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Indigenous Knowledge, Major Threats and Conservation Practices of Medicinal Plants by Local Community in Heban Arsi District, Oromia, South Eastern Ethiopia

Gemedi Abdela[1] Mustefa Sultan[2]
1.Department of Ecotourism and Biodiversity Conservation, Bedelle College of Agriculture and Forestry, Mettu University, Bedelle, Ethiopia
2.Department of Forestry, College of Agriculture and Environmental Science, Arsi University, Asella, Ethiopia

Abstract
Ethnobotanical study of medicinal plants in Heban Arsi district was conducted to document medicinal plants, related indigenous knowledge, major threats and conservation practices. Ethnobotanical data were obtained using Household Survey, Key informant interview and market survey from October 12, 2014 to January 12, 2015. Data were analyzed by descriptive statistics using Microsoft Excel and Statistical Package for Social Science. Accordingly, the result of study revealed a Pearson correlation test indicated a positive and significant ($r = 0.409$, $p<0.001$ and $\alpha=0.05$) correlation between age group and the number of medicinal plant species reported by the household respondents in the study area. A Pearson correlation test indicated a negative and significant ($r = -0.299$, $p<0.001$ and $\alpha=0.05$) correlation between a level of education and the number of species reported. Agricultural expansion (41.96%) stood first as a factor threatening medicinal plants, followed by firewood collection (33.04%) and overgrazing (25.00%). To support local people effort on in-situ conservation and ex-situ conservation, further research is needed to identify population structure of medicinal plants in the study area. The average number of medicinal plants reported by males was 4.97± 3.38 whereas that of females was 2.90±1.52 (mean ±SD). There was significant difference between male and female in their knowledge of medicinal plants ($t= 2.767$ and $p< 0.009$). Lastly Indigenous knowledge should be encouraged and current threats to medicinal plants should be urgently resolved
Keywords/phrases: Threats, Conservation, Medicinal plants, Heban Arsi district

INTRODUCTION

Background and Justification

Local peoples of different localities have advanced their own specific knowledge on plant resource uses, management and conservation over a century (Cotton, 1996). Indigenous knowledge (IK) of medicinal plants (MPs) and their use by indigenous cultures are beneficial for conservation of cultural traditions and biodiversity, healthcare and drug development in the present and future day (Tamiru *et al*., 2013). Medicinal plant species are the world primary means of treating diseases and fighting infections. From ancient times, plants have been rich sources of effective and safe medicines (Russell *et al*., 2006). Globally, about 64% of the total world population is reliant on traditional medicine (TM) for their healthcare needs (Phondani *et al*., 2016). According to the World Health Organization (WHO), nearly 3.5 billion people in developing countries believe in the efficiency of plant remedies and use them regularly (WHO, 2003).

In Ethiopia, over 80% of the population was relies on TM for their healthcare (Abebe and Ayehu, 1993; Tadesse *et al*., 2005; Bekele, 2007). Plants have shown very effective medicinal value for some diseases of humans and livestock's in Ethiopia. The major reasons for demand of MPs in Ethiopia are due to the trust of communities on medicinal values of TMs, culturally associated traditions, and relatively low cost in using them (Tadesse *et al*., 2005; Bekele, 2007).

Ethiopia is a country with numerous types of climatic, topographic, soil features and agro ecological zones (Institute of Biodiversity Conservation, 2005). This makes the country to have a rich and diverse fauna and flora. But little emphasis has been given to ethnobotanical studies of medicinal plants over the earlier periods (Dawit, 2001), while there is some attempt in investigating MPs and indigenous knowledge (IK) on sustainable use and management of plant resources.

In Ethiopia, TM is faced with the problem of sustainability and continuity mainly due to the loss of taxa of MPs (Kelbessa *et al*., 1992; Asfaw, 2001). According to Abebe *et al*. (2001), the diversity of plants in Ethiopia is on the process of being eroded mainly due to human induced pressures. The study stated that habitat destruction and deforestation for commercial timber, encroachment by agriculture and other land uses have resulted in the loss of some thousand hectares of forest that harbor MPs, annually over the past several decades. In view of these, documentation of the traditional uses of MPs is an issue that is important to preserve the knowledge (Teklehaymanot and Giday, 2007).

According to Lulekal *et al*. (2008), the current loss of MPs in the country due to natural and anthropogenic factors linked with the loss of valuable indigenous knowledge (IK associated with the plants. Hence, there exists

an accelerated destruction of plant resources with loss of IK. Thus, this study attempts to identify and document MPs, indigenous knowledge, conservation practices as well as threats that hamper sustainable management and use of MPs.

Statement of the Problem

knowledge of traditional medicine has been passed orally from one generation to the next in Ethiopia where written records in this field are almost absent. The method is crude and highly conducive to distortion in an area where much accuracy is needed. Some of the lore is lost at each point of transfer or otherwise modified and thereby becomes erroneous and dangerous to use (Amare, 1976). Almost all rural community of our country uses many indigenous plants as an alternative to disease treatments until today. Many traditional remedies are remaining hidden due to movement of people, urban expansion, influence of modern medicine and exotic cultures (Mesfine and Lema, 2001).

There are natural and plantation forests in Heban Arsi district in which ethnobotanical study has not been conducted yet. The local communities living in the study area have unique cultural interactions with plants. They use many wild and domesticated species for the fulfillment of cultural and spiritual needs.

Over utilization of Medicinal Plants from the wild and the lack of knowledge about proper conservation practices result in the loss of biodiversity. In addition to this, the rapid economic growth and alteration of culture threaten the traditional lifestyle of local communities. As a result, there is a high threat for the loss of Medicinal Plants together with IK.

Studies conducted on the traditional MPs in Ethiopia are very limited (Giday *et al*., 2009) Awas (2007) noted that detailed information on Medicinal Plants of Ethiopia could only be acquired when studies are undertaken in several parts of the country where little or no botanical and ethnobotanical explorations have been conducted. Lack of documentation and under reporting of ethno medicinal plant knowledge are some of the major problems of TM in Ethiopia (Yineger and Yewhalaw, 2007; Birhanu, 2013). In the Heban Arsi district there is gap in the documentation of Medicinal Plants and related IK. Moreover, it is necessary to find solution that the new generations underutilization of Medicinal Plants through emphasizing on modern medicine.

Lack of integration of IK with modern science for continuity, and transfer of IK from elder to young generation also needs due attention.

MATERIALS AND METHODS

Description of the Study Area

Geographical location

The vast area of West Arsi Zone is located in south eastern part of Ethiopia in Oromia Regional National State. The zone shares common frontier Via North, East Shawa zone, Via East Arsi zone, Via South East Bale zone, Via South Guji zone and SNNPR.

Heban Arsi is one of the West Arsi Zone district's that is located in Oromia regional state. The district Capital "Goljota" is located at distance of 226 km from Addis Ababa along south east part of the country. The district embraces 9 rural districts and 3 urban districts which is characterized by 4 diversified agro ecological zones. The total area of the District is 35,613.6 hectares. The geographical location is between 7^0 9'N- 7^0 42'N latitude and 38^0 25' E - 38^0 54'E longitude (Fig. 1). The altitude of the study area ranges between 1500-3000 m.a.s.l (HADADO, 2016).

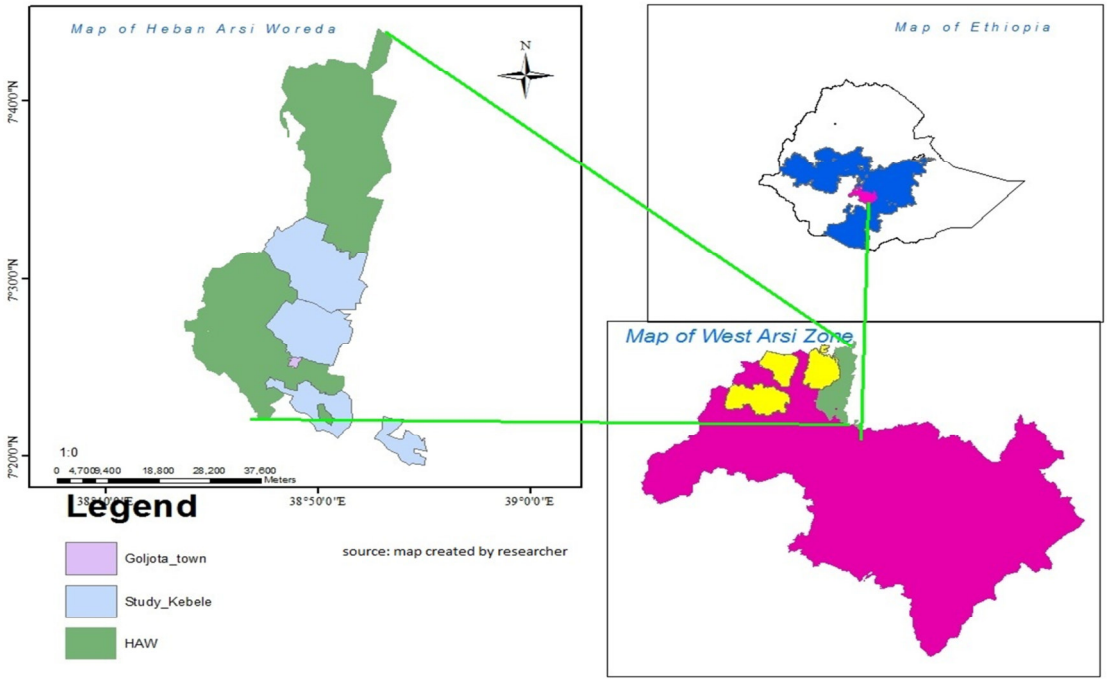

Figure1:Map of the study area

Relief, Drainage, Climate and soil

The topographic feature of Heban Arsi District is mostly flat and undulating landscape. This District is characterized mostly by major three local climatic zone such as *badda-daree (mid land)* (is the immediate zone where huge number of the population settled), *baddaa* (cool highland area) and rarely coverage places of *gammoojjii* (kola or lowland) agro-climatic zones.

These agro-ecological zones differ in altitude and in rainfall distribution. The rainfall distribution is bimodal type, with the short rainy seasons that starts from March to May while long rainy season starts from July to October.

The annual average rainfall of the study area is 825mm (ranges from 500 to 1150 mm) and the mean annual temperature is 19^{o}C (ranges from 10^{0}c to 27^{0}c) (HADADO, 2016). The dominant soil type of the District (study area) is largely derived from volcanic activities in the rift valley. The soils of the study area are characterized as Mollic Andosols (Mulugeta, 2004).

Relief: - the known mountains in the district are Kuke (1,815m), Chorora (1,455m) and Bultum (1,140m). The highest elevation is 1,815m while the lowest elevation is about 1,300m (HADADO, 2016).

Drainage: - The known rivers draining in the district are Gedemso, Guracho, Delale and Lepis also pass through the district. Lake Langano also found in the district (HADADO, 2016).

Soil type

The dominant soil type of the District is largely derived from volcanic activities in the rift valley. The soils of the study area are characterized as Mollic Andosols (Mulugeta, 2004). Principally there are two types of soils in the district. These are nitosoil "*Biyyee Diimaa*" and vertisol "*biyyee" guraacha'* (HADADO, 2016).

Nitosoil: - Found on sloppy areas as well as flat areas and less fertile as compared to vertisols. It is suitable for growing crops such as teff, wheat, maize, barley, pea, bean and sorghum. It has got a good drainage and gives good yield with fertilizers. It is moderately susceptible to erosion. Nitosoil covers about 40% of the total area of the district (HADADO, 2016).

Vertisols: - Mostly found on flat areas. It has got high percentage of organic matter. It has no as such water logging problem. It is suitable for growing crops such as teff, vetch and chick pea.

Vegetation

The physical conditions and variations in altitudes have resulted in a great diversity of climate, soil and vegetation which in turn caused the evolution of different plant species with large diversity. Before 20 years ago, the District was substantially covered with natural forests (HADADO, 2016). But today, that is only history and much of the area, including farmlands and home gardens are covered by planted forests and woodlots. The

District is covered by 19.19% forest area out of the total land area including natural forest, community forest and private forest (HADADO, 2016).

Population and Agricultural activities

Heban Arsi District has a total of 75831 people who are settled and organized under 12 Districts. From those 41103 of them are male and 34728 females (CSA, 2007). The population density of Heban Arsi District is about 213 persons per square kilometre (CSA, 2007). The major agricultural activities in the district are crop production and livestock rearing in the form of mixed farming system. Maize, wheat and barley are the most widely grown cereal crops in the district (HADADO, 2016).

Livestock and health services

In 2012, Heban Arsi district had livestock population of 165,846 heads, out of which 43,812 were cattle, 60,980 were goats, 19,102 were sheep, 982 were horses, 619 were mules and 62,143 were poultry (HADADO, 2016).
The major livestock feeds in this district are natural grazing, hay, crop residues and local beer by-products. The known livestock diseases that exist in the district are blackleg, pasteurellosis, anthrax, rabies, and lamp, external and internal parasites of cattle, internal parasites of sheep and goat, pox, anthrax and rabies of equine. Concerning the availability of veterinary services, up to the end of 2012, there was 1 clinic and 3 health post in the district. The number of health personnel in the district was 3 health assistant and 6 technicians in 2012 (HADADO, 2016).

Methods of Data Collection

Site selection and sampling design

In order to get appropriate and relevant information, the structured questionnaire was developed and translated in local language (Afan Oromo). Then structured questionnaire interview, field observation and focused group discussion was used to collect data by the investigators and field assistants on the identification of medicinal plants, current conservation status, local name of medicinal plants, factors affect the conservation status of medicinal plant species, management techniques and parts of plants mainly collected (used to treat disease). The key informants were selected using a snowball sampling method (Patton, 1990) in which known traditional healers were contacted and each asked to name another person with similar knowledge. Field visits was carried out with the traditional healers to observe and collect medicinal plant species reported. Sample specimens of each medicinal plant species was collected during the field visits.

The collected specimens were identified through flora of Ethiopia and Eritrea (Hedberg *et al*., 2006), useful trees and shrubs for Ethiopia (Azene *et al*., 1993), researcher experience and by asking other experts.

Household Survey

It is survey technics where a semi- structured interview was used with both closed and open-ended questions. So that producing relevant information from respondent's regarding demographic data, traditionally known medicinal plant, species of plants' responsible treatments, parts of plants mostly used as medicine and conservation practiced. An interview was administered by two assistant people and one researcher.

Focused group discussion (FGD)

In order to summarize household survey, Focus group discussion is essential and support to obtain valuable and detail information, because it is difficult to collect information only through household survey regarding overall information. It was held with randomly selected informants in each District through appropriate Checklists.

Market Survey

For identification and record medicinal plants values beyond medicine market survey was carried out and medicinal plants sold in the market was observed. Then the detail information was gathered from buyer and seller of traditional medicinal plants and described economic benefits that indigenous people obtained from medicinal plants in the Study area

Figure 2: Market survey in Goljota and Shopa market (photo by researchers)

Sample Size

To carry out the present study, three districts out of nine rural districts, namely Degega, Argada-Shaldo and Shopa-guenet were selected as representatives by the purposive sampling techniques based on vegetation cover, ethnic composition and Indigenous knowledge of the traditional medicinal plants. Following to the study site selection, Total households of each district around most vegetation cover area or forest was selected based on the following formula;

$$n = \frac{NP(1-p)}{(N-1)(d/Z\alpha/2)^2 + P(1-P)}$$

Where, n = number of sample size;
N= Total number of households in selected districts,
Z α/2 = from the table of standard normal distribution (Scheaffer *et al*., 2012).
α = level of significance;

P= expected proportion (80%, P=0.8, Abebe and Ayehu, 1993; Tadesse *et al*., 2005; Bekele, 2007) and d= precision (10% of p, then d= 0.08, Suresh and Chandrashekara, 2012). then calculated representative sample size were 102 households, when non-respondent 10% (10), this means out of total respondents 10% not respond to ethnobotanical information, and the actual sample size were 112. Selected key informants were 18 from selected districts. Totally 130 informant households were selected for the study.

Out of house hold, key informants were selected by the snowball method in order to identify the traditional healers (key informants) from the total selected informants (Patton, 1990). Key informant is a person who is knowledgeable about the previous and current conservation status of traditional medicinal plants of the area, well experienced and well known by local community. During the selection, 6 farmers was selected from each

districts through snowball method and individual farmer was asked to give the name of six (6) KIs depending on the above definition. Out of the mentioned thirty six (36) KIs, the top ranking 6 KIs was selected from the total informants (n=36, where $n_{=KI}$). Finally, 12 informants from each Districts and totally thirty six (36) informants were selected as a representative for the present study.

Table 1 Household population and Sample size of the study area

Districts	Total number of households	Sampled households	Sampled key informants	Total of informants
Shopa bultum	1131	45	6	51
Degega	848	34	6	40
Argada	823	33	6	39
Total	**2802**	**112**	**18**	**130**

Ethnobotanical data collection

Ethnobotanical data were collected from December 20, 2016 to February 20, 2017 on two field trips made to the site. First field trip was to collect primary ethnobotanical data. The second field trip was conducted in order to confirm ethnobotanical information and to request people participated in study to indicate the wild plants they used to treat human and livestock aliments (Martin, 1995; Cotton, 1996). Accordingly, semi-structured interviewees, focus group discussions, and guided field walks with informants were employed to obtain IK of the local peoples on health, vegetation, land forms and soil types.

Semi-structured interviews were conducted based on a checklist of questions prepared beforehand in English, and translated to local language "*Afaan Oromoo"* Semi-structured interviews were held in "*Afaan Oromoo*" directly. Information regarding local names of MPs, threats and conservation practices to MPs were recorded at the spot (Figure 3). Observations were made on the morphological features and habitats of each MP species in the guided field walk.

Three focus group discussions undertaken in three agro climatic zones with household respondents which have 6 members were conducted to understand indigenous classification of agro climatic zones, MP uses; factors threaten MP species and conservation practiced.

Figure 3: Key informants interview in study area (photo by researchers).

Plant specimen collection and identification

At the end of the interview, the reported MPs were collected from natural vegetation and home garden. Plant identification was performed both in the field, and Preliminary identification was done in the field and collected, numbered, pressed and dried. Identification of plant specimens with experts was done using identification keys and published materials such as the Flora of Ethiopia and Eritrea.

Data Analysis

Descriptive statistics

Descriptive statistics such as percentage and frequency were employed to summarize the data on MPs use and associated IK. The information gathered from local people such as medicinal value, application, the indigenous agro climatic variation of MPs and associated IK were summarized using descriptive statistics. To make summary calculation, to draw bar graphs and pie-charts MS Excel spreadsheet 2010 was used.

Statistical Package for Social Science (SPSS) Version 20 was used to summarize Pearson correlation

between age of respondents and levels of education in relation with number of species cited and compare mean t-test between male and female, and traditional healers and household respondents.

RESULTS AND DISCUSSION

Characteristics of Sampled Households in Heban Arsi District

Sample household respondents were selected from three different agro climatic zones namely, highland (29.41%), midland (30.39%), and lowland (40.19%) proportion to number of households in districts. Out of the total samples, 78.43% were male and 21.57% were female headed household respondents selected randomly from households of districts. Concerning age, 28.43% household respondents were in the age ranges (<40 years) while 71.57% household respondents were in the age category of (≥40 years) age. Most of household respondents were married (85.29%) and few were single (1.96%). Regarding to educational level majority were Illiterate (unable to read and write) (80.39%) and the rest were literate (19.6%) as shown in Table 2. Age classification was similar with Giday *et al*. (2003).

Table 2. Characteristics of household's respondents

Characteristics	Class	Frequency	Percentages (%)
Agroclimaitc zones	Highland	30	29.41
	Midland	31	30.39
	Lowland	41	40.19
Gender	Male	80	78.43
	Female	22	21.57
Ages	<40	29	28.43
	≥40	73	71.57
Marital Status	Single	2	1.96
	Married	87	85.29
	Widowed	7	6.86
	Divorced	6	5.88
Educational level	Illiterate	82	80.39
	Literate	20	19.6

Medicinal Plants in Heban Arsi District

A total of 124 MP species (Appendix 2) belonging to 117 genera and 63 families were identified in study the area. The number of MP species reported were higher than that recorded by Getaneh and Girma (2014) at Debre Libanos district which is 83. However, it is less than the studies carried out around Fiche district by Enyew *et al*. (2014) who reported 155 MP species.

This observation shows that the local peoples in Heban Arsi district have relatively extensive knowledge of medicinal plant to cure different diseases. Out of the reported MPs, 59 species were also reported by Enyew *et al*. (2014) and 37 species were reported by Getaneh and Girma (2014).

Table 2 Distributions of MP species in different family

Families	Number of MP species	Percentages (%)
Fabaceae	13	9.56
Asteraceae	11	8.09
Lamiaceae	8	5.88
Solanaceae	8	5.88
Euphorbiaceae	6	4.41
Asparagaceae	3	2.21
Brassicaceae	3	2.21
Malvaceae	3	2.21
Moraceae	3	2.21
Myrtaceae	3	2.21
Polygalaceae	3	2.21
Ranunculaceae	3	2.21
Rubiaceae	3	2.21
Rutaceae	3	2.21
Verbenaceae	3	2.21
Others 48 families	1 or 2 each	44.28

Sources: Researchers' Data

With regard to plant family, Fabaceae was the most popular to the area and it is represented by 13 species

(9.56%) and followed by Asteraceae 11 species (8.09%), Laminaceae 8 species (5.88%) and Solanaceae 8 species (5.88%) as shown in and (Appendix 2). The finding agrees with other studies in Ethiopia and other countries (Lulekal *et al*., 2008; Assefa and Abebe, 2014; Awang *et al*., 2014; Kewessa *et al*., 2015; Mekuanent *et al*., 2015; Alebie and Mehamed, 2016; Kebebew, 2016; Tugume *et al*., 2016), in which Fabaceae was the dominant.

Other than the listed MPs, local people in Heban Arsi district responds that they have cultural and spiritual related MP harvesting day, starting September first they believe that all plant species harvested in this day used for treatment of ailments. They call MPs harvested in this day as "*Qorichaa Birraa*" to mean autumn medicine especially it is reported to be used to treat febrile illness. MPs collected on this day are kept under the roof of house and used for one year. According to study by Enyew *et al*. (2013) those plants are harvested in same period and sold in market. However, in Heban Arsi district every household harvest it and reported to share between neighborhood households and not sell to the market.

Knowledge of Local People on Agro climatic Zones, Vegetation's and Landscapes

Local classification of agro climatic zones and associated indigenous knowledge

Local people in Heban Arsi district classified the agro climatic zones of the district into three major categories based on climate and elevation characteristics. These agro climatic zones were:

Baddaa /Highlands/- This agro climatic zone was found between altitude ranges of 2400masl to 2900masl in the study area. It was characterized by relatively cool and dry climate with unimodal type of rain fall where rain fed agricultural production were reported the main economic activity. The major crop varieties reported in this agro climatic zone were wheat, barley, peas, beans and potato.

*Badda Daree/*Midlands/- This agro climatic zone lay within altitudinal range of 2100maslto 2400masl in the study area. It was characterized by relatively warm and dry climate with unimodal rainfall where both rain fed agriculture and small scale irrigation based production systems were the main agricultural activities. The reported main crop varieties of this agro climatic zone were wheat, teff, beans, peas and maize.

Gammoojjii/Lowlands/- Refers to agro climatic zone lying between altitude ranges of 1600masl to 2100masl in the study area. The climate of this agro climatic zone was relatively hot and dry. Rain fed agriculture and cattle rearing were the main agricultural activities of the area. The dominant crop varieties in this zone were teff, sorghum and maize.

Local categories of vegetation and associated knowledge

Locally wild vegetation classified as: *Marga (Citaa), Hadaa, Hamoocaa, Bosona* and *Caffaa* depending on the size, growth form of the plants as well as the services they provide.

Marga (Citaa) - Grass and its associated herbaceous plants that were fed by grazing animals.

Hadaa- Small shrubby or non-shrubby plants usually in farmlands and associated habitats

Bosona- Forests with herbaceous and woody layers' understory. Such vegetation category was at decreasing rate and scattered forest available in district.

Hamoocaa- herbaceous and woody vegetation category refers to impenetrable complex plant associations usually in the wild seen around valley.

Caffaa- Refers to herbaceous and grassy types of wetland vegetation that is evergreen throughout the year as well as those lands that become swampy following rainy season.

Local categories of landscapes and associated knowledge

The local people also classified landscapes based on the topography and elevation of the land. The major classes of landscapes were: *watara* (Plain), *Sulula* (Valley), *Ilaala* (Hill), *Tulluu* or *Gaara* (Mountain), *Hallayyaa* (Cliff), *Caffaa'aa* (Swampy), *Ededa* (River banks).

Depending on the soil characteristics and fertility of land the local people categorize land as: *Diimilee* (red soil), *Cirracha* (sandy soil) and *kosii* (fertile soil).

Lands were also classified based on the services they provide as *Lafa Qonnaa* (agricultural land), *Lafa Margaa* (grazing land) *a*nd *Lafa coccodhaa* (infertile land or unproductive).

Distribution of Knowledge of Medicinal Plants among Local Peoples

Distribution of knowledge of medicinal plants corresponding to age

Medicinal plant species knowledge based on age reported on Figure 4. A Pearson correlation test indicated a positive and significant ($r = 0.409$, $p < 0.001$ and $\alpha = 0.05$) correlation between age group and the number of MP species reported by the household respondents in the study area. Similar finding was reported by (Giday *et al*., 2003; Zenebe *et al*., 2012; Kebede *et al*., 2016).

This indicates that as age increases the number of medicinal plants they reported were increased. The likely reasons behind this is as age increase the accumulate knowledge of MPs is high. Thus young generations were

not found to use MPs as their parents and grandparents.

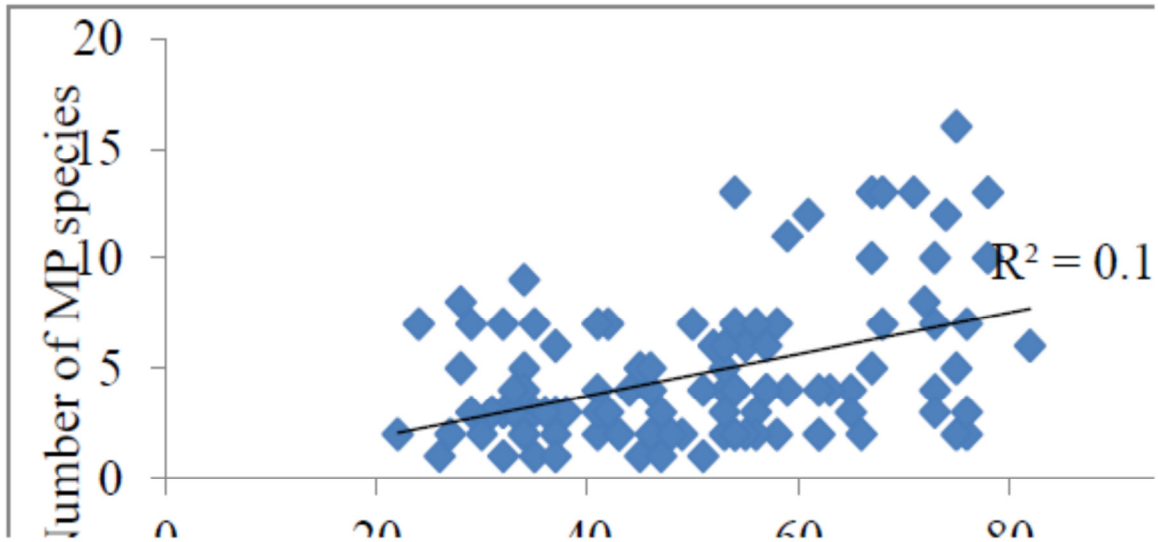

Figure 4: Distribution of MPs corresponding to age informants.

Distribution of knowledge on medicinal plants corresponding to level of education

Medicinal Plant knowledge based on level of education is reported on Figure 5. A Pearson correlation test indicated a negative and significant ($r = -0.299$, $p<0.001$ and $\alpha=0.05$) correlation between a level of education and the number of species reported by the household respondents in the study area and this finding is in line with the finding by (Zenebe *et al*., 2012; Kebede *et al*., 2016). The finding indicates that the level of education is inversely proportional to familiarity to medicinal plant. The likely reason behind that is educated people did not prefer to use traditional medicine rather they prefer to use modern medicine.

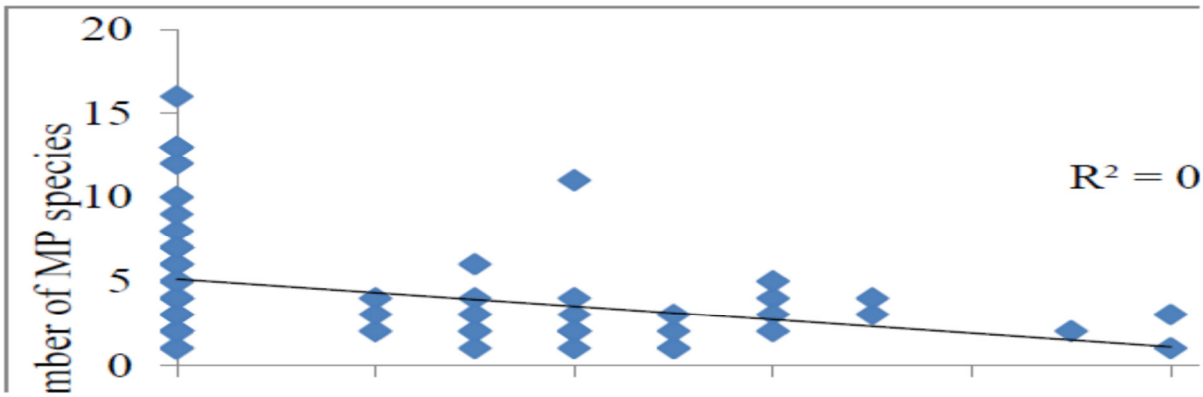

Figure 5: Distribution of MPs corresponding to level of education of respondents.

Distribution of knowledge on medicinal plants corresponding to gender and informants

As shown in Table 4, the average number of medicinal plants reported by males was 4.32± 2.94 whereas that of females was 3.19±1.67 (mean ±SD).

There was significant difference between male and female in their knowledge of medicinal plants ($t= 2.32$ and $p< 0.008$). This indicates males have more awareness about medicinal plants than female in the study area. The average number of medicinal plants reported by key informants was 10.83±3.5, while that of household respondents was 4.60±3.22 (mean ±SD). There was significant difference between number of medicinal plants reported by key informants and household respondents ($t= 6.72$ and $p< 0.001$). In the study area gender was a factor for distribution of medicinal plant knowledge, and informant category (key informants and household respondents) was a major factor connected to number of MPs reported. Key informants have greater knowledge of MPs. The finding was in line with the study conducted in Ankober district, North Showa zone by Lulekal *et al*., 2013, where high number of medicinal plant was reported by key informants than household respondents.

Table 4: Knowledge distribution between gender and informants

Variables		N	Mean of MP	t-value	df	p-value
Gender	Male	80	4.32±2.94[a]	2.32	96	0.008
	Female	22	3.19±1.67[b]			
Informant experience	Household informant	112	4.60±3.22[a]	6.67	130	0.001
	Key informant	18	10.83±3.5[b]			

Significant difference ($p<0.05$), $\alpha=0.05$, different superscript indicates mean difference

Factors Threatening Medicinal Plants

Factors threatening MPs are both anthropogenic and natural causes. Household respondents reported that natural factor such as droughts are the major challenges. The MPs were threatening by human induced factors such as overgrazing, agricultural expansion, pesticide application on farmland and introduction exotic plants (such as *Eucalyptus globulus* Plantation). Local community utilize MP species for other purposes such as firewood, construction, fencing and furniture and thus causing over utilization of MP species and affecting its survival.

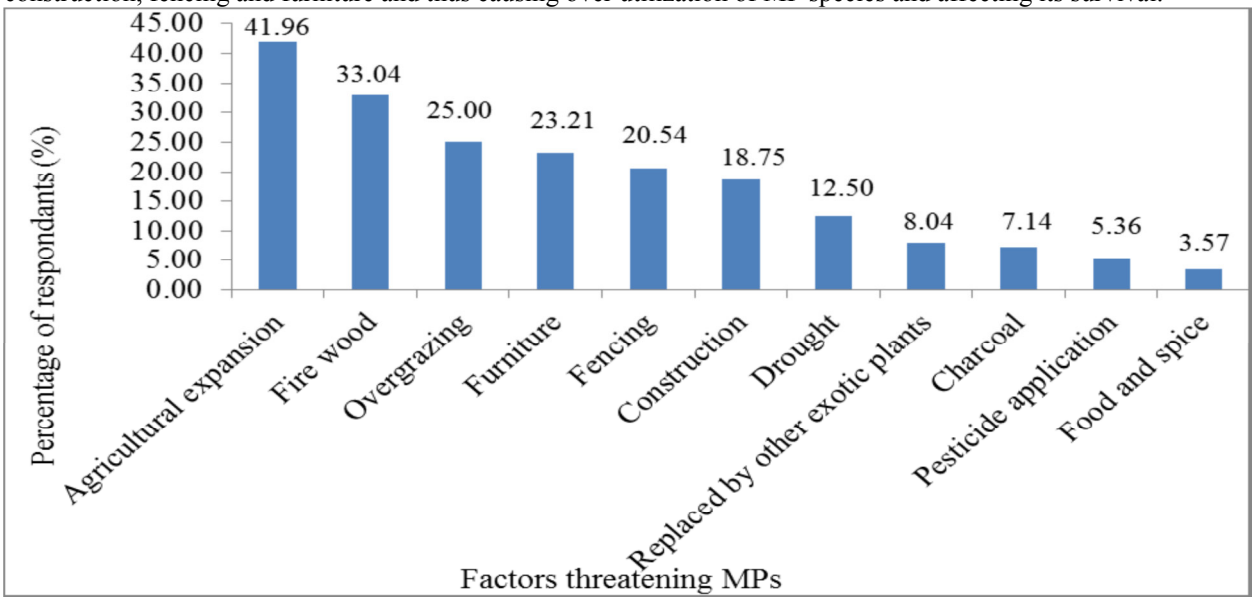

Figure 6: Factors threatening the MPs in the study area.

Based on respondents' perception agricultural expansion (41.96%) stands first to be a threatening factor of MPs in the study area, followed by firewood collection (33.04%) and overgrazing (25.00%). The least threatening factor was collection for food and spices (3.57%) as shown in Figure 14. This finding agrees with Kalu and Seid (2014); Bekele and Reddy (2015); Birhanu *et al*. (2015) that agricultural expansion was the most common threatening factors to MPs, followed by firewood and overgrazing. Agricultural expansion was found to be the highest threatening factor since there is an increasing in population and demand for food.

Conservation of Medicinal Plants

Different conservation practices were reported to be practiced by local peoples in the study area to support sustainability of MPs and associated IK. Ex-situ conservation such as plantation of MPs in home garden by collecting threatened wild MPs, seed storage for annual crop and MP scarce from the wild are common in the study area. In-situ conservation such as limiting grazing by livestock's and pruning branches of species regenerate themselves by pruning (i.e. *Afrocarpus falcatus*) was also practicing by local peoples. Currently forests are being conserved by efforts of the community and the government around the kuke forest and Bultum forest and thereby wild MPs was also conserving. Currently, no one can harvest plants from others farmer farmlands, that annual and perennial MP species grows in farmland was conserving

CONCLUSION AND RECOMMENDATIONS

Conclusion

In Heban Arsi district several plants are used for medicinal purposes. As compared to other studies much number of MPs and associated IK were reported to be used in study area for human and livestock aliments. In the study area elders have better knowledge of medicinal plant than younger, while there was negative and significant difference between level of education and number of medicinal plant species cited. There was significant difference between male and female informants in their knowledge of medicinal plants, and also there was also a

significant difference was found between number of medicinal plants reported by key informants and household respondents.

Agricultural expansion, firewood collection, construction, fencing, furniture, drought and charcoal were threatening MPs in the study area. Local peoples were practicing ex-situ and in-situ conservation to decrease degradation of MPs from the study area. Plantation of MPs, seed storage and limiting grazing by livestock were the major effort of local peoples along with the support of the government to conserve MPs.

Recommendations

- District's stakeholders should undertake conservation activities for threatened MPs as shown by *Afrocarpus falcatus* regeneration by pruning branches.
- Indigenous knowledge should be encouraged by the districts agriculture and natural resources office to store seed of annual MPs harvested from farmland in their home and conserve threatened MPs in their home gardens.
- Concerned institutes should focus on threatened MP species to encouraging gene bank and botanical garden conservation methods.
- Concerned organization should establish MP nurseries and propagate seedlings of the most-preferred MPs to farmers.
- Recognitions and intellectual property rights should be given by concerned bodies to community for continuity of IK.
- Further investigation is needed to determine multipurpose of MPs in study area.

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Appendix 1: List of Local and botanical name of human and livestock diseases

English Name	**Local Name**	**English Name**	**Local Name**
Ameba	*Dhukkubaa Ameebaa*	Internal Parasites	*Raamoo Garaa*
Anemia	*Hir'inaa Dhiigaa*	Kidney Problem	*Dhukkuba Kalee*
Anthrax	*Abbaa Sangaa*	Leeches	*Dhulandhula*
Back Pain	*Waraqi Dugdaa*	Lymphangitis	*Biichee*
Bed Bug	*Tukaana*	Men Sexual Impotency	*Bukkee*
Blackleg	*Abbaa Gorbaa*	Nasal Bleeding	*Funuuna*
Bloat	*Bokoksa Horii*	Rabies	*Saree Maraatte*
Cough	*Qufaa*	Retained Placenta	*Dil'uu ture*
Diarrhea	*Albaatii*	Scabies	*Almaz Baala Ciraa*
Donkey Wound	*Maddaa Harree*	Skin Rash	*Luqqa'uu Qaamaa*
Ear Infection	*Dhukkuba Gurraa*	Snake Bite	*Idda Bofaa*
Eczema/Tinea Corporis	*Shifee*	Spider Poison	*Hadhaa daarabaaftuu*
Erythroblasts	*Gatachaa*	Sterilized Cow	*Maseena Sa'aa*
Evil Eye	*Nyaattoo*	Stomachache	*Dhukkuba Garaa*
Evil Sprit	*Jinnii*	Sudden Disease	*Dhukkuba Tasaa*
External Parasite	*Cinii*	Swelling	*Dhullaa*
Eye Infection	*Dhukkuba Ijaa*	Swelling Leg	*Dhiita Miilaa*
Febrile Illness	*Michii*	Equis disease	*Dhukkubaa kottee*
Fire Burn	*Gubaa Ibidaa*	Tape Worm	*Heexoo*
Gastritis	*Congaara*	Tonsillitis	*Huuba Qoongoo*
Poisness Plant	*Gabissa*	Tooth Infection	*Dhukkuba Ilkaanii*
Goiter	*Quufa mormaa*	Transmitted Disease	*Dhukkuba Daddarboo*
Gonorrhea	*Coophxoo*	Urinating Problem	Fincaan Dadhabuu
Headache	*Bowwoo*	Vomiting	*Gad Deebisuu*
Hepatitis	*Waan Sinbiraa*	Worms	*Raammoo*
Hemorrhoids	*Kintaarotii*	Wound	*Madaa*

Appendix 2: List of Families and number of MP species represent.

Families	Number of MP species	Percentages (%)	Families	Number of MP species	Percentages (%)
Fabaceae	13	9.56	Araliaceae	1	0.74
Asteraceae	11	8.09	Balanitaceae	1	0.74
Lamiaceae	8	5.88	Balsaminaceae	1	0.74
Solanaceae	8	5.88	Bignoniaceae	1	0.74
Euphorbiaceae	6	4.41	Boraginaceae	1	0.74
Asparagaceae	3	2.21	Casuarinaceae	1	0.74
Brassicaceae	3	2.21	Commelinaceae	1	0.74
Malvaceae	3	2.21	Convolvulaceae	1	0.74
Moraceae	3	2.21	Crassulaceae	1	0.74
Myrtaceae	3	2.21	Cupressaceae	1	0.74
Polygalaceae	3	2.21	Liliaceae	1	0.74
Ranunculaceae	3	2.21	Linaceae	1	0.74
Rubiaceae	3	2.21	Loganiaceae	1	0.74
Rutaceae	3	2.21	Maesaceae	1	0.74
Verbenaceae	3	2.21	Meliaceae	1	0.74
Acanthaceae	2	1.47	Menispermaceae	1	0.74
Apiaceae	2	1.47	Myricaceae	1	0.74
Apocynaceae	2	1.47	Myrsinaceae	1	0.74
Asclepiadaceae	2	1.47	Pedaliaceae	1	0.74
Capparidaceae	2	1.47	Phytolaccaceae	1	0.74
Celastraceae	2	1.47	Plumbaginaceae	1	0.74
Cucurbitaceae	2	1.47	Podocarpaceae	1	0.74
Dracaenaceae	2	1.47	Rhamnaceae	1	0.74
Olacaceae	2	1.47	Salicaceae	1	0.74
Poaceae	2	1.47	Salvadoraceae	1	0.74
Polygonaceae	2	1.47	Santalaceae	1	0.74
Rosaceae	2	1.47	Sapindaceae	1	0.74
Aizoaceae	1	0.74	Scrophulariaceae	1	0.74
Alliaceae	1	0.74	Simaroubaceae	1	0.74
Aloaceae	1	0.74	Urticaceae	1	0.74
Amaranthaceae	1	0.74	Zingiberaceae	1	0.74

Sources: Researcher's data

Appendix 3: List of MPs in the study area; with Botanical name, family, local name, habit, habitat, condition of preparation, disease treated, parts used, mode of preparations, and route of administration.

Note: GF(Growth form) (H=herb, T=tree, S=shrub, C=climber, L=liana); H(habitat),(W=wild, HG=Homegarden, B=both wild and home garden, FL=farmland), part used (WP=whole part, StSh=Stem and shrub), StLa (stem and latex), StBa (stem and bark), St (stem), Sh (shoot), SeLe(seed and leaf), Se(seed), SaSt (sap and stem), Sa(sap),RShSt(root,shoot and stem), RSeLa(root,seed and latex), RLeSh(root,leaf and shoot), RLeSe(root, leaf and seed), RLeLa(root, leaf and latex), RLeBa(root,leaf and bark), RLe(root andleaf), RBaStSh(root,bark,stem and shoot), R(root), LeStBa(leaf, stem and bark), LeSt(leaf and stem), LeSh(leaf and shoot), LeSe(leaf and seed), Le(leaf), La(latex),FSt(fruit and stem), FSe(fruit and stem), FSa(fruit and sap), FR(fruit and root), F(fruit), BLe(bulb and leaf),Ba(bark) and B(bulb).Route;D(dermal), DEN(dermal,eye and nasal), DENO(dermal,eye,nasal and oral), DN(dermal and nasal), DNO(dermal,nasal and oral), DNOp(dermal,nasal and optical),DO(dermal and oral), DOOp(dermal,oral and optical), DOp(dermal and optical), DOT(dermal, oral and tooth), DT(dermal and tooth), E(eye), Ea(ear), EaO(ear and optical), ENO(eye,nasal and oral), EO(ear and oral),N(nasal), ON(oral and nasal), NOp(nasal and optical), NOpO(nasal,optical and oral), O(oral),Op(optical), OpO(optical and oral), OT(oral and tooth)and(tooth);Mode of preparation: Ch(chewed),ChP(chewed and pounded),ChPU(chewed, pounded and unprocessed), Cho(chopped), ChoU(chopped and unprocessed),Co(cooked),C(crushed), CCh (crushed and chewed),CH(crushed and heated), CP(crushed and pounded), CPo(crushed and powdered),CHP(crushed, heated and pounded), CHPo (crushed, heated and powdered), CPPo (crushed, pounded and powdered), H(heated), HU(heated and unprocessed), P(pounded), PPo(pounded and powdered), PU(pounded and unprocessed), Po(powdered),R(roasted), S(squeezed), U(unprocessed).

Botanical name	Family	**Local name**	**GF**	**H**	**Disease Treated**	**part used**	**mode**	**condition**	**Route**	**use**
Acacia abyssinica Hochst. ex Benth	Fabaceae	Laaftoo	T	W	Goiter	Le	C	Fr	D	Hu
Acacia gerrardii Benth	Fabaceae	Doddota	T	W	Wound	Ba	CCh	Fr	DT	HuLi
					Tooth Infection					
					Hepatitis					
Acanthus pubescens (Oliv.) Engl	Acanthaceae	Shokoruu	S	W	Eczema/Tinea Corporis	Sa	C	Fr	D	Hu
Achyranthes aspera L.	Amaranthaceae	Darguu	H	B	Sudden Disease	RLe	PC	Fr	OT	Hu
					Tooth Infection					
Acokanthera schimperi (A.DC.) Schweinf.	Apocynaceae	Qaraaruu	T	W	Stomachache	RBaStSh	CPo	Fr/Dr	NOpO	HuLi
					Evil Eye					
					Febrile Illness					
					Hepatitis					
Aframomum corrorima (Braun) Jansen	Zingiberaceae	Kororima	H	HG	Stomachache	Se	Ch	Fr	O	Hu
Afrocarpus falcatus (Thunb.) Mirb.	Podocarpaceae	Birbirsaa	T	W	Tooth Infection	RSeLa	ChPU	Fr	DOT	HuLi
					Leeches					
					Evil Sprit					
					Kidney Problem					
Allium sativum L.	Alliaceae	Shunkurtii Adii	H	HG	Eye Infection	BLe	CHP	Fr/Dr	DENO	HuLi
					Snake Bite					
					Blackleg					
					Evil Eye					
					Swelling Leg					
					Febrile Illness					
					Stomachache					
Aloe debrana Christian	Aloaceace	Argissa	H	W	Wound	R	C	Fr	D	Hu
Aloe vera (L.) Burm.f.	Laliaceae	Argissa	H	W	Wound	R	P	Fr	D	Hu
Artemisia abyssinica Sch.Bip ex A. Rich.	Asteracecae	Ariitii Jaarsaa	H	B	Blackleg	Le	C	Fr	O	Li
*Asparagus flagellaris (*Kunth) Baker	Asparagaceae	Saruyee	S	W	Rabies	R	P	Dr	O	Hu
Asparagus racemosus Willd.	Asparagaceae	Saritii	C	B	Hepatitis	R	CPo	Dr	O	HuLi
Balanites aegyptiaca (L.) Del.	Balanitaceae	Badannoo	T		Stomachache	Ba	Po	Dr	O	Hu
Brassica carinata A. Br.	Brassicaceae	Gomozara	H	FL	Febrile Illness	Se	P	Dr	N	Hu
Brassica nigra (L.) Koch	Brassicaceae	Sanafichaa	H	FL	Febrile Illness	Se	Po	Dr	O	HuLi
					Blackleg					
Brucea antidysenterica J.F. Mill.	Simaroubaceae	Haxaawii	T	W	Stomachache	SeLe	PPo	Fr/Dr	DNO	HuLi
					Evil Eye					
					Hepatitis					
					Scabies					
Buddleja polystachya Fresen.	Loganiaceae	Adaadii	T	B	Eye Infection	Le	CH	Fr	DEN	HuLi
					Blotting					
					Swelling Leg					
Cadaba farinosa Forssk.	Capparidaceaee	Qalqalchaa	T	W	Snake Bite	R	R	Fr	NO	HuLi
Caesalpinia decapetala (Roth) Alston	Fabaceae	Harangama	T	W	Evil Eye	R	C	Dr	Op	Hu
Calpurnia aurea (Ait.) Benth.	Fabaceae	Ceekataa	T	W	Snake Bite	SeLe	Po	Fr/Dr	DO	HuLi
					Rabies					
					External Parasite					
Capparis tomentosa Lam.	Capparidaceae`	Gumare/haranga	S	W	Sudden Disease	R	Po	Dr	O	Hu
Capsicum annuum L.	Solanaceae	Qaaraa	H	HG	Leeches	FSe	PPo	Dr	O	Li
					Blackleg					
					Erythroblasts					
Carissa spinarum L.	Apocynaceae	Agamsaa	S	W	Evil Eye	R	CP	Dr	NOpO	Hu
					Febrile Illness					
Catha edulis (Vahl) Forssk. ex Endl.	Celastraceae	Jimaa	S	HG	Lymphagities	RLe	P	Fr	DNOp	HuLi
					Evil Eye					
Citrus limon L.	Rutaceae	Loomii	T	HG	Stomachache	F	P	Fr	O	Hu
Clematis simensis Fresen.	Ranunculaceae	Fiitii	C	B	Hepatitis	R	CPo	Fr	DO	HuLi
					Gonorrhea					

Botanical name	Family	**Local name**	**GF**	**H**	**Disease Treated**	**part used**	**mode**	**condition**	**Route**	**use**
Clerodendrum myricoides (Hochst.) Vatke	Verbanaceae	Misirichii	S	W	Hemorrhoids	St	Po	Dr	D	Hu
Coffea arabica L.	Rubiaceae	Buna	T	HG	Cough	Se	Po	Dr	O	Hu
					Stomachache					
					Febrile Illness					
Commelina benghalensis L.	Commelinaceae	Anqura	H	W	Snake Bite	r	R	Fr	NO	HuLi
Cordia africana Lam.	Boraginaceae	Wadeessaa	T	W	Evil Eye	Le	CP	Fr	N	Hu
					Febrile Illness					
Crotalaria incana L.	Fabaceae	Qincibirii	H	W	Eye Infection	R	C	Fr	E	Li
Crotalaria laburnifolia L.	Fabaceae	Misira hantuta	H	W	Hepatitis	Le	Po	Dr	D	HuLi
					Hemorrhoids					
Croton macrostachyus Del.	Euphorbiaceae	Bakanisaa	T	W	Febrile Illness	Le	CHP	Fr/Dr	DNO	HuLi
					Blackleg					
					Evil Eye					
					Swelling Leg					
					Stomachache					
					Stomachache					
					Swelling					
					Blackleg					
Cucumis pustulatus Naud. ex Hook.f.	Cucurbitaceae	Araresaa	C	B	Febrile Illness	Le	CPo	Dr	EaO	Hu
					Ear Infection					
Datura stramonium L.	Solanaceae	Banjii	H	B	Fire Burn	LeSe	HC	Fr	DN	Hu
					Wound					
					Teeth Infection					
Discopodium penninervium Hochst.	Solanaceae	Amararo/chac hunga	T	W	Evil Sprit	FR	CP	Fr	DNO	Hu
					Gonorrhea					
					Evil Eye					
Dodonea angustifolia L.f.	Sapindaceae	Itachaa	T	W	Tonsillitis	R	CCh	Fr	DO	Hu
					Hepatitis					
Dracaena afromontana Mildbr.	Dracaenaceae	Merqoo	S	B	Stomachache	Le	C	Fr	O	Hu
Echinops hispidus Fresen.	Asteraceae	Kabirichoo	H	W	Febrile Illness	St	Po	Dr	N	Hu
Echinops kebericho Mesfin	Asteraceae	Korabicho	H	W	Febrile Illness	FSt	Cho	Fr/Dr	N	HuLi
					Equis disease					
Ekebergia capensis Sparrm.	Meliaceae	Onoonuu	T	W	Snake Bite	StBa	Po	Dr	D	HuLi
Eleusine jaegeri Pilg.	Poaceae	Coqorsa	H	B	Snake Bite	Wp	P	Fr	DO	HuLi
Embelia schimperi Vatke	Ulenaceae	qaanquu	T	W	Eye Infection	RLeSe	CPPo	Fr/Dr	EO	HuLi
					Blackleg					
					Anthrax					
					Tape Worm					
Erythrina melanacantha (Taub.) ex Harms	Fabaceae	Waleenaa	T	W	Eye Infection	R	P	Fr	E	Li
Eucalyptus globulus Labill.	Myrtaceae	Baargamoo Adii	T	HG	Blackleg	Le	CPPo	Fr	NO	HuLi
					Erythroblasts					
					Febrile Illness					
					Stomachache					
					Cough					
Euclea racemosa Murr.	Lamiaceae	Mi'eessa	T	W	Leeches	R	Po	Dr	N	HuLi
Euphorbia abyssinica Gmel.	Euphorbiaceae	Adaamii	T	B	Hemorrhoid	SaSt	ChoU	Fr	DOOp	HuLi
					Hepatitis					
					Skin Rash					
					Transmitted Disease					
Euphorbia candelabrum Kostshy	Euphorbiaceae	Adaamii nyaatamu	T	B	Hemorrhoid	FSa	Cho	Fr	DO	HuLi
					Hepatitis					
					Gastritis					
Euphorbia tirucalli L.	Euphorbiaceae	Aanannoo	T	W	Donkey Wound	Sh	Po	Fr	D	Li
Ficus carica L.	Moraceae	Logo	T	W	Hemorrhoid	La	U	Fr	D	Hu
Ficus palmata Forssk.	Moraceae	Este belas	T	W	Evil Sprit	R	P	Dr	D	Hu
Ficus vasta Forssk.	Moraceae	Qilxuu	T	W	Back Pain	RShSt	PPo	Fr/Dr	DO	HuLi
					Hepatitis					
					Headache					
Foeniculum vulgare Mill.	Apiaceae	Isilaalee	H	W	Urinating Problem	Le	Po	Fr	O	Hu

Botanical name	Family	**Local name**	**GF**	**H**	**Disease Treated**	**part used**	**mode**	**condition**	**Route**	**use**
Galiniera saxifrage (Hochst.) Bridson	Rubiaceae	Buunitii	T	W	Hepatitis	Sh	Po	Fr	O	HuLi
Glinus lotoides L.	Aizoaceae	Wagartii	H	W	Febrile Illness	R	C	Fr	N	Hu
Gomphocarpus purpurascens A. Rich.	Asclepiadaceae	Xifrandoo	T	W	Eczema/Tinea Corporis	Le	H	Dr	D	Hu
Guizotia abyssinica (L.f.) Cass.	Asteraceae	Nuugii	H	FL	Leeches	Se	Po	Dr	N	Li
Heteromorpha arborescens (Spreng.) Cham. and Schltdl. var. abyssinica	Apiaceae	Ulee Warabeessa	S	W	Evil Eye	R	P	Dr	NOp	Hu
Hibiscus flavifolius Ulbr.	Malvaceae	Inciinii	S	W	Eye Infection	R	P	Dr	E	Hu
Hordeum vulgare L.	Poaceae	Garbuu Adii	H	FL	Gastritis	Se	C	Dr	O	Hu
*Hymenodictyon floribundum (*Hochst. & Steud.) Robinson	Rubiaceae	Takkaan Dhaha	T	B	Hemorrhoid	RLeLa	CP	Fr/Dr	DNO	HuLi
					Hepatitis					
					Wound					
					Stomachache					
					Evil Eye					
Impatiens rothii Hook. f.	Balsaminaceae	Buurii	H	W	Stomach Problem	B	P	Fr	O	Hu
Indigofera tinctoria L.	Fabaceae	Dingatee/Alangee	S	W	Stomachache	R	Cho	Fr	NO	HuLi
					Febrile Illness					
					Blackleg					
Ipomoea cicatricosa Bak.	Convolvulaceae	Dhamahee	T	W	Febrile Illness	R	P	Dr	N	Hu
Juniperus procera Hochst. ex Endl.	Cuppressaceae	Hindheessa	T	B	Wound	Le	C	Fr	D	Hu
Justicia schimperiana (Hochst. ex Nees) T. Anders.	Acanthaceae	dhummugaa	S	B	Febrile Illness	RLe	CHP	Fr/Dr	DENO	Hu
					Hemorrhoid					
					Hepatitis					
					Stomachache					
					Evil Eye					
					Scabies					
					Eye Infection					
					Swelling Leg					
Kalanchoe petitiana A. Rich.	Crassulaceae	Bosoqee	H	W	Wound	Le	H	Fr	D	Hu
Lamium album L.	Lamiaceae	Qoricha madda	H	W	Wound	Le	C	Fr	D	Hu
Lepidium sativum L.	Brassicaceae	Feexoo	H	FL	Stomachache	Se	PPo	Dr	NO	HuLi
					Febrile Illness					
					Blackleg					
					Retained Placenta					
Leucas martinicensis (Jacq.) R. Br.	Lamiaceae	Bokoluu	H	B	Stomachache	RLe	P	Fr	O	HuLi
					Erythroblasts					
Linum usitatissimum L.	Linaceae	Talbaa	H	FL	Gastritis	Se	Po	Dr	O	HuLi
					Cough					
					Sterilized Cow					
					Retained Placenta					
Lippia adoensis Hochst. ex Walp.	Verbanaceae	sukaayii	H	W	Back Pain	R	P	Fr	O	Hu
Maesa lanceolata Forssk.	Maesaceae	Abbayyii	T	W	Scabies	Se	P	Dr	D	Hu
Malva verticillata L.	Malvaceae	Liitii	H	B	Stomachache	Le	Po	Fr	O	HuLi
					Sterilized Cow					
Maytenus arbutifolia (A. Rich.) Wilczek	Celastraceae	Kombolchaa	T	W	Vomiting	St	Po	Dr	O	Hu
Millettia ferruginea (Hochst.) Bak.	Fabaceae	Birbiraa	T	W	Skin Rash	F	C	Fr	D	HuLi
Myrica salicifolia A. Rich.	Myricaceae	Shinat	T	W	Headache	Ba	Ch	Fr	O	HuLi
Nicotiana tabacum L.	Solanaceae	Tamboo	H	FL	Blotting	Le	CPPo	Fr	DN	HuLi
					Scabies					
					Nasal Bleeding					
					Leeches					
Nigella sativa L.	Ranunculaceae	Maxafata Guraacha	H	HG	Stomachache	Se	Ch	Dr	O	Hu
Ocimum lamiifolium Hochst. ex. Benth.	Lamiaceae	Damakasee	H	W	Sudden Disease	RLe	CHP	Fr/Dr	NO	HuLi
					Cough					

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					Febrile Illness					
					Evil Eye					
					Eye Infection					
					Equis Disease					
					Blackleg					
					Stomachache					
Olea europaea L. subsp. cuspidata	Oliaceae	Ejersaa	T	B	Hemorrhoid	StLa	HU	Fr/Dr	DO	HuLi
					Spider Poison					
Osyris quadripartita Decn.	Santalaceae	Waatoo	T	W	Tonsillitis	RLe	C	Fr	OpO	Hu
					Evil Eye					
Otostegia integrifolia Benth.	Lamiaceae	Tunjiitii	T	W	Febrile Illness	LeSh	C	Fr/Dr	NO	Hu
					Cough					
					Stomachache					
Parthenium hysterophorus L.	Asteraceae	Kaskasee	S	B	Stomachache	Le	C	Fr/Dr	NO	Hu
					Febrile Illness					
Periploca linearifolia Quart.-Dill. & A. Rich.	Asclepiadaceae	Ananoo	L	W	Headache	R	C	Fr/Dr	OpO	Hu
					Evil Eye					
Pisum sativum L.	Fabaceae	Ataraa	H	FL	Febrile Illness	Le	H	Dr	N	Li
Physalis peruviana L.	Solanaceae	Hawuxii faranji	H	W	Spider Poison	FSe	Cho	Fr/Dr	O	both
Phytolacca dodecandra L″Her.	Phytolaccaceae	Andoodee	S	B	Gonorrhea	R	Po	Fr/Dr	O	HuLi
					Rabies					
Plumbago zeylanica L.	Plumbaginaceae	Aamira	H	W	Tooth Infection	Ba	Ch	Fr	T	Hu
Polygala abyssinica Fresen.	Polygalaceae	Este lebona	H	W	Evil Eye	R	U	Fr/Dr	N	Hu
Premna schimperi Engl.	Lamiaceae	Urgessaa	S	W	Teeth Infection	R	C	Fr	T	Hu
					Evil Sprit					
					Blotting					
Psidium guajava L.	Myrtaceae	Roqa	H	W	Eye Infection	R	P	Fr/Dr	E	Li
Rhamnus prinoides L″Herit.	Rhamnaceae	Geeshoo	H	HG	Tonsillitis	Le	P	Fr/Dr	O	Hu
Rosmarinus officinalis L.	Lamiaceae	Qoricha kontariitii	H	W	Hemorrhoid	Le	P	Fr	D	HuLi
Rumex abyssinicus Jacq.	Polygalaceae	Mamaqoo	H	FL	Anemia	R	P	Dr	O	Hu
Rumex nepalensis spreng.	Polygonaceae	Shultii	H	B	Stomachache	RLeBa	PPo	Fr	O	Hu
					Anemia					
					Cough					
Rumex nervosus Vahl	Polygonaceae	Dhangagoo	S	W	Wound	Le	CH	Fr	D	HuLi
					Swelling Leg					
Ruta chalepensis L.	Rutaceae	Tenadamii	H	HG	Stomachache	RLeSh	PPo	Fr	OpO	Hu
					Evil Eye					
					Febrile Illness					
Salix subserrata Willd.	Salicaceae	Aleltu	T	W	Rabies	R	S	Fr	O	HuLi
Salvadora persica L.	Salvadoraceae	Hudha	S	W	Hepatitis	RLeBa	CHP	Fr/Dr	DO	HuLi
					Cough					
					Wound					
					Stomachache					
					Anemia					
					Ameba					
Sansevieria ehrenbergii Schweinf. Ex Baker	Dracanaeae	Alge Korma	S	HG	Ear Infection	Sa	S	Fr	Ea	Hu
Scadoxus multiflorus (Martyn) Raf.	Amaryllidaceae	Shunkurtii Warabeessa	H	W	Blackleg	B	P	Fr/Dr	O	HuLi
					Stomachache					
Schefflera abyssinica (Hochst. ex A. Rich.) Harms	Araliaceae	Afartuu	T	W	Snake Bite	Le	P	Fr	O	HuLi
Securidaca longipedunculata Fresen.	Polygalaceae	Iste manahea	T	W	Cough	R	CCh	Fr	OT	Hu
					Tooth Infection					
Senna petersiana (Bolle) Lock	Fabaceace	alanqabeessa	T	W	Rabies	Le	P	Fr	O	Li
Senna singueana (Del.) Lock	Fabaceae	Gafatoo/Gufa	T	W	Wound	LeStBa	Po	Dr	D	Hu
Sesamum angustifolium (Oliver) Engl.	Pedaliaceae	Saliixii	H	FL	Snake Bite	Se	S	Dr	NO	HuLi
Sida schimperiana Hochst. ex A. Rich.	Malvaceae	Chifrigii	S	W	Back Pain	R	P	Fr/Dr	O	Hu
Solanecio gigas (Vatke) C. Jeffrey	Asteraceae	danqalee	T	B	Stomachache	Le	C	Fr	ENO	HuLi

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					Eye Infection					
					Cough					
					Evil Eye					
Solanum dasyphyllum Schumach.	Solanaceae	Hiddi Hongorca	H	W	Blotting	Fr	C	Fr	N	Li
Solanum incanum L.	Solanaceae	Hiddii	S	W	Evil Eye	RLe	ChPU	Fr	NO	HuLi
					Nasal Bleeding					
					Febrile Illness					
					Stomachache					
					Blackleg					
Stephania abyssinica (Dillon & A. Rich.) Walp.	Mensipermaceae	Kalaala	H	W	Poison Plant	RLe	PU	Fr	NO	HuLi
					Evil Eye					
Stereospermum kunthianum Cham.	Bignoniaceae	Botoraa	T	W	Snake Bite	R	C	Fr	NO	HuLi
Syzygium guineense (Willd.) DC.	Myrtaceae	Baddeessa	T	W	Internal Parasites	Ba	Co	Dr	O	Hu
Thalictrum rhynchocarpum Dill. & A. Rich.	Ranunculaceae	Sira bizu	H	W	Hepatitis	R	P	Fr/Dr	O	Hu
					Men Sexual Impotency					
Tragia mixta M. Gilbert	Euphorbiaceae	Kaasaa	S	W	Tonsillitis	Le	P	Dr	O	Hu
Urtica simensis Steudel	Urticaceae	Doobii	H	B	Gastritis	Le	Co	Fr	O	Hu
Verbascum sinaticum L.	Scrophulariaceae	Gurra Harree	H	W	Leeches	R	CPo	Fr/Dr	NO	HuLi
					Snake Bite					
					Fibril Illness					
					Evil Eye					
					Blackleg					
Verbena officinalis L.	Verbanaceae	Kororaachii	H	HG	Blackleg	RLe	ChPo	Fr	NO	HuLi
					Anthrax					
					Tonsillitis					
					Stomachache					
Vernonia amygdalina Del.	Asteracecae	Dhebichaa	T	B	Urinating Problem	LeSh	CPPo	Fr	ON	HuLi
					Blotting					
Vernonia auriculifera Hiern.	Asteracecae	Reengii	T	W	Blotting	StSh	U	Fr/Dr	DOp	HuLi
					Snake Bite					
Vernonia hochstetteri SCh. Bip. ex Walp.	Asteracecae	Wayina Gifti	S	B	Evil Eye	LeSt	C	Fr	ON	HuLi
					Eye Infection					
					Rabies					
Vicia faba L.	Fabaceae	Baaqelaa	H	FL	Gastritis	Se	R	Dr	O	Hu
Withania somnifera (L.) Dunal	Solanaceae	Gizawa	S	W	Evil Eye	R	C	Fr	D	HuLi
					Hepatitis					
Ximenia americana L.	Olacaceae	Inkoy	T	W	Hemorrhoid	Le	U	Fr	D	HuLi
Zingiber officinale Roscoe	Zingiberaceae	Gangibeeloo	H	HG	Stomachache	B	Ch	Fr	O	Hu