headache) | L | F | Cr, Ty | Der |
| | | | | | | Dhibe Eja (Eye problem) | L | F | Cr | Op |
| | | | | | | Forefor (dermatophytes) (Dandruff) | R | D | Co, Cr, Pw, Pa | Der |
| *Maytenus arbutifolia* (A. Rich.) Wilczek | A | Celastraceae | S | Qartame (Kombolcha) | 152 | Dhibe Tiru (Liver diseae) | Fr, L | D | Co, Cr, chw, Dr | O |
| | | | | | | Buda (stress) [Evil eye] | L | D | P | O, N |
| *Maytenus gracilipes* (Welw.ex Oliv.) Exell | F | Celastraceae | S | Kombolcha | 90 | Epilepsy | L | D | Pw, Dr | O |
| | | | | | | Bowo (Headache) | L, Fr, Sb | D | Cr, Pw, Swa | O |
| *Melilotus suaveolens* Ledeb. | A | Fabaceae | H | Hanguge | 111 | Dhibe Gura (Earache) | L | F | Sq, Dro | Au |
| | | | | | | Dhibe Gura (Earache) | L | D | Co, Cr, Dro | Au |
| *Myosotis vestergrenii* Stroh | A | Boraginaceae | H | Dingetegna | 161 | Agano (Dingetegna) (Acute stomach illness) | L | F | Sq, Dr | O |
| *Myrica salicifolia* A. Rich. | F | Myricaceae | S | Tona | 25 | Harassa (Qilensa) [Yebird Beshita] | L, St | F | Co, Cr, B, SmB | Der |
| | | | | | | Qora (Cold) | L | F | De, Wa | Der |
| *Nuxia congesta* R.Br.ex Fresen. | F | Loganiaceae | S | Bitena | 89 | Harassa (Qilensa) [Yebird Beshita] | L, Sb | F | Co, Cr, StB | Der |
| | | | | | | Hossis or Chito (Scabies) | Sb | FD | Co, De, Cr, Wa | Der |
| *Oenanthe procumbens* (Wolff) Norman | A | Apiaceae | H | Bunkaka Hida | 11 | Garaa Ciniinnaa/Garaa kaasaa (Stomach pain) | R | FD | De, Cr, Pw, Dr | O |
| *Oldenlandia monanthos* (A. Rich.) Hiern | A | Rubiaceae | H | Matane Ilbisa | 148 | Dhibe Laffaa (Evil spirit) | L, St | FD | Co, Cr, StB | Der |

**Appendix III continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Olea europaea* L. subsp. *cuspidata* (Wall. ex G.Don) Cif. | F | Oleaceae | T | Ejersa | 95 | Dhibe Gura (Earache) | St | F | Cr, Dro | Au |
| | | | | | | Sibiji (Chife) [Eczema] | St | F | Pa | Der |
| | | | | | | Bochore (Skin disease) | So | F | Cr | Der |
| | | | | | | Sibiji (Chife) [Eczema] | So | F | Co, Sq, Pa | Der |
| | | | | | | Sibiji (Chife) [Eczema] | L, So | FD | Cr, Pa | Der |
| | | | | | | Sibiji (Chife) [Eczema] | So | FD | Pa | Der |
| | | | | | | Sibiji (Chife) [Eczema] | So | F | Pa | Der |
| | | | | | | Qumata | So | F | Pa | Der |
| | | | | | | Sibiji (Chife) [Eczema] | So | F | Pa | Der |
| | | | | | | Kurmuman (Kintarot) [Haemorrhoid] | So | F | Pa | Der |
| | | | | | | Kurmuman (Kintarot) [Haemorrhoid] | So | F | Co, Sq, Pa | Der |
| | | | | | | Dhibe Laffaa (Evil spirit) | St | F | Cr, B, SmB | O, Der |
| | | | | | | Sibiji (Chife) [Eczema] | So | D | Pa | Der |
| *Opuntia ficus-indica* (L.) Miller | A | Cactaceae | S | Beles | 133 | | R | F | Co, Cr | Der |
| | | | | | | Forefor (dermatophytes) (Dandruff) | Ste | F | Co, St.cu, Pa | Der |
| *Ornithogalum tenuifolium* Delaroche | Ra | Hyacinthaceae | H | Kuras | 180 | Kurmuman (Kintarot) [Haemorrhoid] | Se | FD | Co, Cr, Pw, Pa | Der |
| *Osyris quadripartita* Decn. | F | Santalaceae | S | Karo | 88 | Hilicani (toothache) | L | FD | Cr, Wa | O |
| *Otostegia erlangeri* Gürke | A | Lamiaceae | S | Demboba | 168 | Sore (Infected wound) | L | D | Co, Cr, Pw | Der |
| *Peperomia abyssinica* Mig. | A | Piperaceae | E | Rafu Osole | 108 | Qora (Cold) | R | F | Co, De, Wa | Der |
| | | | | | | Hossis or Chito (Scabies) | L | F | Co, De, Cr, Wa | Der |
| *Peperomia tetraphyla* (Foster) Hook. & Arn. | Ra | Piperaceae | E | | 8 | Harassa (Qilensa) [Yebird Beshita] | Wh | F | Co, Cr, StB | Der |
| *Plantago africana* Verde | A | Plantaginaceae | H | Baxxicha | 63 | Dhibee Sinbiraa (Hepatitis B) | R | F | De, Cr, Dr | O |
| *Plantago lanceolata* L. | A | Plantaginaceae | H | Sandabo | 62 | Hilicani (toothache) | Wh | D | Cr, Pw, chw, Dr | O |
| *Plectrantus barbatus* Group | F | Lamiaceae | S | Damakessie | 169 | Michi (Febrile illness) | L | FD | De, Cr, Wa | Der |
| *Polycarpon tetraphyllum* (L.) L. | A | Caryophyllaceae | H | Lalessa | 109 | Hilicani (toothache) | R | FD | Csw | O |
| | | | | | | Menustrual pbm | R | F | Pw, chw, Dr | O |

**Appendix III continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Ranunculus multifidus* Forssk. | F | Ranunculaceae | H | Akouku-Qartassa | 149 | Intestinal worms | R, L | D | De, Cr, Dr | O |
| | | | | Kertassa | 149 | Asthma | R | D | Co, Cr, Swa | O |
| | | | | Scherif | 149 | Naqarsa | L | FD | Pw | Der |
| | | | | Kartasa | 149 | Kurmuman (Kintarot) [Haemorrhoid] | R | D | Co, Cr, Pw | Der |
| | | | | Kartasa | 149 | Dubarraa (Amoebiasis) | Fl | D | Pw, Swa | O |
| *Ranunculus simensis* Fresen. | F | Ranunculaceae | H | Kinta | 85 | Sibiji (Chife) [Eczema] | R, L | FD | Cr, Ty | Der |
| *Rhamnus staddo* A. Rich. | Ra | Rhamnaceae | S | Qedida | 24 | Qora (Cold) | L | F | Co, De, Wa | Der |
| *Rubia cordifolia* L. | Ra | Rubiaceae | H | Anqis | 147 | Bassa (Diarrhoea) | R | FD | De, Pw, chw, Dr | O |
| *Rubus steudneri* Schwienf. | A | Rosaceae | S | Gora | 14 | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, StB | Der |
| *Rubus volkensii* Engl. | F | Rosaceae | S | Gura Hagena | 10 | Dhibe Laffaa (Evil spirit) | L | F | Co, Cr, StB | O, Der |
| *Salix mucronata* Willd. | Ra | Salicaceae | T | Aleltu | 139 | Hobati (Retained placenta) | L | D | Pw, chw, Dr | O |
| | | | | | | Dhibe Sere (Rabies) | L | D | Co, Pw, Dr | O |
| *Satureja pseudosimensis* Brenan | A | Lamiaceae | H | Riggii | 164 | Agano (Dingetegna) (Acute stomach illness) | R, L | FD | Cr, Csw | O |
| *Satureja punctata* (Benth.) Briq. | A | Lamiaceae | H | Yemich medihanit | 172 | Michi (Febrile illness) | L | FD | Cr, Sq, Dr | O |
| | | | | | | Michi (Febrile illness) | L | F | Cr, Sq | N, Der |
| *Schefflera volkensii* (Engl.) Harms | A | Araliaceae | T | Ansha | 33 | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, Cr, StB | Der |
| | | | | | | Bowo (Headache) | L | F | Co, Cr, StB | Der |
| | | | | | | Qora (Cold) | L | F | Co, De, Wa | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, De, Cr, Wa | Der |
| *Sedum baleensis* M. Gilbert | F | Crassulaceae | H | Buri | 145 | Sibiji (Chife) [Eczema] | R | F | Cr, Ty | Der |
| *Senecio myriocephalus* Sch. Bip. ex A. Rich. | A | Asteraceae | S | Agadena | 119 | Dhibee Sinbiraa (Hepatitis B) | R | D | Co, Pw, Swa | O |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | R | F | Co, Csw | O |
| *Senecio syringifolius* O. Haffm. | F | Asteraceae | H | Lukan Luko | 122 | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, Cr | O |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, De | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | Tw | F | Co, De, Cr | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | L | F | Co, Cr, StB | Der |

**Appendix III continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Sideroxylon oxyacanthum* Baill. | Ra | Sapotaceae | S | Kombolcha | 151 | Buda (stress) [Evil eye] | R | FD | Co, P, StB | Der |
| | | | | | | Qora (Cold) | L | F | Pw | N |
| | | | | | | Dhibe Laffaa (Evil spirit) | L | F | Co, Cr, Pw, chw, Dr | O |
| | | | | | | Dhibe Laffaa (Evil spirit) | R, L | D | Cr, SmB | Der |
| *Solanum adoense* Hochst. ex A. Rich. | A | Solanaceae | S | Hiddi Oromo | 167 | Hossis or Chito (Scabies) | L | F | Co, Cr, chw | Der |
| | | | | | | Funana (nosebleed) | L | FD | P | N |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | L | F | Co, Csw | O |
| *Solanum anguivi* Lam. | Ra | Solanaceae | S | Hiddi | 69 | Michi (Febrile illness) | R | FD | Csw | O |
| | | | | Mujule Worabesa | 69 | Kurmuman (Kintarot) [Haemorrhoid] | Fr, L | F | Cr | Der |
| | | | | Mujule Worabesa | 69 | Sibiji (Chife) [Eczema] | Fr, L | FD | Pw | Der |
| | | | | Hiddi Binessa (Yejib imbuay) | 69 | Baki (Barile)= Quaqucha [Tinea versicolor] | Fr | D | Co, Pw, Ty | Der |
| | | | | Mujule Worabesa | 69 | Naqarsa | L | D | Co, Cr, B | Der |
| | | | | Mujule Worabesa | 69 | Sibiji (Chife) [Eczema] | L | D | Co, Cr, Pa | Der |
| | | | | Hidi (Mujule Worabesa) | 69 | Naqarsa | R | F | De, Cr, Dr | O |
| | | | | Qore Worabesa | 69 | Agano (Dingetegna) (Acute stomach illness) | R | F | Co, Cr, chw, Dr | O |
| *Stephania abyssinica* (Dillon & A. Rich.) | A | Menispermaceae | H(climb) | Kalala | 37 | Chobto (Gonorrhoea) | R | F | De, Cr, Dr | O |
| *Tagetes minuta* L. | A | Asteraceae | H | Hada Gola | 84 | Bassa (Diarrhoea) | L | FD | Co, De, Cr, Dr | O |
| *Thalictrum rhynchocarpum* Dill. & A. Rich. | F | Ranunculaceae | H | Sire-Bizu | 107 | Intestinal worms | R | F | Co, P, Dr | O |
| *Thymus schimperi* Ronniger | A | Lamiaceae | H | Tosigni | 87 | Gara Bokoyso | L | D | Co, Cr, chw, Dr | O |
| *Umbilicus botryoides* A. Rich. | F | Crassulaceae | H | Darara lafa (Lamcho) | 92 | Funana (nosebleed) | R | FD | Cr, Pw, Sq, Sm | N |
| | | | | Darara | 92 | Dhibe Koke (Pharingitis) | Wh | FD | Cr, chw, Dr | N |
| *Verbena officinalis* L. | A | Verbenaceae | H | Dargu (Hulegeb) | 163 | Unable to urinate (Diuretic) | L | F | Cr, Dr | O |
| | | | | Atochi (Amh) | 163 | Naqarsa | R | F | Co, Cr | Der |

**Appendix IV**. List of medicinal plants used for livestock, scientific names, family, local name, growth form, collection number, status, disease treated, part used, form used, methods of preparation and application, and route of administration

**Key**: Status (Sta), plant part used (PU), form used (FU), methods of preparation and aplication (MPAP), route of administration (RA), concoction (Co), decoction (De), steam bath (StB), smoke bath (SmB), chewing (Che), crushing (Cr), powdering (Pw), pounding (P), crushing and homogenizing with water (chw), squizing (Sq), burning (B), stem cut (St.cu), drinking (Dr), painting (Pa), washing (Wa), tying (Ty), dropping (Dro), swallowing or direct eating (Swa), chewing and swallowing juice (Csw), tooth brushing (Tb), smelling (Sm), whole part (Wh), flower (Fl), fruits (Fr), seeds (Se), stem bark (Sb), root bark (Rb), stem internal bark (Sib), stem exudate (Ste), stem oil (So), stem (St), root (R), bulb (Bu), leaves (L), dried (D), fresh (F), fresh or dried (FD), dermal (Der), auricular (Au), optical (Op), intraveinus (In), nasal (N), oral (O), abundant (A), rare (Ra), very rare (VR), fairly present (F)
GF [growth form], H [herb], S [shrub], T [tree], Li [liana], H(clim) [herbaceous climber], E[epiphyte]

| Scientific name | Family | GF | Local name | Coll. No. | Sta | Livestock Disease | PU | FU | MPAP | RA |
|---|---|---|---|---|---|---|---|---|---|---|
| *Achyranthes aspera* L. | Amaranthaceae | H | | 91 | A | Darissaa (Gamoji or Zalaqa) | R | F | Cr, chw, Pa | N |
| *Agrocharis melanantha* Hochst. | Apiaceae | H | | 105 | A | Wan Qabana (Elbissa) (Epilepsy) | R | F | Cr, J | N |
| *Artemisia abyssinica* Sch. Bip. ex A. Rich. | Asteraceae | H | Chukine (Chikugne) | 50 | A | Wan Qabana (Elbissa) (Epilepsy) | R | F | Cr, Che | N |
| *Asplenium aethiopicum* (Burm.f.) Becherer | Aspleniaceae | H | | 72 | A | Wan Laffa (Evilspirit) | R | F | Co, Cr, chw, Dr | O |
| *Asplenium monanthes* L. | Aspleniaceae | H | | 71 | A | Wan Laffa (Evilspirit) | R | F | Co, Cr, chw, Dr | O |
| *Basananthe hanningtoniana* (Mast.) W.J. de Wilde | Passifloraceae | H(clim) | | 106 | VR | Darissaa (Gamoji or Zalaqa) | L | F | De, Cr, Dr | O |
| *Cheilanthes farinosa* (Forssk.) Kaulf. | Sinopteridaceae | H | | 157 | A | Dhukuba Alati (Hepatitis) | L | FD | Co, Cr, Pw | Der |
| *Cycniopsis humifusa* (Forssk.) Sengl. | Scrophulariaceae | H | Dendi (Qorsa alati) | 61 | A | Dhukuba Alati (Hepatitis) | R | F | Co, Cr, chw, Dr | O |
| *Dryopteris inaequalis* (Schlecht.) Kuntze | Aspidiaceae | H | Okota | 73 | A | Rajjoo | R | F | De, Cr, Dr | O |
| *Haplosciadium abyssinicum* Hochst. | Apiaceae | H | | 129 | A | Wan Laffa (Evilspirit) | Wh | F | Co, Cr, Swa | O, Der |
| *Ocimum lamifolium* Hochst. | Lamiaceae | S | Qorsa alati | 178 | Ra | Dhukuba Alati (Hepatitis) | R | F | Cr, chw | N, Der |
| | | | Qorsa simbra/alati | 178 | Ra | Dhukuba Alati (Hepatitis) | R | FD | De, Cr, Dr | O |
| | | | Qorsa alati | 178 | Ra | Albati (Diarrhoea) | R | F | Co, Cr, chw, Dr | O |
| | | | Qorsan lati | 178 | Ra | Dhukuba Alati (Hepatitis) | R | F | Cr, chw, Dr | O |
| *Polygala sphenoptera* Fresen. | Polygalaceae | H | | 6 | F | Wan Laffa (Evilspirit) | L | F | Cr, chw, Dr | O, Der |
| *Polygala steudneri* Chod. | Polygalaceae | H | | 102 | F | Wan Laffa (Evilspirit) | Wh | F | Co, Cr, Swa | O, Der |
| *Rosa abyssinica* Lindley | Rosaceae | S | Gora | 142 | F | Dhukuba Alati (Hepatitis) | L | F | Co, Cr, chw, Dr | O |

**Appendix IV continued**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Senecio fresenii* Sch. Bip. ex Oliv. & Hiern | Asteraceae | H | | 41 | A | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | F | Cr, chw, Dr | O |
| *Senecio ragazzii* Chiov. | Asteraceae | H | Baredduu | 4 | A | Buda (Evil eye) | L | F | Co, De, Dr | O, Der |
| *Solanecio gigas* (Vatke) C. Jeffrey | Asteraceae | S | | 3 | Ra | Dhukuba Alati (Hepatitis) | L | F | Cr, chw, Dr | O, Der |
| *Trichilia prieuriana* A. Juss. | Meliaceae | S | Anonu | 156 | F | Albati (Diarrhoea) | R | F | Co, Cr, Swa | O |
| *Vernonia hymenolepis* A. Rich. | Asteraceae | S | Agadena | 48 | F | Dhukuba Alati (Hepatitis) | L | F | De, Cr, Dr | O |
| *Veronica gunae* Schweinf. ex Fries | Scrophulariaceae | H | | 159 | Ra | Dhibe Sanga (Anthrax) | R | F | Cr, chw, Dr | O |

**Appendix V**. List of medicinal plants used for both human and livestock, scientific names, family, local name, growth form, collection number, status, disease treated, part used, form used, methods of preparation and application, and route of administration

**Key**: Status (Sta), plant part used (PU), form used (FU), methods of preparation and aplication (MPAP), route of administration (RA), concoction (Co), decoction (De), steam bath (StB), smoke bath (SmB), chewing (Che), crushing (Cr), powdering (Pw), pounding (P), crushing and homogenizing with water (chw), squizing (Sq), burning (B), stem cut (St.cu), drinking (Dr), painting (Pa), washing (Wa), tying (Ty), dropping (Dro), swallowing or direct eating (Swa), chewing and swallowing juice (Csw), tooth brushing (Tb), smelling (Sm), whole part (Wh), flower (Fl), fruits (Fr), seeds (Se), stem bark (Sb), root bark (Rb), stem internal bark (Sib), stem exudate (Ste), stem oil (So), stem (St), root (R), bulb (Bu), leaves (L), dried (D), fresh (F), fresh or dried (FD), dermal (Der), auricular (Au), optical (Op), intraveinus (In), nasal (N), oral (O), abundant (A), rare (Ra), very rare (VR), fairly present (F)
GF [growth form], H [herb], S [shrub], T [tree], Li [liana], H(clim) [herbaceous climber], E[epiphyte]

| **Scientific name** | **Sta** | **Family** | **GF** | **Local name** | **Coll. No.** | **Human Disease** | **Livestock Disease** | **PU** | **FU** | **MPAP** | **RA** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Alchemilla abyssinica* Fresen. | A | Rosaceae | H | Hindrif | 18 | Hemorrhage | | L | F | Cr, Pa | Der |
| | | | | Hindriffi | 18 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | F | Co, Cr, Dr | O, N |
| *Allium sativum* L. | A | Alliaceae | H | Qulubi Adi | 57 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | Bu | FD | Co, P, Dr | O |
| | | | | | | Asthma | | Bu | FD | Co, Cr, Swa | O |
| | | | | | | Sibiji (Chife) [Eczema] | | Bu | FD | P, Pa | Der |
| | | | | | | | Darissaa (Gamoji or Zalaqa) | Bu | FD | Co, P, chw | N |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | Bu | F | Co, P, chw, Dr | O |
| | | | | | | Darabaftu (Almaz balecira) [Herpes Zoster] | | Bu | FD | Co, P, Pa | Der |
| | | | | | | Dhibe Gura (Earache) | | Bu | D | Cr, Dro | Au |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Darissaa (Gamoji or Zalaqa) | Bu | FD | Co, De | N |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | Bu | FD | Co, Cr, Dr | O, Der |
| | | | | | | Kambussa | | Bu | FD | Co, P, chw, Dr | O |
| | | | | | | | | Bu | D | Co, Pw, Dr | O |
| | | | | | | Bassa (Diarrhoea) | | Bu | D | Co, Csw | O |
| | | | | | | Buda (stress) [Evil eye] | | Bu | D | Cr, chw, Dr | O |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | Bu | F | Co, Cr, Dr | O |
| | | | | | | Typhoid | | Bu | F | Co, chw, Dr | O |
| | | | | | | Dhibe somba (Lung disease) | | Bu | F | Cr, Swa | O |
| | | | | | | Dhibe somba (Lung disease) | | Bu | FD | Co, Cr, Swa | O |
| | | | | | | Intestinal worms | | Bu | F | Cr, Swa | O |
| | | | | | | Robii (Fungal infection)[Ringworm] | | R | F | Cr, Pa | Der |
| | | | | | | | Dhukuba Alati (Hepatitis) | Bu | F | Cr, chw, Dr | O |
| | | | | | | | Naqarsa | Bu | F | Co, Cr, Ty | O |
| | | | | | | Naqarsa | | Bu | F | Co, Cr, Ty | Der |
| | | | | | | Pneumonia | | Bu | F | Cr, Swa | O |
| | | | | | | | Buda (Evil eye) | Bu | F | Co, De, Dr | O, Der |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | | Bu | FD | Swa | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | Bu | D | Co, De, Cr, Pw, Dr | O |
| | | | | | | Bassa (Diarrhoea) | | Bu | FD | Co, De, Cr, Dr | O |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | Bu | F | Co, Cr, Swa | O |
| | | | | | | | Badhaftu | Bu | F | Co, Cr, Ty | Der |
| *Artemisia absinthium* L. | Ra | Asteraceae | H | Enari | 114 | Dhibe Laffaa (Evil spirit) | | L | F | Cr, SmB, StB | Der |
| | | | | | | | Badhaftu | L | F | Co, Cr, Ty | Der |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Asparagus africanus* Lam. | F | Asparagaceae | S | Seriti | 80 | Chobto (Gonorrhoea) | | R | FD | Co, Cr, Dr | O |
| | | | | Seriti | 80 | Impotence | | R | F | Csw | O |
| | | | | Seriti | 80 | Hossis or Chito (Scabies) | | L | F | Co, Cr | Der |
| | | | | Seriti | 80 | Chobto (Gonorrhoea) | | R | FD | Co, De, Cr, Dr | O |
| | | | | Seriti | 80 | Dhibe Sere (Rabies) | | R | FD | P, chw, Dr | O |
| | | | | Seriti | 80 | Sibiji (Chife) [Eczema] | | L | FD | Cr, Pa | Der |
| | | | | Seriti | 80 | Breast pain | | L | FD | Cr, Ty | Der |
| | | | | Zariti | 80 | Chobto (Gonorrhoea) | | R | D | Cr, Pw, chw, Dr | O |
| | | | | Zariti | 80 | | Hudhaa (Poisons) | L | F | Cr, chw, Dr | O, N |
| | | | | Shuko | 80 | Dhibe Tiru (Liver diseae) | | Fr, L | D | Co, chw, Dr | O |
| | | | | Seriti | 80 | | Dhukuba Sere (Rabies) | L | FD | Cr, Pw, chw, Dr | O |
| | | | | Seriti | 80 | Dhibe Qabana (Epilepsy) | | L, R, Sb | F | Co, Cr, Sq, chw | N |
| | | | | Seriti | 80 | | Dhukuba Sere (Rabies) | R | FD | Co, chw, Dr | O |
| *Bersama abyssinica* Fresen. | Ra | Melianthaceae | S | Horoqaa | 104 | Qora (Cold) | | L | F | Cr, StB | Der |
| | | | | Lolchisa (Abalo) | 104 | Sibiji (Chife) [Eczema] | | Se | D | Co, Cr, Pw, Pa | Der |
| | | | | Lolchisa (Abalo) | 104 | | Ikek (Horse's) [Dermatophytes] | L | F | Co, De, Cr, Pa | Der |
| | | | | Horoqaa | 104 | Bowo (Headache) | | Sib | D | Cr, Pw, Swa | N |
| *Berula erecta* (Hudson) Coville | A | Apiaceae | H | Gonde | 132 | Naqarsa | | R | D | Co, Cr, B | Der |
| | | | | | | | Chachabsa | L | F | Co, Cr | Der |
| *Calpurnia aurea* (Ait.) Benth. | F | Fabaceae | S | Chekata | 137 | Hilicani (toothache) | | R | FD | Tb | O |
| | | | | Chekata | 137 | Hilicani (toothache) | | L | FD | Cr, chw | O |
| | | | | Chekata | 137 | Hossis or Chito (Scabies) | | L | D | Co, Cr, Pw, Pa | Der |
| | | | | Digita | 137 | | Ikek (Horse's) [Dermatophytes] | L | F | Co, De, Cr, Pa | Der |
| | | | | Digita | 137 | Dhibe Sere (Rabies) | | Se | F | Pw, Dr | O |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Carduus nyassanus* (S. Moore) R.E. Fries | A | Asteraceae | H | Kore Hare | 49 | | Gubbaa | R | FD | Cr, chw, Dr | O |
| | | | | Kore | 49 | | Darissaa (Gamoji or Zalaqa) | R | D | Co, Cr, Pw, Swa | O |
| | | | | Kore | 49 | | Dhukuba Alati (Hepatitis) | R | F | Co, Swa | O |
| | | | | Kore | 49 | | Albati (Diarrhoea) | R | F | Co, Cr, chw, Dr | O |
| | | | | Kore | 49 | Robii (Fungal infection)[Ringworm] | | R | F | Co, Cr, Pa | Der |
| | | | | Qorree | 49 | Dhibee Sinbiraa (Hepatitis B) | | R | FD | Co, Cr, chw, Dr | O |
| | | | | Kore Hare | 49 | | Dhukuba Sere (Rabies) | R | FD | Co, Cr, chw, Dr | O |
| *Clematis hirsuta* Perr. & Guill. | A | Ranunculaceae | Li | Gale fitti | 26 | | Chachabsa | L | F | Co | N |
| | | | | Gale fitti | 26 | Hilicani (toothache) | | L | FD | Cr, Sq | N |
| | | | | Fitti | 26 | Bowo (Headache) | | L | F | Sq | N |
| | | | | Fitti | 26 | Sibiji (Chife) [Eczema] | | L | D | Co, Pw, Pa | Der |
| | | | | Fitti | 26 | Naqarsa | | L | FD | Pw | Der |
| | | | | Fitti | 26 | Naqarsa | | L | FD | Cr | Der |
| | | | | Gale fitti | 26 | Sibiji (Chife) [Eczema] | | L | F | Cr, chw | Der |
| | | | | Gale fitti | 26 | Kurmuman (Kintarot) [Haemorrhoid] | | L | F | Co, Cr, Pa | Der |
| | | | | Fitti | 26 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | D | Co, Cr, Pw, chw, Dr | O, N |
| | | | | Fitti | 26 | | Naqarsa | L | F | Cr, chw | In |
| | | | | Fitti | 26 | Naqarsa | | R, L | F | Cr | Der |
| | | | | Azo Areg (Amh) | 26 | Sibiji (Chife) [Eczema] | | L | F | P, Ty | Der |
| | | | | Fitti | 26 | Sibiji (Chife) [Eczema] | | L | D | Cr, Pw | Der |
| | | | | Gale | 26 | Ito | | L | F | Co, De, Cr | Der |
| | | | | Azo Areg (Amh) | 26 | TB | | R | FD | Co, Cr, Pw | Der |
| | | | | Kormuman Fittii | 26 | Kurmuman (Kintarot) [Haemorrhoid] | | L | FD | Co, Cr, Pa | Der |
| | | | | Feedii | 26 | Robii (Fungal infection) [Ringworm] | | L | F | Co, Cr, Pa | Der |
| | | | | Feedii | 26 | Naqarsa | | R, L | D | Cr, Ty | Der |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Feedii | 26 | | Naqarsa | Fr, L | F | Co, Cr, Ty | O |
| | | | | Feedii | 26 | Naqarsa | | Fr, L | F | Co, Cr, Ty | Der |
| | | | | Gale Hinesa | 26 | Dubarraa (Amoebiasis) | | L | F | De, Cr, Dr | O |
| | | | | Fittii | 26 | Naqarsa | | L | D | Co, Cr, Pw, Ty | Der |
| | | | | Fittii | | | Chachabsa | L | F | Co, Cr, Sq, chw, Ty | Der |
| | | | | Fiittii | 26 | Naqarsa | | R | D | Pw | Der |
| *Clutia abyssinica* Jaub. & Spach | F | Euphorbiaceae | S | Muka Foni | 9 | Harassa (Qilensa) [Yebird Beshita] | | Tw | F | Co, De, Cr | Der |
| | | | | | | Qora (Cold) | | R | F | Co, De, Wa | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, Cr, StB | Der |
| | | | | | | Epilepsy | | L | F | Co, StB | Der |
| | | | | | | | Albati (Diarrhoea) | L | F | Co, Cr, chw, Dr | O |
| | | | | | | Qufa (common cold) | | L | F | Co, Cr, StB | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | | L, St, R | F | Co, Cr, SmB | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, De, Cr | O, Der |
| *Crepis ruepellii* Sch. Bip. | A | Asteraceae | H | Kartassa | 45 | | Albati (Diarrhoea) | R | F | Co, Cr, chw, Dr | O |
| | | | | Kartasa | 45 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | D | Co, Cr, Pw, chw, Dr | O, N |
| | | | | | 45 | | Dhukuba Alati (Hepatitis) | Wh | FD | Co, Cr, Pw | Der |
| | | | | Kartasa | 45 | Dhullaa (Bugunj) (Skin infection) | | L | D | Co, Pw, Ty | Der |
| | | | | Kartasa | 45 | Dhibe Tiru (Liver diseae) | | R | D | Co, Cr, Pw, Dr | O |
| | | | | Mucharae (Yefiyel Tut) | 45 | Eye brow irritation | | Wh | FD | De, Dr | O |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cucumis ficifolius* A. Rich. | VR | Cucurbitaceae | H(creep) | Hanchote | 138 | Dula Arba (Elephantiasis) | | Fr | F | Cr, Ty | Der |
| | | | | Hanchote | 138 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | F | Cr, chw, Dr | O |
| | | | | Hanchote | 138 | Dubarraa (Amoebiasis) | | R | FD | Co, Cr, StB, Dr | O |
| | | | | Holeto | 138 | Dhibe Sere (Rabies) | | R | F | Co, P, Dr | O |
| | | | | Hanchote | 138 | Dhibe Sere (Rabies) | | R | FD | P, Dr | O |
| | | | | Hanchote | 138 | Hobati (Retained placenta) | | R | D | Pw, chw, Dr | O |
| | | | | Hanchote | 138 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | FD | Co, Cr, Dr | O, Der |
| | | | | Hanchote | 138 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | F | Co, Cr, chw, Dr | O |
| | | | | Hanchote Xixiqo | 138 | | Chachabsa | R | F | Cr | Der |
| | | | | Anchote (Holoto, Yemdr imbuay) | 138 | Sibiji (Chife) [Eczema] | | R | D | Co, Cr, Pw, Pa | Der |
| | | | | Yemdr imbuay | 138 | Chobto (Gonorrhoea) | | R | D | Co, cr, Pw, Dr | O |
| | | | | Yemdr imbuay | 138 | Buda (stress) [Evil eye] | | R | D | Pw, chw, Dr | O |
| | | | | Yemdr imbuay | 138 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | F | Co, Cr, Dr | O |
| | | | | Anchote | 138 | Chobto (Gonorrhoea) | | R | F | Co, Cr, Swa | O |
| | | | | Anchote | 138 | Sibiji (Chife) [Eczema] | | Fr | D | Co, Cr, Pa | Der |
| | | | | Anchote | 138 | Kurmuman (Kintarot) [Haemorrhoid] | | Fr | D | Co, Pw, Pa | Der |
| | | | | Anchote | 138 | Dhibe Tiru (Liver diseae) | | R | FD | P, chw, Dr | O |
| *Cupressus lusitanica* Mill | A | Cupressaceae | T | Hindesa ferenji | 98 | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, StB | Der |
| | | | | | | | Albati (Diarrhoea) | R | F | Co, Cr, chw, Dr | O |
| | | | | | | Qufa (common cold) | | L | F | Cr, StB | Der |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cyathula polycephala* Bak. | F | Amaranthaceae | H | Hacho | 113 | | Darissaa (Gamoji or Zalaqa) | R | FD | Co, P | N |
| | | | | | | | Darissaa (Gamoji or Zalaqa) | R | FD | Cr, chw | N |
| | | | | | | | | R | F | Co, Cr, chw, Dr | O |
| | | | | | | Dhibe Tiru (Liver diseae) | | R | F | Co, Cr, chw, Dr | O |
| | | | | | | Dhibe Sere (Rabies) | | R | F | Co, De, Cr, Dr | O |
| | | | | | | | | R | F | Co, Cr | Der |
| | | | | | | Dhibe Tiru (Liver diseae) | | R | D | Co, Cr, Pw, chw, Dr | O |
| | | | | | | Buda (stress) [Evil eye] | | R | D | SmB | Der |
| | | | | | | Dhibe Sere (Rabies) | | R | D | Co, Pw, Dr | O |
| | | | | | | | Gara Gelcha | R | F | Co, Cr, chw, Dr | O |
| | | | | | | | Darissaa (Gamoji or Zalaqa) | R | F | Cr, chw | N |
| | | | | | | Dhibe Sere (Rabies) | | R | F | Cr, chw, Dr | O |
| *Cymbopogon citratus* (DC.) Stapf | Ra | Poaceae | H | Qorsa alati | 61 | | Dhukuba Alati (Hepatitis) | R | F | Cr, chw, Dr | O, N, Der |
| | | | | Iticho (tejsar) | 158 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | L | F | Co, Cr, chw, Dr | O |
| | | | | Iticho (tejsar) | 158 | | Somba (Lung disease) | R | D | Co, Cr, Pw, chw, Dr | O |
| | | | | Wagartii | 158 | | Dhukuba Alati (Hepatitis) | R | F | Cr, chw, Dr | O |
| | | | | Hiticho | 61 | Qufa (common cold) | | L | D | Co, De, Cr, Dr | O |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Cynoglossum coeruleum* Hochst. | A | Boraginaceae | H | Maxxane | | Dubarraa (Amoebiasis) | | R | FD | Co, Cr, chw, Dr | O |
| | | | | | | Intestinal worms | | R | D | Cr, Swa | O |
| | | | | | | Asthma | | R | FD | Co, Cr, Swa | O |
| | | | | | | Hemorrhage | | R | F | Cr | Der |
| | | | | Qarchaba | | Dhullaa (Bugunj) (Skin infection) | | R | F | Cr, Ty | Der |
| | | | | | | Dhibe Tiru (Liver diseae) | | R | F | Co, De, Cr, Dr | O |
| | | | | | 74 | Dhullaa (Bugunj) (Skin infection) | | R | FD | Cr, Swa | O |
| | | | | Qoricha Michi (Qarchaba) | | | Albati (Diarrhoea) | R | F | Co, Cr, chw, Dr | O |
| | | | | | | Naqarsa | | R | F | Co, Cr, Ty | Der |
| *Discopodium eremanthum* Chiov. | A | Solanaceae | S | Mararo | 67 | Abdominal distension | | L | F | Co, Cr, chw, Dr | O |
| | | | | | | Hobati (Retained placenta) | | L | F | De, P, Dr | O |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | L | FD | Co, Cr, Dr | O, Der |
| | | | | | | Breast pain | | L | FD | Cr, SmB | Der |
| | | | | | | | Chixxo (Scabies) | L | F | Co, Cr, chw, Pa | Der |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | | L | F | Co, Csw | O |
| | | | | | | Chobto (Gonorrhoea) | | R | F | De, Cr, Dr | O |
| *Erythrina brucei* Schweinf. | F | Fabaceae | T | Wolena | 140 | | Dhukuba Ija (Eye problem) | L | FD | P, Dro | Op |
| | | | | | | | Darissaa (Gamoji or Zalaqa) | L | F | Cr, chw, Dr | O |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | L | F | Co, Cr, Dr | O |
| | | | | | | Dhibe Laffaa (Evil spirit) | | L | F | Co, Cr, B, SmB | O, Der |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Euphorbia schimperiana* Scheele | F | Euphorbiaceae | S | Gurii | 117 | Chobto (Gonorrhoea) | | R | FD | Co, Cr, Dr | O |
| | | | | | | Chobto (Gonorrhoea) | | R | FD | Co, De, Cr, Dr | O |
| | | | | | | | Dhibe Sanga (Anthrax) | Fr | F | Co, Cr, chw, Dr | O |
| | | | | | | Dhibe Tiru (Liver diseae) | | L | F | Co, Cr, chw, Dr | O |
| | | | | | | Dhibe Sere (Rabies) | | L | F | Co, De, Cr, Dr | O |
| | | | | | | Dhukuba Dhudha | | R | F | Co, De, Cr, Dr | O |
| *Ficus palmata* Forssk. | Ra | Moraceae | S | Lugo | 103 | Bowo & Quffa (Headache) [Influenza] | | L | FD | Cr, StB | Der |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, Cr, StB | Der |
| | | | | | | Epilepsy | | L | F | StB | Der |
| | | | | | | | Darissaa (Gamoji or Zalaqa) | L | F | Co, De, Cr, Dr | O |
| | | | | | | Qufa (common cold) | | L | F | Co, Cr, StB | Der |
| | | | | | | Qora (Cold) | | R | FD | Co, Cr, SmB | Der |
| *Gomphocarpus fruticosus* (L.) Ait. f. | F | Asclepiadaceae | H | Anano | 116 | Buda (stress) [Evil eye] | | R | D | B, SmB | Der |
| | | | | | | | Somba (Lung disease) | L | D | Co, Cr, Pw, chw, Dr | O |
| | | | | | | | Albati (Diarrhoea) | L | F | Co, Cr, chw, Dr | O |
| *Hagenia abyssinica* (Bruce) J.F. Gmel. | A | Rosaceae | T | Hexxoo | 51 | Dhibee Sinbiraa (Hepatitis B) | | R, Se | FD | Co, De, Cr, Dr | O |
| | | | | | | Chobto (Gonorrhoea) | | Se | FD | Pw, chw, Dr | O |
| | | | | | | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, StB | Der |
| | | | | | | Ascariasis | | Sib | F | Co, De, Dr | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | Sib | F | Cr, chw, Dr | O |
| | | | | | | Qufa (common cold) | | L | F | Cr, Sm | N |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Chobto (Gonorrhoea) | | Fl | F | Co, Cr, Swa | O |
| | | | | | | Taeniasis | | Se | D | Cr, chw, Dr | O |
| | | | | | | | Darissaa (Gamoji or Zalaqa) | Sb | F | Co, De, Cr, Dr | O |
| | | | | | | Bowo (Headache) | | Fl | D | Cr, chw, Dr | O |
| | | | | | | Dhibe Laffaa (Evil spirit) | | L | F | Cr, SmB, StB | Der |
| | | | | | | Dubarraa (Amoebiasis) | | Fl | D | Co, De, Cr, Dr | O |
| *Inula confertiflora* A. Rich. | A | Asteraceae | S | Haxxawii | 39 | Asthma | | L | D | Co, De, Pw, Dr | O |
| | | | | | | Bowo (Headache) | | L | D | Pw, Ty | Der |
| | | | | | | Kurmuman (Kintarot) [Haemorrhoid] | | L | FD | Co, Cr, Pa | Der |
| | | | | | | Kurmuman (Kintarot) [Haemorrhoid] | | L | FD | De, Dr | O |
| | | | | | | Robii (Fungal infection)[Ringworm] | | L | F | Co, Cr, Pa | Der |
| | | | | | | Naqarsa | | R, L | F | Cr, Ty | Der |
| | | | | | | | Gonde (due to eating poisoning plant) | L | F | Cr, chw, Dr | O |
| | | | | | | Gara Bokoyso | | L | D | Co, Cr, chw, Dr | O |
| *Juniperus procera* L. | A | Cupressaceae | T | Hindesa | 53 | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, De | Der |
| | | | | Hindesa | 53 | | Albati (Diarrhoea) | R | F | Co, Cr, chw, Dr | O |
| | | | | Hindesa | 53 | Typhoid | | L | F | Co, Cr, chw, Dr | O |
| | | | | Hindesa Adi | 53 | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, De, Cr | O, Der |
| *Kalanchoe petitiana* A. Rich. | A | Crassulaceae | S | Anchura | 28 | Constipation | | L | F | Sq | O |
| | | | | | | | Ibach (Swelling) | R | F | Cr, Ty | Der |
| | | | | | | | Darissaa (Gamoji or Zalaqa) | R | F | Co, Cr, chw | N |
| | | | | | | Qonqo (Tonsilitis) | | R | F | Csw | O |
| | | | | | | Dhullaa (Bugunj) (Skin infection) | | R | F | Cr | Der |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Unable to urinate (Diuretic) | | R | FD | Co, Cr, Pw, chw | O, N |
| | | | | | | | Ab.constipation | R | F | Co, Cr, chw, Dr | O |
| | | | | | | Qonqo (Tonsilitis) | | R | F | Che | O, N |
| | | | | | | Qonqo (Tonsilitis) | | R, L | F | Sq | N |
| | | | | | | Michi (Febrile illness) | | R | FD | Cr, Pa | Der |
| | | | | | | Naqarsa | | R | F | Co, Cr, Ty | Der |
| *Kniphofia foliosa* Hochst. | A | Asphodelaceae | H | Lela | 54 | | Hudhaa (Poisons) | R | FD | Cr, chw, Dr | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | R | FD | Co, Cr, Pw, chw, Dr | O |
| | | | | | | | Dhukuba Alati (Hepatitis) | R | F | De, Cr, Dr | O |
| | | | | | | | Gubbaa | R | F | Co, Cr, chw, Dr | O |
| | | | | | | | Dhukuba Alati (Hepatitis) | R | D | De, Cr, Dr | O |
| *Leonotis ocymifolia* (Burm.f.) Iwarsson | A | Lamiaceae | S | Urgo or Bokkulu | 65 | Dhibe Maratu (Madness) | | L | FD | Cr, chw, Pa | N, Der |
| | | | | | | Constipation | | L | F | Co, P, Dr | O |
| | | | | | | Abdominal distension | | L | F | Co, Cr, chw, Dr | O |
| | | | | | | Bowo (Headache) | | L | FD | P | N |
| | | | | | | Breast pain | | L | FD | Cr, Ty | Der |
| | | | | | | Michi (Febrile illness) | | L | F | Sq | N, Der |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | L | D | Co, Pw, Swa | O |
| | | | | | | | Dhibe Sanga (Anthrax) | R | F | Cr, chw, Dr | O |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | | L | F | Co, Cr, chw, Dr | O |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | | L | FD | Co, Cr, Csw | O |
| | | | | | | Michi (Febrile illness) | | L | FD | Cr, chw, Dr | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | L | D | Co, De, Cr, Pw, Dr | O |
| | | | | | | Abdominal irritation (Gastritis) | | L | F | Csw | O |
| | | | | | | | Badhaftu | L | F | Co, Cr, Ty | Der |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Lobelia rhynchopetalum* Hemsl. | A | Lobeliaceae | S | Tarura | 160 | Kurmuman (Kintarot) [Haemorrhoid] | | Ste | F | St.cu, Pa | Der |
| | | | | | | | Gubbaa | R | F | Co, Cr, chw, Dr | O |
| *Lotus corniculatus* L. | F | Fabaceae | H | Loya | 83 | | Dhukuba Alati (Hepatitis) | L | F | Cr, chw, Dr | O |
| | | | | Garasita | 83 | Baki (Barile)= Quaqucha [Tinea versicolor] | | R | F | Cr, Pa, Cr | Der |
| *Maesa lanceolata* Forssk. | A | Myrsinaceae | S | Abeyi (Kelewa) | 52 | Hossis or Chito (Scabies) | | Fr | D | Co, Cr, Pw, Pa | Der |
| | | | | | | Naqarsa | | Fr, L | D | Co, Cr, B | Der |
| | | | | | | | Chachabsa | L | F | Co, Cr | Der |
| | | | | | | Naqarsa | | L | D | Cr, Pw | Der |
| *Millettia ferruginea* (Hochst.) Bak. | Ra | Fabaceae | T | Birbira | 141 | Hilicani (toothache) | | Se | F | Co, P | O |
| | | | | | | | Albati (Diarrhoea) | L | F | Co, Cr, chw, Dr | O |
| *Nicotiana tabacum* L. | Ra | Solanaceae | S | Tambo | 77 | Darabaftu (Almaz balecira) [Herpes Zoster] | | L | FD | Co, P | Der |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | L | FD | Co, Cr, Dr | O, Der |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | L | F | Co, Cr, chw | O |
| | | | | | | Dhibe Ha'dha (Poisons) | | L | F | Cr, Ty | Der |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | L | F | Co, Cr, Swa | O |
| | | | | | | | Badhaftu | L | F | Co, Cr, Ty | Der |
| *Nigella sativa* L. | Ra | Ranunculaceae | H | Habsuda guracha | 100 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | Se | FD | Co, P, Dr | O |
| | | | | | | Dhibe Gura (Earache) | | Se | FD | Sq, Dro | Au |
| | | | | | | Michi (Febrile illness) | | R | FD | P, Dr | O |
| | | | | | | | | Fr(Se) | D | Co, Pw, Dr | O |
| | | | | | | Bassa (Diarrhoea) | | Fr(Se) | D | Co, Csw | O |
| | | | | | | Asthma | | Se | D | Co, De, Pw, Dr | O |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | Fr | F | Co, Cr, chw, Dr | O |
| | | | | | | Kurmuman (Kintarot) [Haemorrhoid] | | Se | FD | Co, Cr, Pa | Der |
| | | | | | | Dhibe somba (Lung | | Fr | D | Co, Cr, Swa | O |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | disease) | | | | | |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | R | FD | De | Der |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | Fr | F | De, Cr, Dr | O |
| *Olinia rochetiana* A. Juss. | F | Oliniaceae | T | Guna | 32 | | Darissaa (Gamoji or Zalaqa) | L | FD | Co, De | N |
| | | | | Guna | 32 | Qumata | | L | F | StB | Der |
| | | | | Tife | 32 | Sibiji (Chife) [Eczema] | | L | F | Cr, Ty | Der |
| | | | | Guna | 32 | Harassa (Qilensa) [Yebird Beshita] | | L, St | F | Co, Cr, SmB | Der |
| | | | | Guna | 32 | Qora (Cold) | | L | F | Co, De, Wa | Der |
| *Phytolaca dodecandra* L'Hérit. | A | Phytolaccaceae | S | Handode | 174 | Constipation | | L | F | Co, P, Dr | O |
| | | | | Handode | 174 | | Chachabsa | L | F | Co, Cr | N |
| | | | | Handode | 174 | Wolti-Bofa (Snake bite) | | L | F | Co, Cr, chw, Dr | O |
| | | | | Handode | 174 | Dhibe Sere (Rabies) | | R | F | Co, P, Dr | O |
| | | | | Andode | 174 | Dhibe Sere (Rabies) | | R | D | Co, Pw, Dr | O |
| | | | | Andode | 174 | | Gara Gelcha | R, L | F | Co, Cr, chw, Dr | O |
| | | | | Yemehan Endod | 174 | Dhibe Sere (Rabies) | | R | F | Pw, Sq, Dr | O |
| *Pittosporum viridiflorum* Sims | Ra | Pittosporaceae | T | Haraa | | | Darissaa (Gamoji or Zalaqa) | Sb | D | Cr, Pw, Dr | O |
| | | | | | 249 | Qufa (common cold) | | Sb | D | Co, Cr, Swa | O |
| *Prenanthes subpeltata* Stebbins | Ra | Asteraceae | H | Anano | 82 | Hossis or Chito (Scabies) | | R | D | Co, Cr, Pw, Pa | Der |
| | | | | | | Bassa (Diarrhoea) | | L | D | Pw, chw, Dr | O |
| | | | | | | | Ikek (Horse's) [Dermatophytes] | L | F | Co, De, Cr, Pa | Der |
| | | | | | | | Somba (Lung disease) | R | D | Co, Cr, Pw, chw, Dr | O |
| | | | | | | | Darissaa (Gamoji or Zalaqa) | R | D | Cr, Pw, chw | N, Au |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Rhamnus prinoides* L'Herit. | F | Rhamnaceae | S | Gesho | 143 | | Darissaa (Gamoji or Zalaqa) | L | F | Co, De, Cr, Dr | O |
| | | | | | | Qonqo (Tonsilitis) | | L | F | P | Der |
| | | | | | | | Dhukuba Alati (Hepatitis) | L | FD | Co, cr, Pw | Der |
| | | | | | | Dhibe Laffaa (Evil spirit) | | L | F | Co, Cr, SmB | O, Der |
| *Rumex abyssinicus* Jacq. | A | Polygonaceae | H | Hexxo | 31 | Dhibee Sinbiraa (Hepatitis B) | | R | FD | De, Cr, Pw, Dr | O |
| | | | | Hexxo-Jedela | 31 | Dhibee Sinbiraa (Hepatitis B) | | R | FD | Co, Cr, chw, Dr | O |
| | | | | Hexxo Gini (Shabee sere) | 31 | | Tigani | R | F | Cr, chw, Dr | O |
| | | | | Shabbee (Meqmeqo) | 31 | Kurmuman (Kintarot) [Haemorrhoid] | | R | D | Co, Cr, Pw, Pa | Der |
| | | | | Meqmeqo | 31 | Baki (Barile)= Quaqucha [Tinea versicolor] | | R | D | Co, Pw, Ty | Der |
| | | | | Meqmeqo | 31 | | Somba (Lung disease) | R | D | Co, Cr, Pw, chw, Dr | O |
| | | | | Shabbe sere (Hexxo Gini) | 31 | Dhibee Sinbiraa (Hepatitis B) | | R | D | Co, Cr, chw, Dr | O |
| | | | | Shabbee sere | 31 | Dhibee Sinbiraa (Hepatitis B) | | R | F | Cr, chw, Dr | O |
| | | | | Dubara | 31 | Dubarraa (Amoebiasis) | | R | FD | De, Cr, Pw, chw, Dr | O |
| | | | | Kure | 31 | Dubarraa (Amoebiasis) | | R | F | De, Cr, Dr | O |
| | | | | Shabbee-Hexxoo | 31 | Dhibee Sinbiraa (Hepatitis B) | | R | D | De, Cr, Dr | O |
| *Rumex nepalensis* Spreng. | A | Polygonaceae | H | Shabbee/Tult | 29 | Dubarraa (Amoebiasis) | | R | FD | Co, Cr, chw, Dr | O |
| | | | | | | Dubarraa (Amoebiasis) | | R | FD | Co, Cr, StB, Dr | O |
| | | | | | | Constipation | | R | F | Csw | O |
| | | | | | | Dhibe Tiru (Liver diseae) | | R | FD | De, Cr, Dr | O |
| | | | | | | Chobto (Gonorrhoea) | | R | FD | Co, De, Cr, Dr | O |
| | | | | | | Dhibe Gura (Earache) | | R | F | Sq, Dro | Au |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Dubarraa (Amoebiasis) | | R | FD | De, Cr, Dr | O |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | | R | FD | P, Dr | O |
| | | | | | | Bassa (Diarrhoea) | | R | FD | P, Dr | O |
| | | | | | | Dhibe Laffaa (Evil spirit) | | R | F | Co, cr, Pw, Dr | O |
| | | | | | | Quruba | | R | F | Csw | O |
| | | | | | | Dubarraa (Amoebiasis) | | R | D | Co, Pw, Dr | O |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | | R | F | Co, Csw | O |
| | | | | | | Bassa (Diarrhoea) | | R | D | Co, Csw | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | R | FD | Co, cr, Pw, Dr | O |
| | | | | | | Baki (Barile)= Quaqucha [Tinea versicolor] | | R | D | Co, Pw, Ty | Der |
| | | | | | | Dubarraa (Amoebiasis) | | R | D | Pw, Dr | O |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | F | Co, Cr, chw, Dr | O |
| | | | | | | Bassa (Diarrhoea) | | R | F | De, Cr, Dr | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | R | F | Cr | O |
| | | | | | | Bassa (Diarrhoea) | | R | F | Co, Cr, chw, Dr | O |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | F | Co, Cr, chw, Dr | O, N |
| | | | | | | | Gubbaa | R | F | Co, Cr, chw, Dr | O |
| | | | | | | | Albati (Diarrhoea) | R | F | Co, Cr, chw, Dr | O |
| | | | | | | Bassa (Diarrhoea) | | R | F | Cr, Dr | O |
| | | | | | | Dubarraa (Amoebiasis) | | R | D | Cr, Pw, chw, Dr | O |
| | | | | | | Dubarraa (Amoebiasis) | | R | D | Co, De, Cr, Dr | O |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Ruta chalapensis* L | Ra | Rutaceae | S | Siliti | 21 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | L | FD | Co, P, Dr | O |
| | | | | | | Buda (stress) [Evil eye] | | Fr | F | Pw, chw, Dr | O |
| | | | | | | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | L | F | Co, Cr, chw, Dr | O |
| | | | | | | Dhibe somba (Lung disease) | | Fr, L | D | Co, Cr, Swa | O |
| | | | | | | Qufa (common cold) | | L | D | Co, De, Cr, Dr | O |
| *Salvia merjamie* Forssk. | A | Lamiaceae | H | Okotu | 162 | Dubarraa (Amoebiasis) | | R | FD | De, Cr, chw, Dr | O |
| | | | | Okotu | 162 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | F | Co, P, Dr | O |
| | | | | Okotu | 162 | Darabaftu (Almaz balecira) [Herpes Zoster] | | R | FD | Co, P, Dr | O |
| | | | | Okotu (Hulegeb) | 162 | | | R | F | Co, Cr | Der |
| | | | | Hulegeb | 162 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | F | Co, Cr, chw, Dr | O |
| | | | | Okota | 162 | Dhibe Tiru (Liver diseae) | | R | F | Co, De, Cr, Dr | O |
| | | | | Yemich plant | 162 | TB | | R | FD | Co, Cr, Pw | Der |
| *Salvia nilotica* Jacq. | A | Lamiaceae | H | Saynekel | 64 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R, L | F | Co, Cr, chw, Dr | O |
| | | | | Merga | 64 | Hossis or Chito (Scabies) | | Sb | F | De, Cr | Der |
| | | | | Merga like plant | 64 | Kaliti | | R | F | De, Cr, Dr | O |
| *Sida schimperiana* Hochst. ex A. Rich. | Ra | Malvaceae | S | Qorsa shotelay | 134 | Shotelay (Neo natal death) | | R | F | Cr, chw, Dr | O |
| | | | | Qorsa shotelay | 134 | Shotelay (Neo natal death) | | R | F | Cr, chw, Dr | O |
| | | | | Gale Kormomani | 134 | Naqarsa | | Se | D | Pw | Der |
| | | | | Gale Kormomani | 134 | Muje | | Se | D | Co, P, Ty | Der |
| | | | | Haxxarnur | 134 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | D | Co, Cr, Pw, chw, Dr | O, N |
| | | | | Haka Nur (Arabic) | 134 | Chobto (Gonorrhoea) | | R | D | De, Cr, Swa | O |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Silene macrosolen* A. Rich. | F | Caryophyllaceae | H | Wagartii | 16 | Dubarraa (Amoebiasis) | | R | FD | Co, Cr, chw, Dr | O |
| | | | | | | Bowo (Headache) | | R | D | Cr, Sm | O |
| | | | | | | Bowo (Headache) | | R | D | P | N |
| | | | | | | Buda (stress) [Evil eye] | | R | FD | P, Co, StB | Der |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | | R | FD | De, P, Dr | O |
| | | | | | | Bassa (Diarrhoea) | | R | FD | P, Dr | O |
| | | | | | | Buda (stress) [Evil eye] | | R | FD | Pw, Dr | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | R | FD | Co, Cr, chw, Dr | O |
| | | | | | | Aininas | | R | F | B, SmB | Der |
| | | | | | | Dhibe Eja (Eye problem) | | R | D | Co, Cr, B, SmB | Der |
| | | | | | | Buda (stress) [Evil eye] | | R | FD | Cr, Pw, B, SmB | Der |
| | | | | | | | Darissaa (Gamoji or Zalaqa) | R | D | Co, Cr, Pw Swa | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | R | FD | Co, Cr, chw, Dr | O |
| | | | | | | | Dhukuba Alati (Hepatitis) | R | F | Co, Swa | O |
| | | | | | | Dhibe Tiru (Liver diseae) | | R | F | Co, Cr, Pw, chw, Dr | O |
| | | | | | | Qora (Cold) | | R | F | Co, Cr, StB | O, Der |
| *Solanecio angulatus* (Vahl) C. Jeffrey | F | Asteraceae | H | Rafu Osole | 47 | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, De | Der |
| | | | | Rafu Osole | 47 | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, StB | Der |
| | | | | Rafu Osole | 47 | Qufa (common cold) | | L | F | Co, Cr, StB | Der |
| | | | | Yeshikoko Gomen | 47 | | Dhukuba Alati (Hepatitis) | L | F | P, Pa | Der |
| | | | | Rafu | 47 | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, Cr, SmB | Der |
| | | | | Rafu | 47 | Qora (Cold) | | L | F | Co, De, Wa | Der |
| | | | | Rafu | 47 | Dubarraa (Amoebiasis) | | L | F | De, Cr, Dr | O |
| | | | | Rafu Osole | 47 | Dhibe Laffaa (Evil spirit) | | L | F | Cr, SmB, StB | Der |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Solanum incanum* L. | F | Solanaceae | S | Hiddi Orome | 42 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | L | F | Cr, chw, Pa | Der |
| | | | | | | Buda (stress) [Evil eye] | | R | D | De, Pw, Dr | O |
| | | | | | | Bassa (Diarrhoea) | | R | F | Co, Cr, chw, Dr | O |
| | | | | | | Funana (nosebleed) | | L | F | Co, Sq | N |
| | | | | | | Agano (Dingetegna) (Acute stomach illness) | | R | F | Co, Cr, chw, Dr | O |
| *Solanum marginatum* L.f. | A | Solanaceae | S | Hiddi | 68 | Agano (Dingetegna) (Acute stomach illness) | | L | FD | P, Dr | O |
| | | | | | | Dhullaa (Bugunj) (Skin infection) | | Fr | F | Ty | Der |
| | | | | | | | Ikek (Horse's) [Dermatophytes] | Fr | F | Co, De, Cr, Pa | Der |
| | | | | | | Michi (Febrile illness) | | L | F | Csw | O |
| | | | | | | Dhibee Sinbiraa (Hepatitis B) | | L | F | Co, Csw | O |
| | | | | | | Kurmuman (Kintarot) [Haemorrhoid] | | Fr | F | Sq, Pa | Der |
| | | | | | | Abdominal pain | | L | F | Cr, Swa | O |
| *Sonchus bipontini* Asch. | F | Asteraceae | H | Kartassa | 81 | Sore (Infected wound) | | L | D | Co, Cr, Pw | Der |
| | | | | Kartasa | 81 | Dhibe Laffaa (Evil spirit) | | R | FD | Co, Cr, StB | Der |
| | | | | Kartasa | 81 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | R | F | Co, Cr, chw, Dr | O |
| | | | | Kartasa | 81 | | Chixxo (Scabies) | L | F | Co, Cr, chw, Pa | Der |
| | | | | Kartasa | 81 | Dhibe Tiru (Liver diseae) | | R | D | Co, Cr, Pw, chw | O |
| | | | | Rafu Sinbra | 81 | Ito | | L | F | Co, De, Cr | Der |
| | | | | Gale or Rafu Sinbra | 81 | Dubarraa (Amoebiasis) | | L | FD | Cr, Pw | Der |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Verbascum sinaiticum* Benth. | A | Scrophulariaceae | S | Abokena | 59 | | Chachabsa | R | F | Co, Cr, chw | N |
| | | | | Abokena | 59 | | Darissaa (Gamoji or Zalaqa) | R | F | Cr, chw, Dr | O |
| | | | | Harbokena | 59 | Hobati (Retained placenta) | | R | F | Co, De, P, Dr | O |
| | | | | Harbokena | 59 | Darabaftu (Almaz balecira) [Herpes Zoster] | | R | FD | Co, P, Dr | O |
| | | | | Abokena | 59 | Agano (Dingetegna) (Acute stomach illness) | | R, L | FD | P | O |
| | | | | Abokena | 59 | Qora (Cold) | | R | F | Co, De, Wa | Der |
| | | | | Abokena | 59 | Bassa (Diarrhoea) | | R | F | Cr, Dr | O |
| | | | | Harbokena | 59 | | Darissaa (Gamoji or Zalaqa) | R | F | Co, Cr, chw | N |
| | | | | Abokena | 59 | Dhibe Sere (Rabies) | | R | F | Co, De, Cr, Dr | O |
| | | | | Abokena | 59 | Unable to urinate (Diuretic) | | R | FD | Co, Cr, Pw, chw | O, N |
| | | | | Abokena | 59 | | Ab.constipation | R | F | Co, Cr, chw, Dr | O |
| | | | | Gura Hare | 59 | | | L | F | Co, Cr | Der |
| | | | | Abokena | 59 | Dhibe Sere (Rabies) | | R | D | Co, Pw, chw, Dr | O |
| | | | | Harbokena | 59 | Dhibe Ha'dha (Poisons) | | L | F | Cr, chw | O, N, Der |
| | | | | Harbokena | 59 | Funana (nosebleed) | | L | F | Co, Sq | N |
| | | | | Abokena | 59 | Dhibe Sere (Rabies) | | R | F | Co, Cr, chw, Dr | O |
| | | | | Abokena | 59 | Bassa (Diarrhoea) | | R | D | Cr, Pw, chw, Dr | O |
| | | | | Harbokena | 59 | | Dhukuba Alati (Hepatitis) | R | F | Co, Swa | O |
| | | | | Harboqana | 59 | Naqarsa | | R | D | Co, Cr, Pw, Ty | Der |
| | | | | Harboqana | 59 | | Chachabsa | L | F | Co, Cr, Sq, chw, Ty | Der |
| | | | | Abokena | 59 | Bassa (Diarrhoea) | | R | F | Cr, Swa | O |

**Appendix V continued**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Vernonia amygdalina* Del. | F | Asteraceae | S | Aebicha | 115 | | Dhukuba Alati (Hepatitis) | L | F | Co, Cr, chw, Dr | O |
| | | | | Ebicha | 115 | Intestinal worms | | L | F | Co, P, Dr | O |
| | | | | Ebicha | 115 | Funana (nosebleed) | | L | F | Cr, Sq, Dr | N |
| | | | | Ebicha | 115 | Sibiji (Chife) [Eczema] | | L | FD | Cr, Pa | Der |
| | | | | Aebicha | 115 | Dhibee Sinbiraa (Hepatitis B) | | L | D | Co, Pw, Swa | O |
| | | | | Aebicha | 115 | | Chixxo (Scabies) | L | F | Co, Cr, chw, Pa | Der |
| | | | | Aebicha | 115 | Ascariasis | | L | F | Co, De, Dr | O |
| | | | | Aebicha | 115 | | Albati (Diarrhoea) | L | F | Co, Cr, chw, Dr | O |
| | | | | Aebicha | 115 | | Albati (Diarrhoea) | L | F | Co, Cr, chw, Dr | O |
| | | | | Girawa (Amh) | 115 | Intestinal worms | | L | F | Co, Cr, Sq, chw, Dr | O |
| | | | | Girawa (Amh) | 115 | | Albati (Diarrhoea) | L | F | P, Swa | O |
| | | | | Aebicha | 115 | Sibiji (Chife) [Eczema] | | L | FD | Cr, Ty | Der |
| | | | | Aebicha | 115 | | Dhukuba Alati (Hepatitis) | L | F | De, Cr, Dr | O |
| | | | | Aebicha | 115 | Qora (Cold) | | L | F | Co, Cr, StB | O, Der |
| *Vernonia myrantha* Hook.f. | F | Asteraceae | S | Regi | 38 | Dhibe Tiru (Liver diseae) | | L | D | Co, Cr, Pw, chw, Dr | O |
| | | | | Regi | 38 | | Dhukuba Gorbe (Aba Gorba) [Blackleg] | L | F | Co, Cr, chw, Dr | O |
| | | | | Rangii | 38 | Sibiji (Chife) [Eczema] | | L | D | Cr, Pa | Der |
| *Withania somnifera* (L.) Dun. | VR | Solanaceae | S | Hunzo | 66 | Dhibe Laffaa (Evil spirit) | | L | F | Co, Cr | O |
| | | | | Hunzo | 66 | Buda (stress) [Evil eye] | | R | FD | Co, P, StB | Der |
| | | | | Hunzo | 66 | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, De | Der |
| | | | | Hunzo | 66 | Abdominal irritation (Gastritis) | | R | D | De, P, Dr | O |
| | | | | Hunzo | 66 | | Darissaa (Gamoji or Zalaqa) | R | FD | Co, De | N |
| | | | | Hunzo | 66 | Bowo & Quffa (Headache)[Influenza] | | R | FD | Cr, StB | Der |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Hunzo | 66 | Harassa (Qilensa) [Yebird Beshita] | | L | F | Co, Cr, StB | Der |
| | | | | Hunzo | 66 | Dhibe Laffaa (Evil spirit) | | R | FD | Co, Cr, StB | Der |
| | | | | Hunzo | 66 | Dhibe Laffaa (Evil spirit) | | R | FD | B, SmB | Der |
| | | | | Hunzo (Gizawa) | 66 | Buda (stress) [Evil eye] | | R, L | D | B, SmB | O, Der |
| | | | | Hunso | 66 | Chobto (Gonorrhoea) | | R | F | Co, Cr, Swa | O |
| | | | | Hunso | 66 | Dhibe Eja (Eye problem) | | R | D | Co, Cr, B, SmB | Der |
| | | | | Hunso | 66 | Buda (stress) [Evil eye] | | R | D | Co, cr, Pw, Dr | O |
| | | | | Hunzo | 66 | | Wan Laffa (Evilspirit) | R | F | Co, Cr, chw, Dr | O |
| | | | | Hunso | 66 | Qora (Cold) | | R | FD | Co, Cr, SmB | Der |
| | | | | Hunso | 66 | | Darissaa (Gamoji or Zalaqa) | R | FD | De, Cr, Dr | O |
| | | | | Hunso | 66 | | Darissaa (Gamoji or Zalaqa) | Sb | F | Co, De, Cr, Dr | O |
| *Zehneria scabra* (Linn.f.) Sond. | F | Cucurbitaceae | H(Clim) | Harola | 124 | Wolti-Bofa (Snake bite) | | L | F | Co, Cr, chw, Dr | O |
| | | | | Haregresa | 124 | Hemorrhage | | L | F | Sq | Der |
| | | | | Harola / Haregresa | 124 | Dhibe Tiru (Liver diseae) | | R | FD | De, Cr, Dr | O |
| | | | | Harola | 124 | Dhibe Sere (Rabies) | | R | FD | P, Dr | O |
| | | | | Harola | 124 | | Darissaa (Gamoji or Zalaqa) | L | FD | Co, De | N |
| | | | | Harola | 124 | Chobto (Gonorrhoea) | | R | D | Co, Cr, Pw, Dr | O |
| | | | | Etse Sabek | 124 | Dhibe Tiru (Liver diseae) | | R, Fr | FD | Co, P, Sq, Dr | O |
| | | | | Etse Sabek | 124 | Bile (Jaundice) | | R | FD | Csw | O |

**Appendix VI**. Frequency of being informed (FBI) of common human and livestock health problems and the number of medicinal plant species used

| **Human Disease** | **FBI** | **Nsp** | **Human Disease** | **FBI** | **Nsp** |
|---|---|---|---|---|---|
| Abdominal distension | 2 | 2 | Pharingitis (*Dhibe Koke*) | 1 | 1 |
| Abdominal irritation (Gastritis) | 3 | 3 | Pneumonia | 1 | 1 |
| Abdominal pain | 1 | 1 | Poisons (*Dhibe Ha'dha*) | 2 | 2 |
| Acute stomach illness [*Agano (Dingetegna)*] | 17 | 19 | *Qilensa [Harassa (Yebird Beshita)]*. | 18 | 21 |
| *Aininas* | 1 | 1 | *Qumata* | 2 | 2 |
| Amoebiasis (*Dubarraa*) | 14 | 14 | *Quruba* | 1 | 1 |
| Ascariasis | 4 | 4 | Rabies (*Dhibe Sere*) | 12 | 13 |
| Asthma | 5 | 5 | *Rajoo* | 1 | 4 |
| Breast pain | 3 | 3 | Retained placenta (*Hobati*) | 6 | 8 |
| Cold (*Qora*) | 15 | 17 | Dandruff [Dermatophytes (*Forefor*)] | 1 | 3 |
| Common cold (*Qufa*) | 8 | 10 | Ringworm *[Robii (Fungal infection)]* | 4 | 5 |
| Constipation | 6 | 6 | Scabies [Chito (Hossis)] | 7 | 8 |
| *Dhukuba Dhudha* | 2 | 2 | Skin disease (*Bochore*) | 2 | 2 |
| Diarrhoea (*Bassa*) | 14 | 9 | Skin infection [*Dhullaa (Bugunj)*] | 6 | 6 |
| Diuretic (unable to urinate) | 3 | 3 | Snake bite (*Wolti-Bofa*) | 2 | 2 |
| Dry cough | 1 | 1 | *Spasm (Kurtmat)* | 1 | 1 |
| Earache (*Dhibe*) | 7 | 6 | Stabbing Pain (*Wugat*) | 1 | 1 |
| Eczema [*Sibiji (Chife)*] | 14 | 14 | Stomach pain [*Garaa Ciniinnaa/Garaa kaasaa*] | 3 | 3 |
| Elephantiasis (*Dula Arba*) | 1 | 1 | Taeniasis | 1 | 1 |
| Epilepsy (*Dhibe Qabana*) | 5 | 6 | TB | 3 | 3 |
| Evil eye (*Buda*) | 13 | 14 | Tinea versicolor [*Baki (Barile)=Quaqucha*)] | 5 | 5 |
| Evil spirit (*Dhibe Laffaa*) | 14 | 15 | Tonsillitis (*Qonqo*) | 4 | 3 |
| Eye brow irritation | 1 | 1 | Toothache (*Hilicani*) | 7 | 9 |
| Eye disease (*Dhibe Eja*) | 4 | 4 | Typhoid fever | 2 | 3 |
| Febrile illness (*Michi*) | 10 | 11 | | | |
| *Gara Bokoyso* | 2 | 2 | **Livestock Disease** | **FBI** | **Nsp** |
| Gonorrhoea (*Chobto*) | 19 | 18 | Abdominal constipation | 2 | 2 |
| Haemorrhoid [*Kurmuman (Kintarot*)] | 13 | 12 | Anthrax (*Dhibee Sanga*) | 3 | 3 |
| Headache & oral sore of children | 1 | 1 | *Badhaftu* | 2 | 4 |
| Headache (*Bowo*) | 10 | 12 | Blackleg [Dhukuba Gorbe (Aba Gorba)] | 16 | 19 |
| Hemorrhage | 4 | 4 | *Darissaa (Gamoji or Zalaqa)* | 16 | 17 |
| Hepatitis B (*Dhibee Sinbiraa*) | 21 | 22 | Dermatophytes [*Ikek* (horses')] | 2 | 4 |
| Herpes Zoster [*Darabaftu (Almaz balechira*)] | 5 | 5 | Diarrhoea (*Albati*) | 9 | 12 |
| Impotence | 1 | 1 | Epilepsy *[Wan Qabana (Elbissa)]* | 2 | 2 |
| Infected wound or sore | 3 | 3 | Evil eye (*Buda*) | 1 | 2 |
| Influenza [*Bowo & Quffa*) | 2 | 2 | Evil spirit *(Wan Laffa)* | 4 | 6 |
| Intestinal worms | 6 | 7 | Eye disease (*Dhukuba Eja*) | 1 | 1 |
| *Ito* | 2 | 2 | *Gara Gelcha* | 2 | 2 |
| Jaundice (*Hamot)* | 2 | 2 | *Gonde* (due to eating poisoning plant) | 1 | 1 |
| *Kaliti* | 1 | 1 | Hepatitis *(Dhukuba Alati)* | 16 | 17 |
| *Kambussa* | 2 | 3 | Lung disease (Somba) | 1 | 4 |
| Kidney disease | 3 | 4 | *Naqarsa* | 2 | 2 |
| Liver disease (*Dhibe Tiru*) | 13 | 22 | Nose swelling in mules *(Chachabsa)* | 6 | 6 |
| Lung disease (*Dhibe Somba*) | 4 | 4 | Poisons (*Hudhaa*) | 2 | 2 |

**Appendix VI continued**

| | | | | | |
|---|---|---|---|---|---|
| Madness (*Dhibe Maratu*) | 1 | 1 | Rabies (*Dhukuba Sere*) | 2 | 2 |
| Menstrual problem | 1 | 1 | *Rajoo* | 1 | 1 |
| *Muje* | 2 | 3 | Scabies (*Chixxo)* | 3 | 3 |
| *Naqarsa* | 18 | 17 | Swelling (*Ibach*) | 1 | 1 |
| Neonatal death *(Shotelay)* | 2 | 1 | Swelling? (Gubbaa) | 3 | 4 |
| Nosebleed (*Funuunna*) | 7 | 7 | *Tigani* | 1 | 1 |

**Appendix VII**. List of informants

**Key**: * Key informants

| **Informant** | **Sex** | **Age** | **Marital Status** | **Education** | **District** | **Qebele** |
|---|---|---|---|---|---|---|
| Abda Haji Sheko | M | 45 | Married | Grade 7 | Goba | Fasil Angeso |
| Abdul Jebar Hassen | M | 32 | Married | Grade 7 | Goba | Alu Azira |
| Abdurahman Bime | M | 46 | Married | Read & write | Adaba | Maskal Haricho |
| Abduri Mohammed | M | 55 | Married | No | S. Dinsho | Hora Soba |
| Ade- Manaza Chura | F | 44 | Married | Grade 2 | S. Dinsho | Garamba Dima |
| Adune Alemu | M | 18 | Single | Grade 6 | S. Dinsho | Kaso Meo |
| Ahmu Hussen | M | 55 | Married | Read & write | S. Dinsho | Homa |
| Beletu Wordofa | F | 30 | Divorced | 12 complete | S. Dinsho | Wolti Berisa |
| Berhanu Aga | M | 37 | Married | Grade 3 | S. Dinsho | Kaso Meo |
| Beriso Haji Sheko | M | 49 | Married | Grade 6 | Goba | Fasil Angeso |
| Beshir Fetto | M | 49 | Married | No | Adaba | Maskal Haricho |
| Gemeda Tegene | M | 60 | Married | Grade 3 | S. Dinsho | Kaso Meo |
| Gobenae Ibrahim * | F | 40 | Married | Grade 4 | S. Dinsho | Dinsho 02 |
| Haji Abute Haji Aliyi * | M | 56 | Married | Read & write | S. Dinsho | Hora Soba |
| Haji Hassen Kebir Seid * | M | 50 | Married | Grade 6 | S. Dinsho | Dinsho 02 |
| Haji Kedir Haji Sheko | M | 49 | Married | Grade 2 | S. Dinsho | Kaso Meo |
| Hassen Haji Adem * | M | 40 | Married | Grade 2 | S. Dinsho | Homa |
| Hassen Haru * | M | 75 | Married | No | S. Dinsho | Kaso Meo |
| Hussen Abdul | M | 20 | Married | Read & write | S. Dinsho | Kaso Meo |
| Hussen Biftu * | M | 60 | Married | No | S. Dinsho | Gojera |
| Jarso Waritu * | M | 57 | Married | No | S. Dinsho | Hora Soba |
| Jemila Telo | F | 40 | Married | Read & write | Adaba | Maskal Haricho |
| Jemila Tilimu | F | 41 | Divorced | Grade 4 | Goba | Burkitu |
| Kedir Beshira | M | 66 | Married | No | S. Dinsho | Abakara |
| Kedir Ebu * | M | 70 | Married | Read & write | S. Dinsho | Gojera |
| Kedir Kebir Seid * | M | 56 | Married | Read & write | S. Dinsho | Abakara |
| Lolle Allo | M | 48 | Married | Grade 6 | S. Dinsho | Dinsho 02 |
| Mohammed Hussen Nure | M | 77 | Married | No | S. Dinsho | Wolti Berisa |
| Mohammed Aman | M | 20 | Single | Grade 6 | S. Dinsho | Kaso Meo |
| Priest- Meaza G/Wold | M | 47 | Married | Grade 8 | Goba | . 02 |
| Seifu Ere | M | 70 | Married | Read & write | Goba | Alu Azira |
| Shek Abulkadir Haji Aliye | M | 50 | Married | Read & write | S. Dinsho | Abakara |
| Shek Adem Tulu | M | 38 | Married | Grade 2 | S. Dinsho | Dinsho 01 (town) |

**Appendix VII continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| Shek Mohammed Haji Hayi * | M | 36 | Married | Grade 4 | S. Dinsho | Gofingra |
| Shek Mohammed Hamu | M | 52 | Married | Grade 2 | S. Dinsho | Abakara |
| Shek Mohammed Hussen Haji Usman | M | 45 | Married | Read & write | S. Dinsho | Abakara |
| Shek Mohammed Hussien Adem Woliye | M | 67 | Married | Grade 3 | S. Dinsho | Homa |
| Shek Nuru Haji Hussen | M | 63 | Married | Read & write | S. Dinsho | Dinsho 02 |
| Shek Qasim Haji Mudi * | M | 58 | Married | No | S. Dinsho | Dinsho 02 |
| Shek Suleiman Shemsu * | M | 45 | Married | Read & write | S. Dinsho | Garamba Dima |
| Shek Tahir Shek Kedir | M | 43 | Married | Grade 3 | S. Dinsho | Kaso Meo |
| Shek Taju Haji Mohammed | M | 35 | Married | Grade 3 | Goba | Shedam |
| Shek Umar Kebir Kedir * | M | 57 | Married | Read & write | S. Dinsho | Dinsho 02 |
| Shemsya Aliye * | F | 40 | Married | Read & write | S. Dinsho | Dinsho 02 |
| Shifera Mekonnen | M | 40 | Married | Grade 6 | S. Dinsho | Kaso Meo |
| Shubbise Awseenoo | M | 88 | Married | No | S. Dinsho | Hora Soba |
| Shube Sheko Shaba * | F | 45 | Married | Grade 4 | S. Dinsho | Wolti Berisa |
| Sinto Haji Kedir | F | 70 | Married | No | Goba | Shedam |
| Woyibo Jarso | M | 55 | Married | No | S. Dinsho | Wolti Berisa |

**Appendix VIII.** Semi-Structured Interview Schedule Employed in the Research Project

1. Name of the respondent
2. Sex of the respondent
3. Marital status of the respondent: Married/widowed/divorced/single (Underline)
4. Age of the respondent
5. Educational status of the: Read and write? (Yes/No) Underline
   Indicate level/grade completed
6. Locality: Detailed description of locality (Including Woreda/District and Qebele)
7. What are the main human health problems/diseases?
8. What are the main livestock health problems/diseases?
9. How do you diagnose each disease/health problem?
10. Symptom(s) of the disease/health problem
11. How do you control/prevent health problems/diseases?
12. How do you treat human health problems/diseases?
13. How do you treat livestock health problems/diseases?
14. Which plant(s) do you use for treating that particular health problem/disease?
15. Local name(s) of the plant(s)
16. Botanical name(s)
17. Family name(s)
18. Growth form: Tree/shrub/herb/liana/epiphyte/semi-parasite/parasite/aquatic
19. Brief description of the plant (by investigator/enumerator), including height, flower color, mature fruit color, mature seed color and other unique features
20. Habitat: Wild or cultivated, if wild specific habitat_____and vegetation type_____
21. How widespread is/are the medicinal plant(s)? Easily obtained from home garden/surrounding areas/far away places (how far?___)/purchased [if purchased from individual at household/market (indicate name of individual/market place)]
22. Plant part used in medicine: Root/stem/rootbark/stembark/leaves/small twigs with leaves/flowers/fruit/seed/whole (Underline). Others_____.

23. Used alone, mixed with water or other materials, concoction/decoction (Underline): Other_____
24. How plant parts are used: Fresh only/dried only/ fresh or dried (Underline). Other_____
25. Preparation for medicinal use: Crushed/crushed and powdered/extracted with cold water/ boiled (juice/latex) (Underline). Other_____
26. Dose/amount
27. Does the dose differ among males, females, children, elders?
28. Any noticeable adverse/side effect(s)
29. Any antidotes for adverse/side effect(s)
30. How do you preserve traditional medicine?
31. Any restriction or taboo in collecting medicinal plants
32. Are medicinal plant marketed/marketable?
33. For what other purposes do you use traditional medicinal plants? Food/firewood/charcoal/house construction/forage/etc.
34. Are there any threats to the medicinal plants? List out the main threats, starting with the most serious threat
35. How do you conserve traditional medicinal plants?
36. How is the knowledge on traditional medicine passed to a family member/younger generation?
37. How does modernization interfere with traditional medicinal knowledge?

IDENTIFICATION:
Name of: Survey Area/Woreda_____
Peasant Association_____
Community/Village_____
Interviewer/facilitator_____
Date/Month/Year: _____
Time: From_____a.m./p.m. to _____a.m./p.m.

**Appendix IX**. Format used to collect data of preference ranking

| Species / Respondent | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| **R1** | | | | | | | |
| **.** | | | | | | | |
| **.** | | | | | | | |
| **.** | | | | | | | |
| **R15** | | | | | | | |
| **Total** | | | | | | | |
| **Rank** | | | | | | | |

**Appendix X**. Format used to summarize data of direct matrix ranking

| Species | Use Diversity | | | | | | | | Total | Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | | |
| **.** | | | | | | | | | | |
| **.** | | | | | | | | | | |
| **.** | | | | | | | | | | |
| **7** | | | | | | | | | | |
| **Total** | | | | | | | | | | |

| Rank | | | | | | | | |
|---|---|---|---|---|---|---|---|---|

**Appendix XI**. List of species at Adelle, Boditi and Gaysay

**Key**: GF [growth form], H [herb], S [shrub], T [tree], Li [liana], H(clim) [herbaceous climber], E [epiphyte], PH [parasitic herb]
**Note**: Species written in bold are reportedly medicinal

| Scientific Name | Family | Local Name | GF | Coll.No |
|---|---|---|---|---|
| ***Achyranthes aspera* L.** | **Amaranthaceae** | Roppe, Qorsa Waranssa | **H** | **200/253** |
| ***Agrocharis melanantha* Hochst.** | **Apiaceae** | Hindriffa, Bobonka | **H** | **256** |
| *Agrostis sclerophylla* C.E. Hubb. | Poaceae | Merga | H | 356 |
| *Ajuga bracteosa* Wall. ex Benth. in Wall. | Lamiaceae | | H | 333 |
| ***Alchemilla abyssinica* Fresen.** | **Rosaceae** | Hindriff | **H** | **266** |
| *Alchemilla ellenbeckii* Engl. | Rosaceae | Hidhanhidhoo | H | 191 |
| *Alchemilla pedata* A. Rich. | Rosaceae | Hindriff, Indriif Hindriiffi bala | H | 264 |
| *Alepidea peduncularis* Steud. ex A. Rich. | Apiaceae | | H | 399 |
| *Anaptychia liucomeleana* Wain | Lichen | | E | 345 |
| *Anchusa affinis* R.Br. | Boraginaceae | Burii Jeldessa | H | 300 |
| *Andropogon amethystinus* Steud. | Poaceae | Bulto | H | 384 |
| *Andropogon lima* (Hack.) Stapf | Poaceae | Wegel Seber (Amh) | H | 379 |
| ***Anthemis tigreensis* J. Gay ex A. Rich.** | **Asteraceae** | | **H** | **287** |
| *Anthoxanthum aethiopicum* I. Hedberg | Poaceae | | H | 375 |
| *Argyrolobium confertum* Polhill | Fabaceae | | H | 192 |
| ***Arisaema schimperianum* Schott** | **Araceae** | Chobii | **H** | **319** |
| *Aristida tuniculata* Trin. & Rupr. | Poaceae | Laancaa | H | 370 |
| ***Artemisia abyssinica* Sch. Bip.** | **Asteraceae** | Merga dima | **H** | **227** |
| ***Artemisia afra* Jacq. ex Willd.** | **Asteraceae** | Tepeno | **S** | **286** |
| ***Asparagus africanus* Lam.** | **Asparagaceae** | Seriti | **S** | **301** |
| ***Asparagus setaceus* (Kunth) Jessap** | **Asparagaceae** | Seriti | **S** | **79** |
| ***Asplenium aethiopicum* (Burm.f.) Bech.** | **Aspleniaceae** | Qumbuta | **E** | **339** |
| ***Asplenium monanthes* L.** | **Aspleniaceae** | Qumbuta | **H** | **340** |
| *Asplenium theciferum* (Kunth) Merr. | Aspleniaceae | | E | 341 |
| *Astragalus atropilosulus* (Hochst.) Bange | Fabaceae | Hara | S | 246 |
| *Bartisia abyssinica* Hochst. ex Benth. | Scrophulariaceae | Daffura | H | 294 |
| *Bartisia petitiana (*A. Rich.) Hemsl. | Scrophulariaceae | | H | 298 |
| ***Bidens macroptera* (Sch. Bip. ex Chiov.) Mesfin** | **Asteraceae** | Hade gola | **H** | **44** |
| *Bidens prestinaria (*Sch. Bip.) Cuf. | Asteraceae | Hade gola | H | 289 |
| *Brachycorythis buchananii (*Schltr.) Rolfe | Orchidaceae | Shumbura gala | H | 310 |
| *Bromus pectinatus* Thunb. | Poaceae | Alanmuressa | H | 388 |
| *Campanula edulis* Forssk. | Campanulaceae | Rirmu | H | 303 |
| *Cardamine hirsuta* L. | Brassicaceae | Biribina | H | 234 |
| *Cardamine obliqua* A. Rich. | Brassicaceae | Raffuu simbira | H | 242 |
| **Carduus nyassanus (S. Moore) R.E. Fries** | **Asteraceae** | Qore Haree | **H** | **49** |
| *Carduus leptacanthus* Fresen. | Asteraceae | Qore Haree | H | 398 |
| *Carex bequaertii* De Wild. | Cyperaceae | Alanmuressa | H | 368 |

**Appendix XI continued**

| | | | | |
|---|---|---|---|---|
| *Carex chlorosaccus* C.B. Clarke | Cyperaceae | | H | 383 |
| *Carex conferta* Hochst. ex A. Rich. | Cyperaceae | Alando, Alanmuressa | H | 362 |
| *Carex echinochloë* Kunze | Cyperaceae | | H | 360 |
| *Carex simensis* Hochst. ex A. Rich. | Cyperaceae | Alanmuressa | H | 365 |
| *Carex thomasii* Nelmes | Cyperaceae | Alanmuressa | H | 366 |
| *Centella asiatica (*L.) Urb. | Apiaceae | Balee, Qudu | H | 233 |
| *Centhrus setigerus* Vahl | Poaceae | Serdo (Amh) | H | 386 |
| *Cerastium afromontanum* Th. Fr. jr. & Weimarck | Caryophyllaceae | Duqusha chuffa | H | 237 |
| *Ceropegia cufodontis* Chiov. | Asclepiadaceae | Xxorso | H(clim) | 224 |
| ***Cheilanthes farinosa* (Forssk.) Kaulf.** | **Sinopteridaceae** | | **H** | **157** |
| *Chiliocephalum schimperi* Benth. | Asteraceae | Badubera, Muka Dadi | H | 204 |
| *Chlorophytum tenuifolium* Bak. | Anthericaceae | | H | 315 |
| *Cineraria abyssinica* Sch. Bip. ex A.Rich | Asteraceae | Gori Amaa, Gale Simbira | H | 211 |
| ***Clematis hirsuta* Perr. & Guill.** | **Ranunculaceae** | Fitii | **Li** | **241** |
| *Colpodium spp. Altaicum* Trin. *?* | Poaceae | | H | 387 |
| *Commelina africana* L. | Commelinaceae | Gura Jarsa | H | 305 |
| ***Commelina foliacea* Chiov.** | **Commelinaceae** | Marga Simbira | **H** | **78** |
| *Conyza tigrensis* Oliv. & Hiern | Asteraceae | Anamuro, Qumbi, Darara Simbira | H | 210 |
| *Conyza variegata* Sch. Bip. ex A. Rich. | Asteraceae | | H | 212 |
| *Crassula alba* Forssk. | Crassulaceae | Burii Jeldessa | H | 400 |
| *Crassula schimperi* Fisch. & Mey | Crassulaceae | | H | 231 |
| *Craterostigma plantagineum* Hochstetter | Scrophulariaceae | | H | 307 |
| *Crepis carbonaria* Sch. Bip. | Asteraceae | Marga Hoffi | H | 218 |
| ***Crepis ruepellii* Sch. Bip.** | **Asteraceae** | | **H** | **45** |
| *Cuscuta kilimanjari* Oliv. | Cuscutaceae | Segeniti | PH | 293 |
| *Cyanotis polyrrhiza* Hochst. ex Hassk. | Commelinaceae | | H | 302 |
| *Cycniopsis humifusa* (Forssk.) Engl. | Scrophulariaceae | | H | 295 |
| ***Cynoglossum amplifolium* Hochst. ex DC.** | **Boraginaceae** | Qarccabbaa | **H** | **299** |
| *Cynoglossum coeruleum* Hochst. | **Boraginaceae** | Qarccabbaa | **H** | 74 |
| *Cyperus elegantulus* Steud. | Cyperaceae | | H | 389 |
| *Cyperus platycaulis* Baker. | Cyperaceae | | H | 363 |
| *Cyperus rigidifolius* Steud. | Cyperaceae | Alandoo, Aladoo (Or.), Engicha (Amh) | H | 361 |
| *Cyperus schimperianus* Steud. | Cyperaceae | Alando | H | 358 |
| *Deschamsia caespitosa* (L.) P. Beauv. | Poaceae | Looyaa, BuriiJaldeessa | H | 374 |
| *Dichondra repens* J.R. & G.Frost. | Convolvulaceae | Bala Toko | H | 312 |
| *Dicrocephala chrysanthemifolia* (Blume) DC. | Asteraceae | Marga Simbira | H | 206 |
| *Dicrocephala integrifolia* (L.f.) Kuntze | Asteraceae | Rafu Osole | H | 284 |
| *Digitaria abyssinica* (Hochst. ex A. Rich.) Stapf | Poaceae | Meqala | H | 378 |
| ***Discopodium eremanthum* Chiov.** | **Solanaceae** | Meraro | **S** | **320** |
| *Indigofera lupatana* Bak.f. | Fabaceae | Shashamane | H | 245 |

**Appendix XI continued**

| | | | | |
|---|---|---|---|---|
| *Echinops hoehnelii* Schweinf. | Asteraceae | Qore Haree | S | 291 |
| *Echinops macrochaetus* Fresen. | Asteraceae | Tuqa, Qoree | H | 290 |
| *Ehrharta erecta* Lam. | Poaceae | | H | 377 |
| *Eleusine floccifolia (*Forssk.) Spreng. | Poaceae | Maqala (Or.), Akirima (Amh) | H | 351 |
| *Eragrostis Schweinfurthii* Chiov. | Poaceae | | H | 367 |
| *Erica arborea* L. | Ericaceae | Satoo | S | 250 |
| *Erigeron moonei* ms.fide J.W. Ash | Asteraceae | | H | 285 |
| *Erodium moschatum* (L.) Ait. | Geraniaceae | | H | 199 |
| ***Euphorbia depauperata* A. Rich.** | **Euphorbiaceae** | Guri Xixiqo | **H** | **258** |
| ***Euphorbia dumalis* S. Carter** | **Euphorbiaceae** | **Gurii** | **S** | **20** |
| *Euphorbia platyphyllos* L. | Euphorbiaceae | | H | 198 |
| *Eurynchium pulchellum* (Hedw.) Jenn. | Bryophytes | Hansufe | E | 347 |
| *Felicia abyssinica* Sch. Bip. ex A. Rich. | Asteraceae | | H | 230 |
| ***Ferula communis* L.** | **Apiaceae** | Gnida | **H** | **257** |
| *Festuca richardii* Alexeev | Poaceae | Yeqoq Sar (Amh) | H | 353 |
| *Festuca simensis* Hochst. ex A. Rich. | Poaceae | Lancha | H | 382 |
| *Ficinia clandestina* (Steud.) Bock. | Cyperaceae | Chekorsa | H | 357 |
| ***Galium simense* Fresen.** | **Rubiaceae** | Maxxane (Or.), Asheket (Amh) | **H** | **251** |
| *Galium thunbergianum* Eckl. & Zeyh. | Rubiaceae | Xooshinbaate | H | 238 |
| ***Geranium arabicum* Forssk.** | **Geraniaceae** | Bucha | **H** | **265/349** |
| *Geranium kilimandscharicum* Engl. | Geraniaceae | Balee Tiqo | H | 190 |
| *Gerbera piloselloides* (L.) Cass. | Asteraceae | | H | 280 |
| *Gladiolus candidus* (Rendle) Goldblatt | Iridaceae | Hanxxaye | H | 393 |
| *Gnaphalium rubriflorum* Hilliard | Asteraceae | Badubera | H | 216 |
| *Guizotia scabra* (Vis.) Chiov. | Asteraceae | Hadaa (Or.), Mech (Amh) | H | 209 |
| *Gynura pseudochina* (L.) DC. | Asteraceae | Raffu | H | 220 |
| *Habenaria peristyloides* A. Rich. | Orchidaceae | Kerkashaw | H | 309 |
| ***Hagenia abyssinica* (Bruce) J.F. Gmel.** | **Rosaceae** | Hexxoo | **T** | **51** |
| ***Haplocarpha rueppellii* (Sch. Bip.) Beauv.** | **Asteraceae** | | **H** | **276** |
| *Hebenstretia angolensis* Rolfe | Scrophulariaceae | | H | 296 |
| *Helichrysum citrispinum* Del. | Asteraceae | | S | 279 |
| *Helichrysum foetidum* (L.) Moench. | Asteraceae | | H | 283 |
| *Helichrysum globosum* A. Rich. | Asteraceae | | **H** | 281 |
| ***Helichrysum gofense* Cufod.** | **Asteraceae** | Irsha | **H** | **43** |
| *Helichrysum harenensis* Mesfin. | Asteraceae | Hoffii | H | 215 |
| *Helichrysum quartinianum* A. Rich. | Asteraceae | Agadena | H | 205 |
| *Helichrysum schimperi* (Sch. Bip. ex A. Rich.) Moeser | Asteraceae | Badubera | H | 292 |
| *Helichrysum splendidum* (Thunb.) Less. | Asteraceae | Badubera | S | 214 |
| *Helictotricon elongatum* (Hochst. ex A. Rich.) C.E. Hubb. | Poaceae | Maaxaa | H | 373 |

**Appendix XI continued**

| | | | | |
|---|---|---|---|---|
| ***Heracleum abyssinicum* (Boiss.) Norman** | **Apiaceae** | Bosoqa | **H** | **271** |
| *Heracleum elongense* (Wolff) Bullock | Apiaceae | Qumbuta | H | 272 |
| *Heterophyllum haldanianum* (Grev.) Kindb. | Bryophytes | | E | 346 |
| *Hydrocotyle mannii* Hook.f. | Apiaceae | | H | 273 |
| *Hyparthelia dissoluta* (Steud.) W.D. Clayton. | Poaceae | Loya | H | 381 |
| *Hypericum annulatum* Moris | Hypericaceae | Sissa | H | 195 |
| *Hypericum peplidifolium* A. Rich. | Hypericaceae | | H | 193 |
| ***Hypericum revolutum* Vahl** | **Hypericaceae** | Garamba | **S** | **27** |
| *Hypericum scioanum* Chiov. | Hypericaceae | | H | 196 |
| *Impatiens rothii* Hook. f. | Balsaminaceae | | H | 255 |
| *Juncus effusus* L. | Juncaceae | Alando | H | 311 |
| ***Juniperus procera* L.** | **Cupressaceae** | **Hindessa** | **T** | **53** |
| ***Kalanchoe petitiana* A. Rich.** | **Crassulaceae** | | **S** | **28** |
| ***Kniphofia foliosa* Hochst.** | **Asphodelaceae** | **Lela** | **H** | **317** |
| *Kniphofia insignis* Rendle. | Asphodelaceae | **Lela Xixiqo** | **H** | 314 |
| ***Kniphofia isoetifolia* Steud. ex Hochst.** | **Asphodelaceae** | **Lela Xixiqo** | **H** | **316** |
| *Koeleria capensis (*Steud.) Nees | Poaceae | | H | 355 |
| *Kyllinga bulbosa* Vahl | Cyperaceae | Qumbura | H | 364 |
| *Linum trigynum* L. | Linaceae | | H | 225 |
| *Lobelia erlangeriana* Engl. | Lobeliaceae | | H | 308 |
| *Lobelia holstii* Engl. | Lobeliaceae | | H | 306 |
| *Lobelia neumannii* T.C.E. Fries | Lobeliaceae | | H | 304 |
| *Lobularia spp.1* | Lichen | | E | 348 |
| *Lobularia spp.2* | Lichen | | E | 349 |
| ***Lotus corniculatus* L.** | Fabaceae | Toshimbata, Qeticha | **H** | **187** |
| *Lotus goetzei* Harms | Fabaceae | Garasita | H | 185 |
| *Lotus schoelleri* Schweinf. | Fabaceae | Garasita | H | 275 |
| ***Malva verticillata* L.** | **Malvaceae** | Lita | **S** | **136** |
| *Maytenus obscura* (A. Rich.) Cuf. | Celastraceae | Kombolcha | S | 208 |
| *Mentha aquatica* L. | Lamiaceae | Buchaa, Duqusha (Or.), Yemich medihanit (Amh) | H | 327 |
| *Merendera schimperiana* Hochst. | Colchicaceae | | H | 313 |
| *Microchloa kunthii* Desv. | Poaceae | Marga Dima | H | 352 |
| *Microlepia speluncae* (L.) Moore | Dennstaediaceae | Kumbuta | H | 343 |
| *Mikaniopsis clematoides* (Sch. Bip. ex A. Rich.) Milne-Redh. | Asteraceae | Kumbuta | Li | 207 |
| *Minuartia filifolia* (Forssk.) Mattf. | Caryophyllaceae | Qerqora, Qerqora gale | H | 244 |
| *Moraea schimperi* (Hochst.) Pic.-Serm. | Iridaceae | Loga | **S** | 318 |
| *Myrsine melanophoeos* (L.) R. Br. | Myrsinaceae | Tuullaa | T | 250 |
| *Nepeta azurea* R.Br. ex Benth. | Lamiaceae | | S | 329 |
| *Oldenlandia herbacea* (L.) Roxb. | Rubiaceae | Omachessaa | H | 228 |
| ***Oldenlandia monanthos* (A. Rich.) Hiern** | **Rubiaceae** | Marga Dima | **H** | **229** |

**Appendix XI continued**

| | | | | |
|---|---|---|---|---|
| *Oxalis anthelmintica* A. Rich. | Oxalidaceae | Soqido | H | 260 |
| *Oxalis obliquifolia* A. Rich. | Oxalidaceae | | H | 263 |
| *Oxalis radicosa* A. Rich. | Oxalidaceae | | H | 261 |
| *Oxystelma bornouense* R. Br. | Asclepiadaceae | Xxorso, Anano | H(clim) | 201 |
| *Pelargonium glechomoides* Hochst. | Geraniaceae | | H | 189 |
| *Pennisetum humile* Hochst. ex A. Rich. | Poaceae | | H | 369 |
| *Pennisetum sphacelatum* (Nees) Th. Dur. & Schinz | Poaceae | Wixxa | H | 380 |
| *Pentarrhinum balense* (Liede) Liede | Asclepiadaceae | | H(clim) | 203 |
| *Phalaris arundinacea* L. | Poaceae | | H | 376 |
| ***Pittosporum viridiflorum* Sims** | **Pittosporaceae** | Ara | **T** | **249** |
| ***Plantago africana* Verdc.** | **Plantaginaceae** | Qinxaa, Baallee | **H** | **297** |
| *Plectocephalus varians (*A. Rich.) C. Jeff. ex Cuf. | Asteraceae | Qumbura | H | 277 |
| *Plectranthus puberulentus* J.H. Morton | Lamiaceae | Biranbira | H | 336 |
| *Pleopeltis macrocarpa* (Willd.) Kaulf | Polypodiaceae | | E | 342 |
| *Poa schimperiana* Hochst. ex A. Rich. | Poaceae | | H | 371 |
| *Pollichia campestris* Ait. | Caryophyllaceae | | H | 235 |
| ***Polygala steudneri* Chod.** | **Polygalaceae** | Garasita | **H** | **186** |
| *Polypogon schimperianus (*Hochst. ex Steud.) Cope | Poaceae | | H | 354 |
| *Polystichum ammifolium (*Poir.) C.Chr. | Dryopteridaceae | Qumbuta, Gammanyee | H | 338 |
| *Pseudognaphalium luteo-album* (L.) Hilliard & Burtt | Asteraceae | | H | 282 |
| ***Ranunculus multifidus* Forssk.** | **Ranunculaceae** | Sherif | **H** | **267** |
| ***Ranunculus simensis* Fresen.** | **Ranunculaceae** | | **H** | **268** |
| ***Rosa abyssinica* Lindley** | **Rosaceae** | **Gora** | **S** | **142** |
| *Rubus apetalus* Poir. | Rosaceae | | S | 262 |
| *Rubus erlangeri* Engl. | Rosaceae | Hato | S | 202 |
| ***Rubus steudnerii* Schwienf.** | **Rosaceae** | Gora | **S** | **14** |
| ***Rumex abyssinicus* Jacq.** | **Polygonaceae** | Shabee Haga | **H** | **269** |
| ***Rumex nepalensis* Spreng.** | **Polygonaceae** | Shabee | **H** | **29** |
| *Rytidosperma subulata (*A. Rich.) Cope | Poaceae | Marga Hori, Qecha | H | 359 |
| ***Salvia merjiamie* Forssk.** | **Lamiaceae** | Okotu | **S** | **330** |
| ***Salvia nilotica* Jacq.** | **Lamiaceae** | Okotu | **H** | **332** |
| *Sanicula elata* Buch. -Ham. ex D.Don | Apiaceae | Galee Simbira, Sidissa | H | 270 |
| *Satureja biflora (*Don.) Briq. | Lamiaceae | Tosign | H | 335 |
| *Satureja kilimandeschari* (Gurke) Hedberg | Lamiaceae | | H | 324 |
| ***Satureja pseudosimensis* Brenan** | **Lamiaceae** | Toshimbata | **H** | **325** |
| ***Satureja punctuta (*Benth.) Briq.** | **Lamiaceae** | | **H** | **326** |
| *Satureja simensis (*Benth.) Briq. | Lamiaceae | Toshimbata | H | 328 |
| *Scabiosa columbaria* L. | Dipsacaceae | Anamuro | H | 222 |
| ***Sedum baleensis* M. Gilbert** | **Crassulaceae** | Qorso gogorii | **H** | **274** |
| *Senecio ochrocarpus* Oliv. & Hiern | Asteraceae | Agadena | H | 278 |
| ***Senecio ragazzii* Chiov.** | **Asteraceae** | Agadena | **H** | **221** |

**Appendix XI continued**

| | | | | |
|---|---|---|---|---|
| ***Silene macrosolen* A. Rich.** | **Caryophyllaceae** | Wagarti | **H** | **248** |
| ***Solanum anguivi* Lam.** | **Solanaceae** | Mujule Worabessa | **S** | **69** |
| *Solanum benderianum* Schimper ex Dammer | Solanaceae | | S | 322 |
| *Solanum garae* Friis | Solanaceae | | S | 321 |
| ***Solanum marginatum* L.f.** | **Solanaceae** | Hidii | **S** | **68** |
| ***Sonchus bipontini* Aschers** | **Asteraceae** | Kartassa, Maaracaa | **H(clim)** | **288** |
| *Sporobolus africanus* (Poir.) Robyns & Tournay | Poaceae | Marga Hilensa (Or.), Mure (Amha) | H | 350 |
| *Spp. A* | Poaceae | | H | 390 |
| *Spp. B* | Poaceae | | H | 391 |
| *Spp. C* | Poaceae | Dargu | H | 392 |
| *Spp. D* | | | H | 395 |
| *Spp. E* | Boraginaceae | | H | 396 |
| *Spp. F* | | Qerqora | Li | 397 |
| *Spp. G* | Asteraceae ? | Marecha | H | 401 |
| *Spp. H* | Asteraceae ? | Haxawwi Balaa | H | 402 |
| *Stachys alpigena* T.C.E.Fries | Lamiaceae | Qorsa alati, Merga simbira, Qoricha gemogi, Dara simbira | H | 334 |
| *Stellaria media (*L.) Vill. | Caryophyllaceae | Mosiye (Amh) | H | 226 |
| *Stellaria sennii* Chiov. | Caryophyllaceae | Duqushu, Dinbiba | H | 239 |
| ***Thalictrum rhynchocarpum* Dill. & A. Rich.** | **Ranunculaceae** | Sire Bizu (Amh) | **H** | **254** |
| ***Thymus schimperi* Ronniger** | **Lamiaceae** | Tossigne | **H** | **331** |
| *Trifolium burchellianum* Ser. | Fabaceae | | H | 183 |
| *Trifolium substerraneum* L. | Fabaceae | Sidissa | H | 184 |
| *Trifolium cryptopodium* Steud. ex A. Rich. | Fabaceae | | H | 194 |
| *Trifolium rueppellianum* Fresen. | Fabaceae | Sidissa (Maget) | H | 182 |
| *Trifolium semipilosum* Fresen. | Fabaceae | Sidissa | H | 181 |
| *Trifolium simense* Fresen. | Fabaceae | | H | 247 |
| *Uebelinia abyssinica* Hochst. | Caryophyllaceae | Balee | H | 240 |
| *Ursinia nana* DC. | Asteraceae | Qinxxa | H | 219 |
| *Urtica simensis* Steudel | Urticaceae | Dobii | H | 252 |
| *Usnea africana* Motyka | Lichen | Ye' Abuye tsim | E | 344 |
| *Verbascum benthamianum* Hepper | Scrophulariaceae | Rafuu Mada | H | 323 |
| *Vicia sativa* L. | Fabaceae | | H | 197 |
| *Viola abyssinica* Oliv. | Violaceae | | H | 337 |
| ***Zehneria scabra* (Linn.f.) Sond.** | **Cucurbitaceae** | **Harola** | **H(clim** | **124** |

**Appendix XII.** Altitudinal distribution of the community types

| **Community type** | **Altitude range (m)** | **Plots included** |
|---|---|---|
| *Erica arborea* dominating type | 3133 - 3408 | 33, 37, 56, 57, 58, 59, 62, 63, 64, 65, 66 |
| *Juniperus procera – Hypericum revolutum – Myrsine melanophloes – Hagenia abyssinica* type | 3063 - 3373 | 1, 3, 4, 5, 7, 8, 9, 10, 12, 13, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 34, 38, 40, 47, 49, 50, 51, 52, 53, 61 |
| *Hypericum revolutum – Myrsine melanophloeos – Hagenia abyssinica – Solanum marginatum* type | 3092 - 3347 | 2, 6, 11, 14, 15, 17, 30, 35, 36, 39, 41, 42, 43, 44, 45, 46, 48, 54, 55, 60, 67, 68 |
| *Artemisia afra – Nepeta azurea* type | 3015 - 3052 | 69, 70, 71, 72, 73, 74, 76, 81, 86, 87, 88, 89 |
| *Ferula communis* community type | 3008 - 3061 | 59, 75, 78, 79, 80, 82, 83, 84, 85, 90 |

**Appendix XIII**. Percent frequency (**% F**) of medicinal plant species at Adelle and Boditi forests and Gaysay grassland

| **Medicinal Plant Species** | **Adelle** (32plots) | | **Boditi** (36plots) | | **Gaysay** (22plots) | |
|---|---|---|---|---|---|---|
| | **No. of plots present in** | **% F** | **No. of plots present in** | **% F** | **No. of plots present in** | **% F** |
| *Achyranthes aspera* L. | 17 | 53.13 | 14 | 38.89 | 0 | 0 |
| *Agrocharis melanantha* Hochst. | 14 | 43.75 | 24 | 66.67 | 15 | 68.18 |
| *Alchemilla abyssinica* Fresen. | 14 | 43.75 | 29 | 80.56 | 17 | 77.27 |
| *Anthemis tigreensis* J. Gay ex A. Rich. | 0 | 0 | 2 | 5.56 | 0 | 0 |
| *Arisaema schimperianum* Schott | 0 | 0 | 1 | 2.78 | 0 | 0 |
| *Artemisia abyssinica* Sch. Bip. | 1 | 3.13 | 0 | 0 | 1 | 4.55 |
| *Artemisia afra* Jacq. ex Willd. | 1 | 3.13 | 1 | 2.78 | 15 | 68.18 |
| *Asparagus africanus* Lam. | 3 | 9.38 | 1 | 2.78 | 2 | 9.09 |
| *Asparagus setaceus* (Kunth) Jessap | 1 | 3.13 | 0 | 0 | 1 | 4.55 |
| *Asplenium aethiopicum* (Burm.f.) Bech. | 2 | 6.25 | 1 | 2.78 | 0 | 0 |
| *Asplenium monanthes* L. | 3 | 9.38 | 1 | 2.78 | 0 | 0 |
| *Bidens macroptera* (Sch. Bip. ex Chiov.) Mesfin | 0 | 0 | 1 | 2.78 | 0 | 0 |
| *Carduus nyassanus* (S. Moore) R.E. Fries | 6 | 18.75 | 6 | 16.67 | 11 | 50 |
| *Cheilanthes farinosa* (Forssk.) Kaulf. | 0 | 0 | 1 | 2.78 | 0 | 0 |
| *Clematis hirsuta* Perr. & Guill. | 4 | 12.5 | 1 | 2.78 | 0 | 0 |
| *Crepis rueppellii* Sch. Bip. | 0 | 0 | 1 | 2.78 | 0 | 0 |
| *Commelina foliacea* Chiov. | 14 | 43.75 | 0 | 0 | 1 | 4.55 |
| *Cynoglossum amplifolium* Hochst. ex DC. | 6 | 18.75 | 5 | 13.89 | 0 | 0 |
| *Cynoglossum coeruleum* Hochst. | 20 | 62.5 | 15 | 41.67 | 9 | 40.91 |
| *Discopodium eremanthum* Chiov. | 2 | 6.25 | 5 | 13.89 | 0 | 0 |
| *Euphorbia depauperata* A. Rich. | 0 | 0 | 0 | 0 | 5 | 22.73 |
| *Euphorbia dumalis* S. Carter | 15 | 46.88 | 7 | 19.44 | 1 | 4.55 |
| *Ferula communis* L. | 0 | 0 | 17 | 47.22 | 11 | 50 |
| *Galium simense* Fresen. | 16 | 50 | 23 | 63.89 | 21 | 95.45 |
| *Geranium arabicum* Forssk. | 14 | 43.75 | 23 | 63.89 | 17 | 77.27 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Hagenia abyssinica* (Bruce) J.F. Gmel. | 13 | 40.63 | 23 | 63.89 | 0 | 0 |

**Appendix XIII continued**

| | | | | | | |
|---|---|---|---|---|---|---|
| *Haplocarpha rueppellii* (Sch. Bip.) Beauv. | 3 | 9.38 | 1 | 2.78 | 1 | 4.55 |
| *Helichrysum gofense* Cufod. | 0 | 0 | 0 | 0 | 2 | 9.09 |
| *Heracleum abyssinicum (*Boiss.) Norman | 1 | 3.13 | 0 | 0 | 7 | 31.82 |
| *Hypericum revolutum* Vahl | 29 | 90.63 | 27 | 75 | 3 | 13.64 |
| *Juniperus procera* L. | 27 | 84.38 | 13 | 36.11 | 0 | 0 |
| Kalanchoe petitiana *A. Rich.* | 4 | 12.5 | 8 | 22.22 | 0 | 0 |
| *Kniphofia foliosa* Hochst. | 22 | 68.75 | 26 | 72.22 | 11 | 50 |
| *Kniphofia isoetifolia* Steud. ex Hochst. | 0 | 0 | 0 | 0 | 3 | 13.64 |
| *Lotus corniculatus* L. | 1 | 3.125 | 1 | 2.78 | 1 | 4.55 |
| *Malva verticillata* L. | 0 | 0 | 1 | 2.78 | 5 | 22.73 |
| *Oldenlandia monanthos* (A. Rich.) Hiern | 4 | 12.5 | 11 | 30.56 | 2 | 9.09 |
| *Pittosporum viridiflorum* Sims | 1 | 3.13 | 1 | 2.78 | 0 | 0 |
| *Plantago africana* Verdc. | 5 | 15.63 | 3 | 8.33 | 1 | 4.55 |
| *Polygala steudneri* Chod. | 0 | 0 | 3 | 8.33 | 0 | 0 |
| *Ranunculus multifidus* Forssk. | 1 | 3.13 | 0 | 0 | 0 | 0 |
| *Ranunculus simensis* Fresen. | 0 | 0 | 0 | 0 | 1 | 4.55 |
| *Rosa abyssinica* Lindley | 10 | 31.25 | 3 | 8.33 | 0 | 0 |
| *Rubus steudneri* Schwienf. | 2 | 6.25 | 1 | 2.78 | 1 | 4.55 |
| *Rumex abyssinicus* Jacq. | 0 | 0 | 0 | 0 | 4 | 18.18 |
| *Rumex nepalensis* Spreng. | 13 | 40.63 | 6 | 16.67 | 12 | 54.55 |
| *Salvia meriamie* Forssk. | 7 | 21.88 | 12 | 33.33 | 5 | 22.73 |
| *Salvia nilotica* Jacq. | 11 | 34.38 | 13 | 36.11 | 0 | 0 |
| *Satureja pseudosimensis* Brenan | 4 | 12.5 | 13 | 36.11 | 1 | 4.55 |
| *Satureja punctata* (Benth.) Briq. | 0 | 0 | 5 | 13.89 | 0 | 0 |
| *Sedum baleensis* M. Gilbert | 0 | 0 | 3 | 8.33 | 1 | 4.55 |
| *Senecio ragazzii* Chiov. | 2 | 6.25 | 12 | 33.33 | 2 | 9.09 |
| *Silene macrosolen* A. Rich. | 0 | 0 | 2 | 5.56 | 0 | 0 |
| *Solanum anguivi* Lam. | 0 | 0 | 2 | 5.56 | 0 | 0 |
| *Solanum marginatum* L.f. | 17 | 53.13 | 22 | 61.11 | 0 | 0 |
| *Sonchus bipontini* Aschers | 1 | 3.13 | 3 | 8.33 | 0 | 0 |
| *Thalictrum rhynchocarpum* Dill. & A. Rich. | 0 | 0 | 0 | 0 | 1 | 4.55 |
| *Thymus schimperi* Ronniger | 7 | 21.88 | 19 | 52.78 | 1 | 4.55 |
| *Zehneria scabra* (Linn.f.) Sond. | 3 | 9.38 | 1 | 2.78 | 0 | 0 |

**Appendix XIV**. List of endemic plant species documented from BMNP and surrounding areas

**Key**: * Plants used as traditional medicine by the local people

| Scientific Name | Family | Local Name | Coll.N0 |
|---|---|---|---|
| *Alchemilla haumannii* Rothm. * | Rosaceae | Endrif | 96 |
| *Anthoxanthum aethiopicum* I. Hedberg | Poaceae | | 375 |
| *Artemisia abyssinica* Sch. Bip. ex A. Rich. * | Asteraceae | Chuqune | 50 |
| *Bidens macroptera* (Sch. Bip. ex Chiov.) Mesfin * | Asteraceae | Hade gola | 44 |
| *Chiliocephalum schimperi* Benth. | Asteraceae | Badubera, Muka Dadi | 204 |
| *Cineraria abyssinica* Sch. Bip. ex A.Rich | Asteraceae | Gori Amaa, Gale Simbira | 211 |
| *Crotalaria rosenii* (Pax) Milne-Redh. ex Polhill * | Fabaceae | Shashamane | 15 |
| *Crotalaria agatiflora* Schweinf. * | Fabaceae | Shashamane | 146 |
| *Cynoglossum coeruleum* Hochst. * | Boraginaceae | Qarccaba | 74 |
| *Erythrina brucei* Schweinf. * | Fabaceae | Walena | 140 |
| *Euphorbia dumalis* S. Carter * | Euphorbiaceae | Hanano, Guri | 20 |
| *Ficinia clandestina* (Steud.) Bock. | Cyperaceae | Chekorsa | 357 |
| *Helichrysum gofense* Cufod. * | Asteraceae | Irsha | 43 |
| *Helichrysum harenensis* Mesfin. | Asteraceae | Hoffii | 215 |
| *Impatiens rothii* Hook. f. | Balsaminaceae | | 255 |
| *Inula confertiflora* A. Rich. * | Asteraceae | Haxxawii | 39 |
| *Kniphofia foliosa* Hochst. * | Asphodelaceae | Lela | 317 |
| *Kniphofia isoetifolia* Steud. ex Hochst. * | Asphodelaceae | Lela Xixiqo | 316 |
| *Lippia adoensis* Hochst. ex. Walp. * | Verbenaceae | Sukahi | 76 |
| *Lobelia erlangeriana* Engl. | Lobeliaceae | | 308 |
| *Lobelia rhynchopetalum* Hemsl. * | Lobeliaceae | Tarura | 160 |
| *Mikaniopsis clematoides* (Sch. Bip. ex A. Rich.) Milne-Redh. | Asteraceae | Kumbuta | 207 |
| *Millettia ferruginea* (Hochst.) Bak. * | Fabaceae | Birbira | 141 |
| *Pennisetum humile* Hochst. ex A. Rich. | Poaceae | | 369 |
| *Pentarrhinum balense* (Liede) Liede | Asclepiadaceae | | 203 |
| *Plectocephalus varians* (A. Rich.) C. Jeff. ex Cuf. | Asteraceae | Qumbura | 277 |
| *Ranunculus simensis* Fresen. | Ranunculaceae | | 268 |
| *Rubus erlangeri* Engl. | Rosaceae | Hato | 202 |
| *Sedum baleensis* M. Gilbert * | Crassulaceae | Qorso gogorii | 274 |
| *Senecio myriocephalus* Sch. Bip. ex A. Rich. * | Asteraceae | Agadena | 119 |
| *Senecio ochrocarpus* Oliv. & Hiern | Asteraceae | Agadena | 278 |
| *Sideroxylon oxyacanthum* Baill. * | Sapotaceae | Faraqassa | 151 |
| *Solanecio gigas* (Vatke) C. Jeffrey * | Asteraceae | Burkitu code 10 | 3 |
| *Stachys alpigena* T.C.E. Fries | Lamiaceae | Toshimbata, Dara simbira | 334 |
| *Thymus schimperi* Ronniger * | Lamiaceae | Tossigne | 331 |
| *Urtica simensis* Steudel | Urticaceae | Dobii | 252 |

Appendix **XV**. TWINSPAN output for the vegetation data analysis

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  12 Echi macr  -----11-2-------------------------------------------  000
  44 Sene raga  1-1--111----------------------1-----------------1  000
   7 Card lept  ----------11-----------------1-------------------  0010
  43 Sene ochr  -----11-1112------1-1------------11-1------------  00110
  47 Sola gara  -------11-1--------------2----------------------  00110
  13 Eric arbo  -22222223442--1111221--2--2-1--2121--11----2----1-  00111
  17 Gnap rubr  ---------------------1---------------------------  010000
  19 Heli citr  ----------------------------------2---------------  010000
  39 Rubu apet  -----------------------------------1--------------  010000
  45 Sola angu  ---------------------------------11---------------  010000
  23 Heli quar  -------------------1-----------------------------  010001
   9 Dich inte  ----------------------------------------------2---  010010
  33 Mayt obsc  ------------------------------------------1------  010010
  38 Rosa abys  ------------------------1-------1--11-122-22211---  010010
  37 Pitt viri  ------------------------------------------2------  010011
   1 Aris schi  ----------------------------------------------------  010100
  10 Disc erem  ----------------------------------------------122  010100
  28 Kala peti  ---------------1---------------1---------12----2-2  010100
  32 Malv vert  ----------------------------------------------------  010100
  34 More schi  -----------------------------------1--------------  010100
  18 Hage abys  -----1---1-1--------21-2222222222--122122222-----2  010101
  35 Myrs mela  -------1-2-22222222222--222222222-21122212221-1222  010101
  11 Echi hoeh  ----------1----1-----------------------------------  01011
  48 Sola marg  ---11---1111---1-----22-1-2-221-222-1--2-1-1-111--  01011
  27 Juni proc  -------1122-222222222222221--2222--1122222222221-1  0110
  15 Euph duma  ------------22-1--1112----2-----1--111---111-1-1-1  0111
  26 Hype revo  -----111----2122222232-22122322222321111-224112122  0111
  29 Knip foli  ---1---11111222--1----2222222222211-1--1-------2-1  10
  41 Rubu steu  -----------1------2--------------------------------  10
  16 Feru comm  -1---112------------------2212-21-11--------------  1100
   3 Aspa afri  -------------------1----------------1-1-----------  11010
   4 Aspa seta  -------------------1------------------------------  11010
  24 Heli sple  -2-111------2221--221--1---1-----1-1-------1--2---  110110
  25 Hype pepl  -------------------1------------------------------  110110
  46 Sola bend  ----------------------------------------------2-  110111
   2 Arte afra  ----------------------1------------1--------------  111000
   5 Astr atro  ----------------------------------------------------  111001
  31 Knip isoe  ----------------------------------------------------  111001
  36 Nepe azur  ----------------------------------------------------  111001
  40 Rubu erla  ----------------------------------------------------  111001
  30 Knip insi  ----------------------------------------------------  11101
  21 Heli gofe  ----------------------------------------------------  11110
  20 Heli foet  ----------------------------------------------------  111110
  14 Euph depa  ----------------------------------------------------  111111
  22 Heli hare  ----------------------------------------------------  111111
  42 Salv merj  ----------------------------------------------------  111111

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12 Echi macr  --------2-------------------------------  000
44 Sene raga  1-----11-------11-1---------------------  000
 7 Card lept  -----1-----------------------------------  0010
43 Sene ochr  -1-------------1-1----------------------  00110
47 Sola gara  ---1-------------------------------------  00110
13 Eric arbo  -------1------1---1---------------------  00111
17 Gnap rubr  ---------------------------------------  010000
19 Heli citr  ---------------------------------------  010000
39 Rubu apet  ---------------------------------------  010000
45 Sola angu  ---------------------------------------  010000
23 Heli quar  ---------------------------------------  010001
 9 Dich inte  ---------------------------------------  010010
33 Mayt obsc  ---------------------------------------  010010
38 Rosa abys  -1-------------------------------------  010010
37 Pitt viri  -----------------1---------------------  010011
 1 Aris schi  1-------------------------------------  010100
10 Disc erem  -222-1-------------------------------  010100
28 Kala peti  22-222------------1---------------------  010100
32 Malv vert  -----1-------------------------------  010100
34 More schi  --1---------------1---------------------  010100
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35 Myrs mela  22-12-2212222--222---------------------  010101
11 Echi hoeh  -11--1--------1--1---------------------  01011
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26 Hype revo  22212-232222214321----2--22-------------  0111
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16 Feru comm  ------212--------11---------2112222222--  1100
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 4 Aspa seta  -------------------------------1---------  11010
24 Heli sple  -------------------222---2-1212212-11-1-  110110
25 Hype pepl  ------------------------------1--------1  110110
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 5 Astr atro  ----------------------1------------------  111001
31 Knip isoe  ------------------------------1-------1-  111001
36 Nepe azur  ----------------------222222222-1---11--  111001
40 Rubu erla  -------------------------1--1-----------  111001
30 Knip insi  -----1--------------1--------1----------  11101
21 Heli gofe  -------------------1-----------1-------  11110
20 Heli foet  --------------------------------11-1----  111110
14 Euph depa  ---------------------------------1----1-  111111
22 Heli hare  ----------------------------------------1--  111111
42 Salv merj  -------------------------------11-2--22-  111111

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