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An ethnobotanical study of medicinal plants of the Kembatta ethnic group in Enset-based agricultural landscape of Kembatta Tembaro (KT) Zone, Southern Ethiopia

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ABSTRACT

This study was carried out in KT Zone, Ethiopia aimed to identify the taxonomic diversity of medicinal plants (MPs), and document the local knowledge. The methods used for ethnobotanical data collection were semi-structured interviews, field observation, and focus group discussion. Correlation coefficients, Informant Consensus Factor (ICF), and Jaccard's index were calculated, and various ranking methods were employed. The reported specimens of MP were identified and deposited at the National Herbarium.A total of 145 MP species were reported to treat 64 different human ailments. About 40% of the identified MPs were harvested from enset-based homegardens and their surrounding. More than 50% of the MPs were herbs, and the dominant plant parts used were leaves. The ailments with the highest ICF wassudden sickness. The Pearson rank correlations test showed that there is highly significant negative correlation($r = -0.34$, $p < 0.001$) between the number of MP species reported and the education level of informants. Deforestation, agricultural expansion, and over grazing became threats to MPs . The preference score for Ajuga integrifolia as a MP for ascariasis placed it in the first rank for its effective treatment. Although the study area has rich lores of plant diversity, the transfer of traditional knowledge is insecured. The incorporationof issues of traditional medicines into the school curriculum, and encouraging farmers/ healers to grow valuable MPs in their homegarden agroforestry systems seems crucial to sustainthe diversity of MPs

Key words: Ailments, Ensete ventricosum, indigenous knowledge, Kembatta Tembaro, Ranking methods.

INTRODUCTION

The use of traditional medicinal plants (MPs hereafter) has been widely practiced in Ethiopia [1]. Indigenous peoples of different localities in the country have developed their own specific knowledge to use , manage and conserve plant resources [2], which gave traditional medicine its diverse nature. Extensive use of traditional medicine in Ethiopia could be accredited to efficacy against certain type of ailments, economic affordability, physical accessibility, and cultural acceptability as compared to modern medicine [1]. Medicinal plants contain drugs used for suppressing, preventing or curing many forms of diseases [3], and more than 95% of traditional medical preparations are of plant origin in Ethiopia.

Modern studies on traditional MPs in Ethiopia started in 1973[4]. Ever since this time, during the last four decades considerable researchers have been doing investigations on MPs, especially on local knowledge of traditional MPs [5-10]. Hitherto, for most parts of Ethiopia the rich biological diversity and indigenous knowledge of this diversity

was not sufficiently documented, and many of the studies made up to now do not target on a specific agroecological zones of the country.

Studies indicated that habitat and species are being lost as a result of combined effects of environmental degradation, agricultural expansion, deforestation and over harvesting of species [10, 11]. Poor resource administration, lack of awareness on herbal medicine [1], oral transmission of MP lore[12], and underestimating traditional values by young people [13] are also influencing MP resources. Hence, detailed information on MPs is a requisite before the knowledge perishes. This fact holds true for indigenous peoples of Kembatta who rely on plant resources for various purposes. Accordingly, the study aims to identify and document the traditional MP knowledge of Kembatta people. Furthermore, the study offers a baseline data for upcoming pharmacological and phytochemical studies.

MATERIALS AND METHODS

Geo-ethnographical overview of the study area

Kembatta Tembaro (hereafter KT) Zone is found in the NE part of Southern Nations, Nationalities and People's Regional (SNNPR) State of the Southern Ethiopia. Zone refers to a medium administrative unit below Regional level in the country. It is located between latitude 7.08 – 7.30^{0}N and 37.22– 38.04^{0}E longitude, and topographically the Zone lies between altitudinal ranges of 501m asl and 3080m asl. The study area covers a total area of 1523.6 km^2, which is divided into seven *woredas* (administrative units lower than Zone) (Fig. 1). The ethnic groups reported in the Zone are Kembatta, Tembaro, and Donga, and yet, there are few number of Hadya and Wolayta people who live in the Zone [14]. Kembatta people inhabit in six of the seven *woredas* in the Zone though there are considerable number of Kembatta people in Tembaro *woreda*. Thus, Kembatta is the largest ethnic group (83%) in the Zone. Kembatissa is a Highland East Cushitic language [15], spoken by more than 700,000 people [16]. KT Zone has a population of 1,055,828 (559,713 men and 496,11 women) and 86% of the people live in rural areas [14]. The average land holding per household is less than one hectare, and the density is 708 individuals /km^2[17].

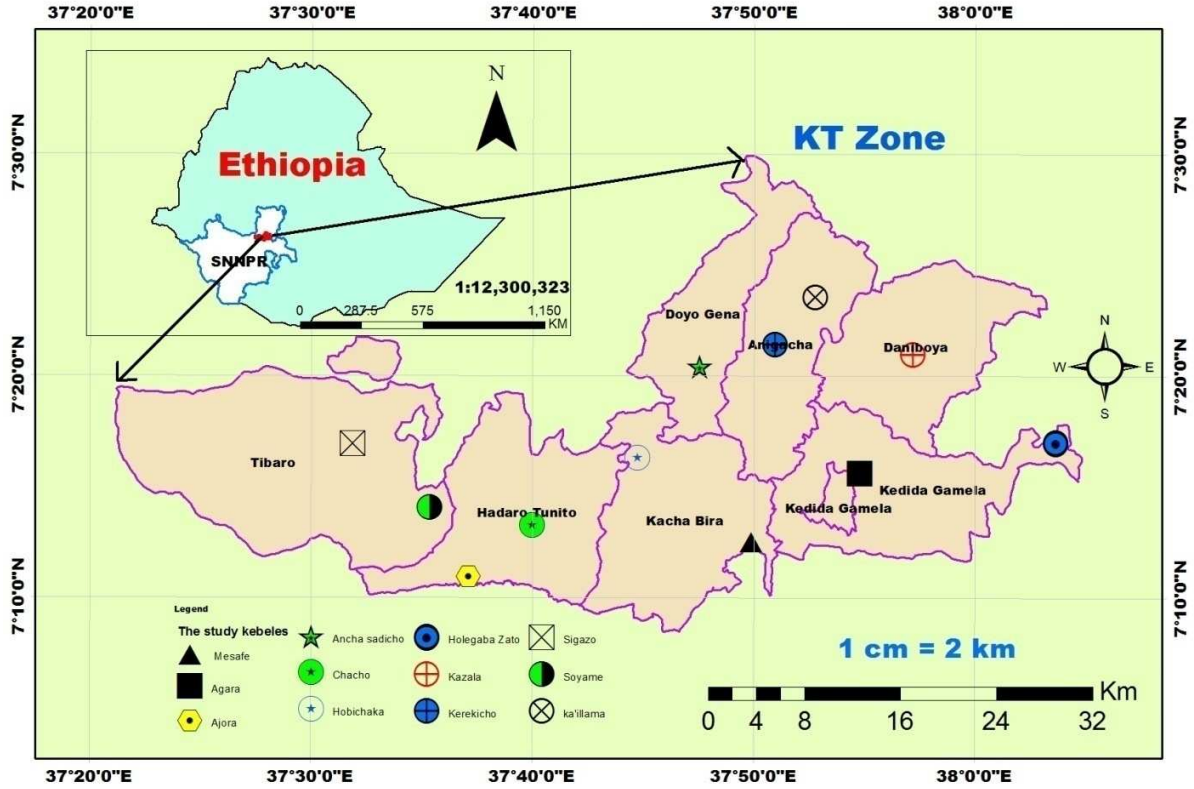

Figure 1: The Map of the study area

The rainfall distribution of the study area is bimodal. The maximum mean temperature record is 26.8°C in June, and the mean annual temperature and rainfall is 19.3°C and 1144mm, respectively. Malaria, intestinal parasite, and respiratory tract infections are the top three major public health problems in the Zone [14]. The economy of the people of Kembatta is mainly based on the subsistence agriculture.There is also a long tradition of using plants for traditional medicines against ailments of both human and livestock, gathered from patches of remaining forests, cultivated lands, graveyards, and field margins [14]. The study Zone has three agroclimatic zones, namely highland (2400-3200m asl) 25%, midhighland(1800-2400masl) 67%, and *Kolla*(Semi desert, 500-1800m asl) 8%. A bout 75 % of the total land area is cultivated [14]. Dry ever green afromotane forest and Grassland complex and *Combretum-Terminalia* woodland and wooded grassland are characteristic vegetation types of the study area [18].

Selection of study sites and informants

A reconnaissance survey was made between October and December, 2009, and data collection was carried out between October and February, 2010, and March and April, 2012 in KT Zone. In total, 12 *Kebeles* (the smallest administrative unit) were randomly selected from the study area (Fig. 1). Both purposive and systematic random sampling methods were employed to select locally recognized traditional healers and representative general informants , respectively following methods described by [19]. The age range of the informants was between 20 and 83 years. Fifty informants with the age between18-35 years were accepted as young. But 181 informants who were with age > 40 years were considered as elders. The selection of 51 (34 Males and 17 females) traditional healers, who participated as key respondents was carried out on recommendations from local leaders, elder people, and development agents in the study *kebeles*. But general informants were sampled during random visits made to houses in each of the study *kebeles.* Accordingly, the number of general informants was 180 (96 men and 84women), forming a total of 231 informant (130 men and 101 females). Ethical clearances were made with local authorities, local peoples and traditional healers of the communities [19]before the start of interviews to share their knowledge.

The methods used for ethnobotanical data collection were semi-structured interviews, walk with informants, focus group discussion, and various ranking methods [20]. Market survey was conducted to ensure the reliability of informants MP use information. Interviews were conducted in *kambatissa* and ran independently for each informant. During interview the respondents' background, namely the name, age, sex, level of education, occupation, religion, and ethnicity were recorded. Likewise, health problems, diagnosis and treatment methods, local names of MPs, habitat of MPs, plant parts used, condition of plant part used (fresh/dried), methods of remedy preparation, dosage prescriptions, routes of remedyadministration, detectable adverse effects, and the use of antidotes were recorded. Furthermore, any taboos /beliefs linked with the collection and use of plants, the source and methods of indigenous knowledge transfer, nonmedicinal uses of ethnomedicinal plants, marketability, threats as well as the management practices of MPs were cautiously recorded. Healers were contacted at least twice to confirm the information he/she has given is correct [19, 20]. A market survey of MPs was conducted twice at seven major markets places to document and identify the extent of marketable MPs in KT Zone.

Furthermore, factors that influence the diversity of MPs were short listed by traditional healers. The preference ranking was conducted to identify the most preferred species for treating commonly reported disease, particularlythe gastrointestinal and parasitic disease category. Fifteen randomly selected key informants ranked plants species based on the ailment treated. Each rank was given an integer number with the most preferred item being assigned the highest number (5 for the most effective , and 1 for the least effective MP) following [19].

Similarly, a direct matrix ranking exercise on uses perceived as threats to six MPs was conducted for multipurpose MPs commonly reported by fifteen key informants following [19, 20]. The selection of multipurpose species was carried out and their uses were listed. The same key informants were enquired to allot use values to each species. Each selected key informant was asked to assign use values. Lastly, average scores of each species were added up and ranked. Finally, ten key informants were involved in priority ranking exercise on factors that were supposed to be threats based on their level of destructive effects to MPs [19, 20].

Additionally, focus group discussion was held to gateher data on the status of MPs, and MPs knowledge of the community and its transfer in order to prove the reliability of data collected through semistructured interviews [19]. Ten key informants who already took part in the in-depth individual interviews participated in the focus group discussion. Specimens of MPs were collected, identified and the voucher specimens were deposited at the National Herbarium (NH) in Addis Ababa University.

Data analysis

Data on informants' background and MPs used in KT Zone were entered on Ms Excel spreadsheet, and the descriptive statistics was employed. The Informant Consensus Factor (ICF) was calculated to see the agreement of informants for a plant species in treating a particular disease using a formula, **ICF = (nuc – ns)/(nuc – 1)**, where **nuc** = number of use citations, **ns** = number of species used for each use citation [21]. Jaccard's similarity coefficient was estimated for comparing MP species composition in twelve (nine from inland and three from other African countries) randomly selected studies following [22].Jaccard's similarity coefficient (JSC) was calculated for comparing MP species composition (Table 6) following [23]. The formula JSC **=c/(c+a +b),** where, a= number of MPs present in KT Zone and absent in the corresponding study site, b=number of MPs absent in KT Zone and present in the corresponding study site, c = number of MPs common in KT Zone and the corresponding study site.

The Pearson Correlation Test was employed to evaluate whether there was significant ($p < 0.05$) correlation between i) the age of healers' and the number of MP species reported, and ii) the educational level of traditional healers' and the number of MP species reported. The informants who have attended either formal or church education, and able to read and write were considered as educated.

RESULTS

Traditional healers back ground

All informants from the community had the age range between 29 and 92, and 98% of them belong to Kembatta ethnic group. All used to lived in rural areas. Sixty three percent were educated, and 94% of the informants were Christians.

The diversity and richness of MP speciesin agroecosystems of KT Zone

The study revealed a total of 145 MP species distributed across 129 genera and 59 families, of which thirteen (*Acanthus sennii*, *Ceropegia microgaster*, *Clematis longicaudata*, *Echinops kebericho*, *Ensete ventricosum* , *Euphorbia dumalis*,*Kniphofia foliosa*, *Leucas stachydiformis*, *Mikaniopsis clematoides*, *Millettia ferruginea*, *Pittosporum abyssinicum*, *Pycnostachys abyssinica*, and *Urtica simensis)* were endemic to Ethiopia (Appendix I, bold text). The family with the highest number of MP species (16 species, 11%) was Asteraceae, followed by Fabaceae (10.3%) and Lamiaceae (9.7%). Twelve families, namely Acanthaceae, Amaranthaceae, Cucurbitaceae, Euphorbiaceae, Meliaceae, Oleaceae, Poaceae, Polygoniaceae, Ranunuclaceae, Rubiaceae, Rutaceae, and Solanaceae were represented by more than two MP species each. Similarly, ten families were represented by two species

Most recorded MP species were herbs (54%), followed by shrubs (25%), and trees (13%). The majority (55%) of the total MP species were collected from wild, followed by cultivated (23%) and semi-cultivated MP species (22%). Here, the term semi-cultivated refers to a kind of plant that is in between wild plants and cultivated crops. Regarding the habitat of MPs, majority were harvested from homegarden (≈ 39%), followed by hedgerows (22%), and cropland (15%) (Fig. 2). Poor peasants in the study area have only homegarden whereas some peasants with relatively broad farmland possess large homegarden that comprises of home area, cropland and Kallo (preserved grazing land) at the bottom.

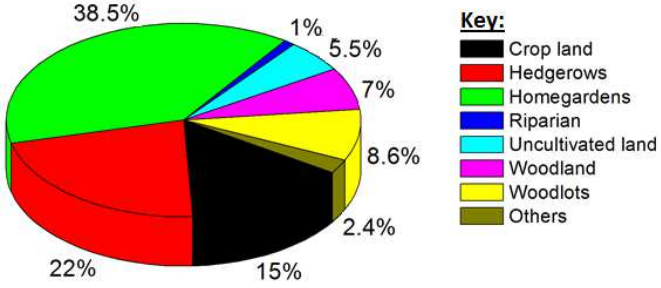

Figure 2: The percentage of the sources of MPs in KT Zone

Ailments treated and their ICF values

The identified MP species (145 in number) were found to treat 64 various ailments of human. The largest proportion (41%) of MP parts of Kembatta were leaves, harvested to treat 69% of the total ailments, followed by roots and seeds that were harvested to treat 59% and 42% of the total identified ailments, respectively (Fig. 3).

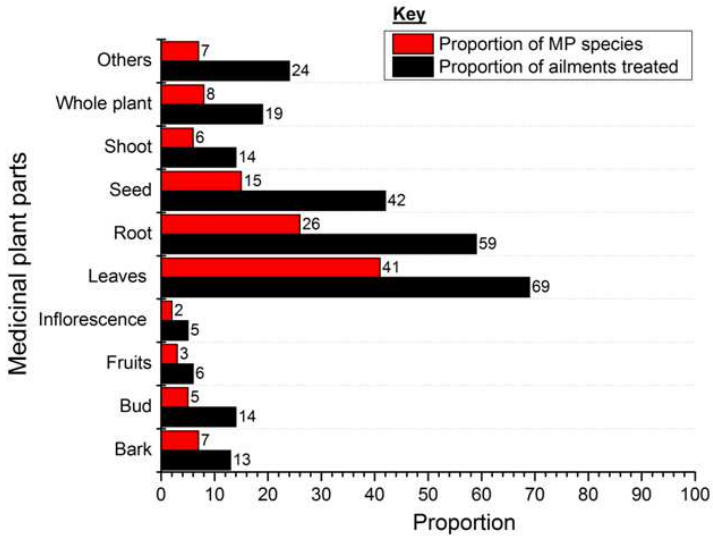

Figure 3: The proportion of MP parts used and the ailments treated

There were cases where various parts of the same plant being used for different purposes, for instance, buds, leaves, saps, roots, and barks of *Croton macrostachyus*. In some cases more than one plant is used to treat a particular aliment. For example, tonsillitis was treated with 14 different MPs. There were also cases where a particular plant is used to treat many aliments. For example, *Echinops kebericho, Pavetta abyssinica* and *Momordica foetida* were used to treat more than four aliments each (Appendix I). Accordingly, sixty percent of the investigated plant species were involved in the cure of more than one disease each.

In this study most values for ICF were above 0.50, which most likely indicates that ailments were wide spread among the society. Ailments with the highest ICF were sudden sickness, febrile, and devil sickness that had ICF values of 0.82, 0.74, and 0.74, respectively (Table 1).

Table 1. Results of ICF values of MPs used for treating human disease categories

S.No	Disease Category	Plant species	use citation	ICF	Percent species	Percent use citation
1	Blood and lymphatic disorders	33	112	0.71	22.8	48.5
2	Dermal disorders	20	64	0.7	13.8	27.7
3	Devil sickness	10	35	0.74	6.9	15.2
4	Febrile	17	62	0.74	11.7	26.8
5	Gastro intestinal and parasitic	60	146	0.59	41.4	63.2
6	Glandular disorders	9	20	0.58	6.2	8.7
7	Gynaecological disorders	9	23	0.64	6.2	10
8	Injure and bleeding	15	50	0.71	10.3	21.7
9	Musculoskeletal and nervous system	19	63	0.71	13.1	27.3
10	Oral, Odontalgia and sensory disorders	33	106	0.7	22.8	45.9
11	Respiratory disorders	17	54	0.7	11.7	23.4
12	Snake and dog bite	7	20	0.68	4.8	8.7
13	Sudden sickness	3	12	0.82	2.1	5.2
14	Urogenetial and veneral	8	16	0.53	5.5	6.9

Marketable Medicinal plants

The market survey revealed that twenty two percent (n= 32 species) of the identified MPs were marketable (Table 2). Sixty nine percent of the marketable MPs were commonly cultivated plant species of the homegarden origin whereas the remaining MPs belong to either wild or semi- wild origin. The largest proportion (90%) of marketable

MP species was sold for food, of which 45% belong to spices. But only four of the total identified marketable MPs were sold for medicinal purpose only. The average price of these MPs is given here. *Securidaca longipedunculata* (about 200gm was sold for 8 Ethiopian Birr/EB = 0.56USD), *Amaranthus caudatus* seed (150g/cup = 2 EB= 0.11USD), *Echinops kebericho* (200gm = 2EB= 0.11USD), and *Hagenia abyssinica* (1glass of inflorescence = 1.25 EB = 0.07 USD).

Table 2: Marketable medicinal plants of the study area

Scientific name	Local names	Functional group	Habit	Habitat
Aframomum corrorima (Braun) Jansen	Wokash	Spice	H	HG (*Gattee*)
Allium porrum L	Sunkutata	Spice	H	HG (*Gattee*)
Allium sativum L.	Tuma	Spice	H	HG (*Gattee*)
Amaranthus caudatus L.*	Halibe	Medicinal	H	HG (*Gattee*)
Carica papaya L.	Papaya	Fruit	T	HG (*Gattee*)
Citrus aurantifolia (Christm) Swingle	Lomita	Fruit	T	HG (*Gattee*)
Coffea arabica L.	Buna	Stimulant	T/S	HG (*Gattee*)
Coriandrum sativum L.	Wodima	Spice	H	HG (*Gattee*)
Cucumis melo L.	Habaaba	Fruit	HL	HG (*Gattee*)
Cucurbita pepa L.	Dabaqula	Fruit	H	HG (*Gattee*)
Echinops kebericho Mesfin *	Tossa	Medicinal	H	HG (*Gattee*)
*Elusine coracana (*L.) Gaertn.	Fagajit	Cereal	H	CL (*Wixxa ulla)*
Ensete ventricosum (Welw) Cheesman	Wesse	Root & tuber	PH	HG (*Gattee*)
Hagenia abyssinica (Bruce) J. F. Gmel*	Xenchuta	Medicinal	T	HR *(Zanna*)
Helianthus annuus L	Nuga	Oil	H	HG (Gattee)
Hordeum vulgare L.	Soa'	Cereal	G	CL (*Wixxa ulla)*
Lepidium sativum L.	sunfa	Medicinal	H	CL (*Wixxa ulla)*
Linum usitatissimum L.	Talba	Oil	H	CL (*Wixxa ulla)*
Nicotiana tabacum L.	Tumbe-oo	Stimulant	H	HG (Gattee)
Nigella sativa L.	xagutta	Spice	H	CL (*Wixxa ulla)*
Phaseolus vulgaris L.	Wokitta	Pulse	H	CL (*Wixxa ulla)*
Piper capense L. *	Ximzi	Spice	H	HG (*Gattee*)
Plectranthus punctatus subsp. edulis (Vatke) Morton	Sheshe dinikata	Root & tuber	H	HG (*Gattee*)
Punica granatum L.	Romana	Fruit	S	HG (*Gattee*)
Ruta chalepensis L.	Xelachuta	Spice	S	HG (*Gattee*)
Securidaca longipedunculata Fresen *	Sanganna	Medicinal	S	WL(*Haqi ulla*)
Solanum macrocarpon poir.	Buluta	Medicinal	PH	HG (*Gattee*)
Thymus schimperi Roninger *	Zazanchut	Spice	H	HG (*Gattee*)
Trigonella foenum-graecum L.	shu'oota	Spice	H	HG (*Gattee*)
Triticum polonicum L.	gardamu	Cereal	H	CL (*Wixxa ulla)*
Vicia faba L.	Bakela	Pulse	H	CL (*Wixxa ulla)*
Zingiber officinale Rosc.	Jangibelu	Spice	H	HG (Gattee)

Note*: *Habit*: *H= herb, PH= Perennial herb, T= tree, S= shrub, G= grass, HL= herbaceous liana
Origin*: **= wild or semiwild origin, HG= homegarden, CL= crop land, WL= woodlot, and WdL= woodland. Gattee = is a backyard of the HG

Medicinal plant processing and administration methods

Most Kembatta remedial plant species (71%) were processed in fresh, others (22%) were applied after immediate drying, and the remaining were applied either in fresh or dried forms (Fig. 4a). Results indicate that remedies were processed mainly through crushing (22%), decoction (20%), and chewing (17%) squeezing (Fig. 4b).

Fifty percent of the Kembatta remedies were prepared and administered undiluted. Substances like cold water, whey, coffee, butter, salt; local alcohols like *'araqee'* and *'tella'*, honey and milk were reported to be mixed with the plant materials during preparation. The results indicate that water constituted the largest proportion (51%) to dilute MP mixtures. The butter, whey, and coffee were used to dilute 11, 7.6, and 5.5% of the MP mixtures, respectively. The rest (4.8%) were diluted using tea, milk, honey and the local alcohols. Our finding showed that only 8% of the healers keep medicines in powder form in the containers such as bottles, papers, and pieces of cloth.

According to the informants antidotes are used for dilution in cases of adverse effects. For instance, milk was cited for use as an antidote when preparations (formulations) were made from *Justitia schimperana* to treatrabies. The milk whey is used as an antidote when formulations are made from *Croton macrostachyus* to treat intestinal worms, *Thalictrum rhynchocarpum* to jaundice, and *Stephania abyssinica* to pneumonia. Similarly, coffee was mentioned as

an antidote when formulations were made from *Senna occidentalis* to treat diarrhea, and *tella* was used as an antidote when *Oncocalyx g1abratus* is used to treat gonorrhea.

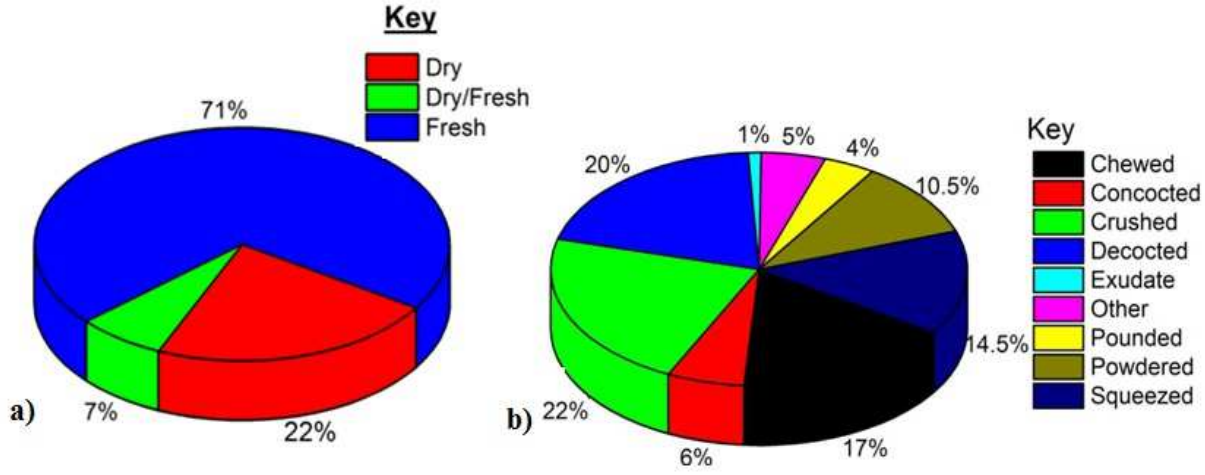

Figure4: Methods of preparation of remedies by Kembatta People: a), condition of plant parts used, and b), Methods of MP processing

The processed remedies were mostly administered through oral (69%) and dermal (22%) routes (Fig. 5).

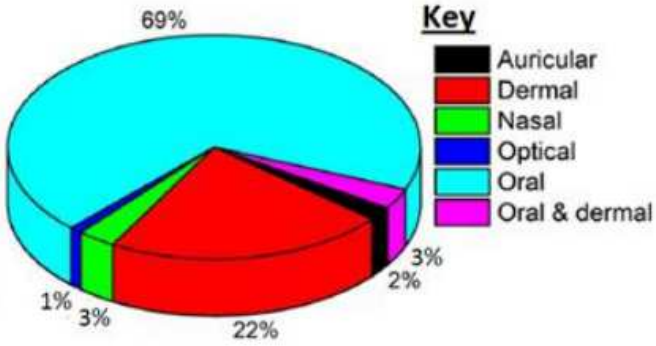

Figure 5: Different routes of administration

Ranking of Medicinal Plants

A preference ranking exercise was carried out by fifteen informants on MPs that were reported for treatment of ascariasis since it represents the gastrointestinal and parasitic disease category, the second top human ailment reported in the Zone. Unlike other disease categories, this category was selected for preference ranking because it comprised the highest number of medicinal plants specified by the informants (Table 1). *Ajuga integrifolia*, *Leucas stachydiformis*, and *Teclea nobilis* were the most preferred species to treat ascariasis (Table 3).

Table 3. Preference ranking of seven MPs used for treating ascariasis

Species	Respondents (A-O)															Total	Rank
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O		
Teclea nobilis	3	1	5	1	4	1	0	1	5	0	5	5	1	5	5	42	**3**
Ajuga integrifolia	2	2	2	1	3	5	5	5	4	1	4	5	5	3	3	48	**1**
Clausena anisata	1	0	1	4	2	3	1	4	2	0	2	2	3	1	5	31	**5**
Vernonia amygdalina	1	4	1	5	1	1	4	3	3	1	3	1	2	5	2	37	**4**
Leucas stachydiformis	0	5	4	2	1	4	2	5	5	0	5	4	4	2	4	47	**2**
Achyrospermum shimperi	2	1	0	0	0	0	3	2	1	0	1	3	1	1	1	16	7
Pycnostachys abyssinica	0	3	3	5	0	2	1	2	3	0	2	1	0	4	1	27	**6**

Use diversity of medicinal species

Kembatta people use plants for various purposes for example, food, charcoal making, construction, forage, fire wood, and fodder. Sixty percent of the identified plants were found to have uses other than medicinal, which may depict that these plants are under a great pressure of excessive use. In direct matrix ranking *Hagenia abyssinica*was in the highest rank (Table 4). *Hagenia abyssinica* and *Podocarpus falcatus* were exploited mainly for their attractive timber, and *Acacia abyssinica* chiefly for charcoal making other than medicinal use.

Table 4. Direct matrix ranking of six MPs with different uses other than medicinal use (total score of fifteen informants) in the study area

Uses	*Acacia abyssinica*	*Croton macrostachyus*	*Hagenia abyssinica*	*Pavetta abyssinica*	*Podocarpus falcatus*	*Vernonia amygdalina*
Farm tools	51	53	63	42	24	23
Construction	53	60	70	22	75	35
Income generation	51	63	68	17	72	35
Charcoal	66	39	42	27	39	47
Fuel wood	60	26	47	24	48	51
Fodder	34	17	30	31	32	36
Total	**315**	**258**	**320**	**163**	**290**	**227**
Rank	**2nd**	**4th**	**1st**	**6th**	**3rd**	**5th**

Priority ranking

Priority ranking exerciseindicates that deforestation, agricultural expansion, and overgrazing were the first three top factors perceived as threats to MPs (Table 5). Most informants (92%) confirmed that the agricultural expansion in highland areas is caused by human population pressure. As a result, most of the available lands (field margin, grazing area, steepy slopes, river sides, etc.) have been cultivated, which consecutively degraded the medicinal plants.

Table 5. Priority ranking of factors perceived as threats to MP resources

	Respondents (A_J)											
Factors	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**percent**	**Rank**
Agricultural expansion	3	6	3	2	5	5	5	5	3	3	19	**2**
Climate change	5	4	4	3	2	2	2	2	2	6	14	**5**
Deforestation	1	3	6	4	4	6	6	6	4	4	21	**1**
Firewood	6	5	1	6	3	1	4	1	1	1	13	**6**
Over grazing	4	1	5	5	6	4	1	3	5	2	18	**3**
Over harvesting	3	2	3	1	1	3	3	4	6	5	15	**4**

Traditional medical practices and the Knowledge transfer

Eighty two percent of the informants declared that they acquired MP knowledge from their families or relatives. Nonetheless, none of the acquired MP knowledge was found in the written form. Some informants affirmed that they gained the MP knowledge through contact with "spirit", yet few acquired through learning from others and through trial and error. Healers transfer traditional medicinal knowledge to the family members whom they think keep the secrecy.

The average number of MPs reported by females was 4.41 ± 0.21 whereas that of males was 3.73 ± 0.11 (mean ± SD). There was highly significant difference between the number of MPs reported by males and females ($t = 16.9$, $P < 0.01$). In average females reported more than males though the total number of informant males and the number of MPs reported by them were higher. There was a significant positive correlation (Pearson correlation coefficinet, $r = 0.28$, at $\alpha = 0.05$, $p = 0.04$) between the age of informants and the number of species reported by the informants. However, there was highly significant negative correlation ($r = -0.34$, at $\alpha = 0.05$, $p < 0.001$) between the number of species reported and informants' educational level (illiterates reported large number of species).

Like any other indigenous communities in Ethiopia, people in the study Zone give priority for their health status. They say "*Fayiimat faduu wimma laliicii abbattaa*" that means "health is better than a pen full of cattle." Most indigenous people used to treat ailments like head ache, abdominal pains, cough, and febrile associated with other diseases at home level. They use some common MPs such as *Ajuga integrifolia, Allium sativum, Coriandrum sativum, Eucalyptus globulus, Ocimum lamiifolium, Rumex nepalensis, Ruta chalepensis, Verbena officinalis, Vernonia amygdalina,* and *Zingiber officinale.* These species are obtained either from users' homegarden or collected freely from close friends or neighbours. More than seventy percent of the studied households had some

common knowledge on MPs useful to treat human ailments. However, about 26% of the studied households owned the knowledge derived either from friends, relatives or family, and they bore knowledge on MPs almost in a similar fashion to some healers. Such people were found willing to offer medicines freely to individuals in need.

However, about eighty percent of the key traditional healers disclosed that the health extension agents at *kebele* level teach people not to use traditional medicines formulated by healers. Similarly, some religious teachers who associate healers practice with witchery discouraged the use of traditional medicines.

DISCUSSION

A total of 145 MP species were identified to manage diverse human ailments in the study area. This is one of the largest MP record in the country [8, 12, 24-27]. The richness of MP record can be an indication of the contribution of MPs as well as the traditional health knowledge held by the Kembatta ethnic group in assisting the primary health care needs of the Zone. Many common ailments were identified and treated at household level, using MPs in from the homegarden. The identification and treatment of ailment at household level was reported [8]. This implies that traditional MPs are playing an important role in supporting the primary health care needs among the communities in the study area. The long experience and practice enabled older people know more MPs than the young people, and the knowledge about MPs declined with increase in education. This result is in accord with earlier workers [12, 27-29]. This may depict the occurrence of rapid loss of ethnobotanical knowledge as the young people attend school, and become acquainted with modern health services.

Our finding showed that MP knowledge is passed mainly through family relation like everywhere else in Ethiopia [24, 27]. Neighborhood social relations also assist in the diffusion of MP knowledge among the rural communities. This is particularly true for MPs that are used to treat common ailments such as fibrile, headache, and abdominal complaints. But under difficult cases the community members often contact the specialist healers. Due to the belief held among the community, ordinary people don't use the MPs that are on use by the specialist since it is believed that doing so will lead to the loss of MPs healing power previous work. Prvious works reported simila results [24]. Such taboos assist in MPs conservation since social restrictions serve to limit MP harvesting [30]. On the other hand, there were few people who claimed to have gained the plant use knowledge from the ghosts. These people were reserved in sharing their knowledge to others because doing so will be considered like breaking a covenant. Nonetheless, almost all MPs could't be found in a written form. Similar works were reported from ethiopia [12].

The identified MPs were used to treat 64 different human ailments. Ailments with the highest ICF were sudden sickness, febrile, and devil sickness that had ICF values of 0.82, 0.74, and 0.74, respectively. MPs supposed to be effective for a certain category of disease treatment will have high ICF as discussed before [25], which is useful to identify MPs with prospective bioactive compounds. Thus, ICF is a good measure of assessing efficacy of MPs for categorical disease in the context of the local community. Among the MPs used against human ailments, the highest proportions were used to treat gastro-interstinal and parasitic disorders (41%, 60 MP species). This could indicate that the disease is widespread in the study area. The intestinal parasitic problems were reported as the second among the ten top human diseases in the study Zone [31]. This could show that traditional knowledge of the MPs and their management is related to the abundance of the ailment type in KT Zone.

Herbs were the most frequently used ethnomedicinal plant species in this study, which is consistent with previous reports [9, 10, 13, 26, 32]. The use of herbaceous medicines seems valuable since they can replace themselves easily, and they are easily accessible ubiquitously given a reasonable climatic condition. Informants confirmed that some herbs become scant during dry seasons of a year. But twenty eight of the total MPs examined were marketed as a functional food, of which 75% were herbs that are cultivated in the homegardens. Previous report in Ethiopia depicted that almost one third of the MPs were used in self health care, which have also long been used as food and/or spices and widely sold in markets [33]. Many plant origin products were marketed as functional food [34]. Therefore, raising local community's awareness could help to presereve herbaceous MPs as described before [8]

The study from market survey showed that only *Securidaca longipedunculata*, *Amaranthus caudatus*, *Echinops kebericho*, and *Hagenia abyssinica* were marketed purely for medicinal purpose to generate income. The role of MP in income generation for the local community was reported [12, 35]. Yet, exhaustive economic valuation of each medicinal of the study area is needed to realize the role of MPs in income generation.

The highest proportions of the MPs were harvested for their leaves to prepare the remedies. Similar practices were reported from Ethiopia [8, 9, 36, 37]. The preference of leaves to other plant parts seems may not cause a plant death. Likewise, the ease of preparation and the presence of more bioactive ingredients in the leaf probably made it worthy [38]. The use of more than one MP species is well known in Ethiopian traditional medical practice [5, 36]. Likewise, in the current study healers reported that about 47% of the examined human ailments were treated using more than one MP species, which could be associated with the additive or synergistic effects of the mixtures that might contain a range of pharmacologically active compounds.

Our finding showed that the largest proportion (71%) of the remedy is processed in a fresh form, which is consistent with earlier reports [8, 12, 26, 32]. Many healers believed that fresh preparations are effective in healing the supposed ailments. Some key informants (45%) confirmed that they were forced to travel a long distance for the collection of fresh remedies owing to the absence of crucial MPs at their viciity. Such monotonous activity could lead healers to abandon easily unreachable MP species, which in turn may lead to a loss of knowledge on the use of a particular plant in the long-run. This requires possibly either the search for a new technology to use herbals in a dried form (for those which maintain their active ingredients)or there should be reliable methods of preserving medicinal extracts for extended shelf life. In our study only 8% of healers had the practice of prolonging medicines in a powder form. Moreover, healers should be spurred to grow MPs in their homegardens, live fences, farmlands and agroforestry systems as it was discussed previously [30, 39],

Medicinal principles are present in different parts of the plant like root, stem, bark, leaf, flower, fruit or plant exudates. They are separated by different processes. Seventy five percent of the remedies were prepared from a single plant, which may show the efficacy of MPs in healing the ailment. The oral route of remedial administration was the highest, which is in accord with others [32, 36, 40]. This could be attributed to the prevalence of internal ailments in the study area.

A considerable number of the current identified MPs were reported as remedies in other parts of the country as well as in other African countries. Higher values of Jaccard`s Coefficient of Similarity Index (JCS) indicate a higher similarity in medicinal plant species composition. JCS comparison of MP studies disclosed that the current study area with 0.18 JCS (41 MP species) has the highest similarity with the study from Kaffa Zone [41] (Table 6). The two Zones are located in the southern parts of the country. This was followed by 0.17 JCS from Eastern Wollega Zone [10], and 0.16 JCS from Gedeo Zone [24]. It is a simple measure of either the extent to which two habitats have species in common or species have habitats in common. The variation in climatic conditions, indigenous knowledge and practice of MPs, sample size, topography and type of flora may influence the similarity. Yet, these JCS values could not powerfully depict that the study area has similarity with other areas rather the values may describe that there are differences in vegetation type as well as cultures with the study area.

Table 6. Similarity in medicinal plant knowledge of the current study with previous works

(Where a= number of MPs present in KT Zone and absent in the corresponding study site, b = number of MPs absent in KT Zone and present in the corresponding study site, and c = number of MPs common in KT Zone and the corresponding study site)

Sample Zone/country	JCS	Sources
Agew-Awi Zone	0.15	[32]
Bale Mountains NP	0.8	[26]
Bench Maji Zone(Bench)	0.17	[27]
Bench Maji Zone (Meinit)	0.18	[27]
Eastern Wollega Zone	0.20	[10]
Gedeo Zone	0.15	[24]
Jimma Zone	0.19	[42]
Kaffa Zone	0.26	[41]
Konta special district	0.11	[9]
Some African countries		
Rwanda	0.09	[43]
Tunisia	0.06	[44]
Uganda	0.06	[45]

Our finding showed that a large proportion of MPs was collected both from homegarden (39%) and the associated hedgerows, which constituted over 60% of the MP sources. But other workers [46] and [24]claimed that homegardens contributed 29% and *13.5%* of MPs, respectively. The disparity could be attributed to factors like difference in cultural practice of MP use, agroclimate of the area, and informants' background. Homegardens

contain diverse life forms, species and varieties [47, 48]. Moreover, sixty nine percent of the marketable MPs in the current study were of homegarden origin, depicting the significance of homegardens for in-situ conservation of useful plant diversity. In Ethiopia, the reported MPs distribution by their state of existence for wild and cultivated species is 40.2 and 5.9%, respectively [49]. The corresponding figures for the current study were 55% and 23%, respectively. MPs of the wild origin become more susceptible when human population pressure increases on the environment. However, the majority of MPs of the wild origin were largely associated with multistory agroforestry systems of the homegardens and the associated hedgerows in the study area. Therefore, proper maintenance of these systems will support the conservation of valuable MPs around homegardens.

Helminthic problem is a major public health and economic importance to human, especially in Sub-Saharan Africa [50]. The preference ranking exercise of seven Mps for their efficacy against ascariasis showed that *A. integrifolia*, *L. stachydiformis* and *T. nobilis* were the top three MPs in treating ascariasis, respectively. These species were reported previously as remedies against ascariasis, namely *A. integrifolia*[8, 40], and *Leucas*. *stachydiformis* and *Teclea nobilis*[41, 50]. *Ajuga integrifolia* was reported to contain bioactive compounds such as terpenoids, glycosides and phenolics, and ajugarins [51]. Likewise, the species of *Leucas* were known to contain bioactive chemicals like oleanolic acid, ursolic acid and beta-sitosterol, a triterpenoid, leucolactone, sitosterol, stigmasterol and campesterol. Substances in these compounds were reported to have a vermifuge action [52]. The presence of these compounds in *A. integrifolia* and *Leucas sp* corroborates with the medicinal use by Kembatta people.

Deforestation and agricultural expansion were reported as the chief threatening factors for MPs in the study area, which is in agreement with previous researchers [6, 10, 11, 26]. As to [53], deforestation and agricultural expansion are major ways of habitat destruction. In the current study area, these problems were more linked with high population pressure and the scarcity of farmland. Additionally, improper use of resources such as harvesting the root part of useful plants (e.g., *Securidaca longipedunculata*)is a significant threat to MP diversity. Our result showed that roots were the second major MP parts where more than 25% of the MP species were harvested to treat 59% of human ailments. Root harvesting is a destructive practice which may result in species extinction. Root as the most commonly used MP part in remedial preparation, was reported by other workers [12, 32, 40]. Poor perception of some local people to traditional healers and the teachings of health extension workers, who discourage those customers who consult healers, are becoming potential threats to the knowledge of MPs in the study area. This finding agrees with other researchers [13, 54]. Ethiopian government definitely recognizes the traditional medicine, mainly herbal medicine [1]. Thus, the responsible governmental body and the public at large should collaborate in the implementation of policy by developing guidlines on the integration of herbal medicine.

Informants confirmed that MP species are diverse ranging from herbs to big trees, and have cultural, socioeconomic, and ecological uses besides to their role in primary health care. Therefore, the management of MPs diversity is chiefly associated with food security, habitat and environmental protection. In our study some knowledgeable community members and traditional practitioners were found to cultivate MPs of rare abundance such as*Clausena anistata, Pavetta abyssinica,* and*Echinops kebericho.* They grow the desired MP species in their homegardens, crop fields and hedgerows. Similar trend was reported from Ethiopia [55].The targeted conservation measures were suggested to be achieved by encouraging people to grow MPs in their homegardens, live fences, farmlands [29, 30, 39], and in agroforestry systems [39]. Moreover, development agents who work in each *kebele*could play a crucial role in enhancing such good practices of growing MPs, including rare species around homegardens of the study area.

Many wild species of MPs were associated with agroforestry of homegardens and the allied hedgerows of enset-based agroecosystem, indicating that the maintenance of this system can rescue many MP species. The development agents can also facilitate the exchange of planting materials of the most preferred and threatened medicinal plant species among the farmers. This practice could ensure the sustainability of MPs in the area. To put this into effect, development agents require training on the conservation of agrobiodiversity, particularly medicinal plants of the study area.

CONCLUSION

This study recorded a total of 145 MP species used to treat 64 different human ailments. This revealed that traditional medicine, which involves the use of medicinal plants, is supporting Kembatta people in meeting the requirements of primary healthcare. Most MPs used were herbs, chiefly harvested from wild. But many wild species were associated with agroforestry of homegardens and the allied hedgerows of enset- based agroecosystem,

indicating that the maintenance of this system can rescue many MP species. Moreover, healers and few knowledgeable farmers were found growing some inaccessible MP species at their homegardens. The development agents, who work closely with farmers at each *kebele* hopefully can enhance such good practices, and may encourage farmers/ healers to cultivate easily unreachable MP species in or around their homegardens (in situ conservation method). They can also facilitate the exchange of planting materials of the most preferred and threatened medicinal plant species among the farmers. This practice could ensure the sustainability of MPs in the area. To put this into effect, development agents require training on the conservation of agrobiodiversity, particularly medicinal plants of the study area.

However, agricultural expansion, root harvesting, disrespect for healers by some social groups, and the teachings that discourage the use of traditional medicines by the members of health extension workers seem to be severe threat to the sustainability of MPs in the study area. This calls for awareness rising on the role of traditional medicines in the primary health care at the Zonal level led by Bureau of Agriculture and Rural Development. Furthermore, introducing the issues of traditional medicines into the school curriculum will help to raise the knowledge and interest of the young generation.

The largest proportion of Kembatta remedial plant species were processed in fresh. This demands newly harvested plant materials for the preparation of remedies, which may intimidate the sustainability of MP in the long run. The truth reveals the necessity of methods/ practices of using appropriate herbals in a dried form or there should be reliable methods to preserve medicinal extracts for the lengthy shelf life. Finally, the documented medicinal plants can be used for future pharmacological research.

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Appendix I. List of medicinal plants used by Kambatta people: ailments treated, Botanical names, family names. Local names (Kambattissa names), habit, plant part used, condition of plant part used (form used), methods of preparation, administration route, ailments treated and voucher number. The values of ICF of each medicinal plant are given in parenthesis following the ailment treated. Abbreviations: Habit- H(Herb), T (tree), S (Shrub), P(perennial); Form used, D (Dried), and F (Fresh).

a. Medicinal Plants list for human ailments

`Scientific and Family names	Local names	Habit	Plant part used	Form used	Mixed with	Route	Ailment treated	voucher no
1.*Acacia abyssinica*Hochst. ex Benth., Fabaceae	Odorraa	T	Gum	D		Oral	Pertussis	MM313
2.*Acanthus sennii* Chiov., Acanthaceae	Chocha	S	Shoots	F/D		Dermal	Eczema	MM 291
3.*Achyranthes aspera* L. , Amaranthaceae	Ambuta	H	Roots	F		Oral	Abdominal complaints	MM 185
4.*Achyrospermum shimper*(Hochst ex Briq.) perkins, Lamiaceae	Zamzameta	S	leaves	F		Oral	Ascariasis	MM 146
5.*Acmella caulirhiza* Del., Asteraceae	Bishibisha	H	leaves	F		Oral	Odontalia	MM09
	Bishibisha	H	leaves	F		Oral	Emaciation	MM 09
	Bishibisha	H	Inflorescence	F		Oral	Tonsillitis	MM 09
	Bishibisha	H	Leaves	F		Dermal	Herpes zoster	MM 09
6.*Aframomum corrorima* (Braun) Jansen, Zingiberaceae	Wokash	H	Seeds	D		Oral	Abdominal complaints	MM314
	Wokash	H	Seeds	D		Oral	Tonsillitis (qoqqera)	MM314
7.*Ajuga integrifolia* D.Don, Lamiaceae	Anamura	H	Leaves	F	19	Dermal	Evil eye	MM142
	Anamura	H	Leaves	F	113, 140	Oral	Ascariasis	MM142
	Anamura	H	Leaves	D		Oral	Rheumatism	MM142
8.*Albizia schimperiana Oliv*, Fabaceae	Ma'ta	T	Barks	F		Oral	Singultus	MM 47
	Ma'ta	T	Barks	F	88	Oral	Abdominal complaints	MM 47
9.*Allium porrum* L., Aliaceae	Sunkutata	H	Bulbs	F	38, 111	Oral	Nephropathy	MM 335
10.*Allium sativum* L., Aliaceae	Tuma	H	Bulbs	F	9	Oral	Diarrhea	MM 206
	Tuma	H	Bulbs	F	9	Oral	Hypertension	MM206
11.*Aloe spp* , Aloaceae	Goti Moquta		Leaves	F			Cold	MM 317
12.*Amaranthus caudatus* L., Amaranthaceae	Halibe	H	Seeds	D	31	Oral	Sunbum	MM 318
13.Amaranthus dubius Theil., Amaranthaceae	Rasulta	H	Seeds	D	31	Oral	Micha	MM 310
14.Anethum foeniculum L. , Apiaceae	Wolenga	H	Roots	F		Oral	Intestinal worms	MM 207
	Wolenga	H	Roots	F		Oral	Abdominal complaints	MM207
15.*Artemisisa absinthium* L. , Asteraceae	Aguffa/natra	H	leaves	F		Oral	Hypertension	MM 147
	Aguffa	H	leaves	F		Dermal	Dandruff	MM 147
	Aguffa/natra	H	Leaves	F		Oral	Aguffa/natra	MM 147
	Aguffa/natra	H	Leaves	F		Oral	Febrile	MM 147
	Aguffa/natra	H	leaves	F	31	Oral	Cough	MM 147
16. *Artemsia afra* Jacq. Ex Wlld , Asteraceae	Artimsa, Natra	H	Leaves	D		Oral	Malaria	MM 256
	serati	S	Roots	F		Oral	Hemorrhoid	MM 225
17.*Asparagus africana* Lam., Asparagaceae	serati	S	Roots	F/D		Dermal	Eczema	MM 225
	serati	S	Roots	F		Oral	Atrophy	MM 225
	serati	S	Roots	F		Oral	Breast pain	MM 225
18.*Bersama abyssinica* Fresen., Melianthaceae	Bitanssa	T	Buds	F	18, 19	Oral	Snake bite	MM321
	Bitanssa	T	Buds	F	19	Oral	Devil sickness	MM321
	Duqetta	H	Leaves	F		Oral	Abdominal complaints	MM273
19. Brucea antidysentrica J. F. Miller, Simaroubaceae	Duqetta	H	Leaves/Seeds	F		Oral	Diarrhea	MM273
	Duqetta	H	Leaves	F		Nasal	Evil eye	MM273
20. *Buddelja polystachya* Fresen, Loganiaceae	Hanfarra	S	leaves	F		Oral	Uterine pain	MM322
21.*Capsicum annuum* L., Solanaceae	Barbaru	H	Seeds	D		Oral	rheumatic gastric pain	MM 382
22.*Carduus camaecephalus* (Vatke) Oliv. And Hiern, Asteraceae	Chua'	H	Roots	F		Oral	Abdominal complaints	MM 227
	Chua'	H	Roots	F	31	Oral	Micha	MM 227
23. *Carica papaya* L., Caricaceae	Papaya	T	Leaves			Oral	Amoebiasis	MM 325
	Papaya	T	Seeds	F/D		Oral	Intestinal worms	MM 325
	Papaya	T	Leaves	F		Oral	Malaria	MM 325
	Pappaaya	S	Fruits	F		Oral	stomachache	MM 325

Contd…

24.*Carissa spinarum* L., Apocynaceae	Atulla	S	Roots	F		Oral	Snake bite	MM 241
	Atulla	S	Roots	F		Oral	Abdominal complaints	MM 241
25. Ceropegia microgaster M. G. G. Gilbert , Asclepiadaceae	Tudichu	L(H)	Leaves	F		Oral/Dermal	Cold	MM 135
26. *Chenopodium ambrsioides* L. , Chenopodiaceae	Gonsidida	H	Leaves	F		Oral	Odontalgia	MM 98
	Gonsidida	H	Leaves	F		Optical	Eye ache	MM 98
27. *Citrus aurantifolia* (Christm) Swingle, Rutaceae	**Lomita**	**T**	**Fruits**	**F**		**Oral**	**Cough**	**MM04**
28.*Clausena anisata* (Willd.) Benth., Rutaceae	Bayxaqqa	S	leaves	F		Oral	Pertussis	MM 330
	Bayxaqqa	S	leaves	F		Oral	Sunburn	MM 330
	Gembaleka	S	leaves	F	88	Oral	Ascariasis	MM 330
	Gembaleka	S	Buds	F	30, 140	Oral	Rheumatism	MM 330
	Gembaleka	S	Leaves	F		Oral	Evil eye	MM 330
29.*Clematis longicaudata* Steud. ex A. Rich., Ranunculaceae	Shishuta	L(H)	Roots	F		Oral	Odontalgia	MM 92
	Shishuta	L(H)	Roots	F		Oral	Tonsillitis	MM 92
30.*Clutia abyssinica* Jaub. &- Spach., Euphorbiaceae	shumtigesha	S	Leaves	F		Dermal	Eczema	MM 333
	shumtigesha	S	Roots	F	76	Oral	Rheumatism	MM 333
31.Coffea arabica L. , Rubiaceae	Buna	T/S	Seeds	D		Dermal	Bleeding	MM 247
	Buna	T/S	Seeds	D	10	Oral	Diarrhea	MM 247
	Buna	T/S	Seeds	D		Dermal	Eczema	MM 247
32.*Commelina benghalensis* L. , Commelinaceae	Laaluncha	H	Latex	F		Dermal	Vitiligo	MM 334
33.Conyza schimperi Sch. Bip. Ex A. Rich , Asteraceae	Natra	H	Shoot	F/D		Dermal	Evil eye	M88
34.Coriandrum sativum, Apiaceae	Wodimamu	H	Inflorescence	F/D		Oral	Abdominal Pain	M308
35. Coronopus didymus (L.) Smith, Brassicaceae	Faranji sunfa	H	Leaves	F		Oral	Abdominal pain	M166
36.*Crotalaria incana* L. , Fabaceae	Chachayena	H	Roots	F		Oral	Diarrhea	MM06
37.Crotalaria plowdenii Bak., Fabaceae	Chachayena	H	Shoots	F		Dermal	Jaundice	MM 301
38.Croton macrostachyus Del., Euphorbiaceae	Mesana	T	buds	F		Dermal	Vitiligo	MM 49
	Mesana	T	Roots	F		Oral	Obesity	MM 316
	Mesana	T	Sap			Dermal	Bleeding	MM 49
	Mesana	T	Barks	D/F	10,86,113	Oral	Intestinal worms	MM 49
	mesana	T	Leaves	F		Oral	Snake bite	MM 49
39.*Cucumis melo* L., Cucurbitaceae	Hababa	L(H)	Fruits	F		Oral	Nephropathy	MM335
40.*Cucurbita pepa* L.	Dabaqula	H	Fruits	D		Oral	Nephropathy	MM 336
41.*Cupressus lusitanica* Mill., Cupressaceae	Faranji Homa	T	Leaves	F		Oral	Typhoid	MM 337
42.*Cymbopogon citratus* (DC.) Stapf., poaceae	Hitichuta	H	leaves	F		Oral	Hypertension	MM 338
	Hitichuta	G	Roots	F		Oral	Abortifacient	MM 338
43.*Cynodon dactylon* L., Poaceae	Qorixxu	G	whole plant	F		Dermal	Snake bite	MM 339
44.*Cynoglossum coeruleum* Steud. ex DC. , Boraginaceae	Kacheba	H	Leaves	F		Dermal	Hemorrhoid	MM 165
45.*Cyperus fischerianus* A. Rich.,Cyperaceae	Na'qqa	H	Roots	F		Oral	Dingategna	MM141
46.*Datura stramonium* L. , Solanaceae	Machareqqa	H	Leaves	F		Oral	Dog bite	MM 339
	Machareqqa	H	Seeds	D		Oral	Odontalgia	MM 339
47.*Dichrocephala integifolia (*L.F.O) Kuntze , Asteraceae	Higme	H	Inflorescence	F		Dermal	Hemorrhoid	MM 74
48.*Dodonaea angustifolia L.F.*, Sapindaceae	kitkita	S	Leaves	D	61	Oral	Intestinal worms	MM 41/02
49.*Dovyalis abyssinica* (A. Rich.) Warb , Flacourtiaceae	Koshima	S	Leaves	F		Oral	Tonsillitis	MM 343
50.Echinops kebericho Mesfin , Asteraceae	Tossa	H	Roots	F/D		Oral	Abortifacient	MM 205
	Tossa	H	Roots	F		Nasal	Epilepsy	MM 205
	Tossa	H	Roots	F		Nasal	Epistaxis	MM 205
	Tossa	H	Roots	F/D		Oral	Atrophy	MM 205
	Tossa	H	Roots	F/D		external	Devil sickness	MM 205
	To'ossa	H	Roots	F/D		Oral	Dingategna	MM 205
	Tossa	H	Roots	F		Oral	Tonsillitis	MM 205
51.*Elusine coracana (L.) Gaertn.*, Poaceae	Fagajit	H	Seeds	D		Oral	bone setting	MM320
52.*Ekebergia capensis* Sparrm , Meliaceae	Olonchuta	T	Barks	F	17	Oral	Odontalgia	MM377

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53.Ensete ventricosum	Wesse	H (P)	Corm	F		Oral	Abortifacient	MM 244
(Welw) Cheesman , Musaceae	wesse	H (P)	Pseudostem	F		Oral	Amoebiasis	MM 244
	Oniya	H (P)	pseudostem	F		Dermal	Tinea corporis	MM 244
54.*Eucalyptus globulus Labull*., Myrtaceae	Woju barzafa	T	Leaves/Seeds	F/D		Oral/Nasa/	Epilepsy	MM346
	wojjuu baarzaffa	T	Leaves /seeds	F/D		Oral /Nasal	Cough	MM344
55.Euphorbia dumalis S. Carter , Euphorbiaceae	Gendele'illata	H	whole plant	F	38	Oral & Dermal	Anorexia	MM347
56.*Euphorbia tirucalli* L., Euphorbiaceae	Hinchibeta/Charata	S	Latex	F	31	Dermal	Hemorrhoid	MM245
57.*Faurea rochetiana Serm* , Proteaceae	Futeta	T	leaves	F		Dermal	Snake bite	MM31
58.Girardinia bullosa Wedd , Urticacaeae	Dobita	S	Roots	F		Oral	Singultus	MM72
59.*Gloriosa superb* L., Liliaceae	Sidita	H	Roots	F		Oral	Abdominal complaints	MM196
60.*Guizotia* scabra (Vis.) Chiov. , Asteraceae	Shesha-a	H	leaves	F		Dermal	wound /cut	MM348
61.*Hagenia abyssinica* (Bruce) J. F. Gmel., Rosaceae	Xenchuta	T	Inflorescence	D	48	Oral	Intestinal worms	MM376
62.*Helianthus annuus* L , Asteraceae	Nuga	H	Seeds	D		Oral	Anorexia	MM251
63.*Hordeum vulgare* L., Poaceae	Soa'	G	Seeds	D	96	Oral	Cold	MM349
64.*Hypericum peplidifolium* A. *Rich.* , Hypericaceae	Wosha babbarru	H	Roots	F		Oral	Pertussis	MM378
65.*Hypericum revolutum vahl* , Guttiferae	Wobexi haqqa	S	Leaves	F		dermal	disinfectant	MM381
66.*Hypoestes forskaolii* (Vahl) R. Br. , Acanthaceae	Omorutta	H	Leaves	F		Auricular	Ear ache	MM03
	Omorutta	H	Leaves	F		Oral	Sunburn	MM03
	Omorutta	H	Leaves	F		Nasal	Cough	MM03
	Omorutta	H	Leaves	F		Optical	Eye ache	MM03
	Omorutta	H	Leaves	F		Nasal	Febrile	MM03
	Omorutta	H	Leaves	F		Nasal	Micha	MM03
67.*Hypoestes sp., Acanthaceae*	Umbatta	H	Leaves	F		Oral	Jaundice	MM135
68.*Indigofera schimperi* Jaub. & Spach var. schimperi. , Fabaceae	Haqa	S	Leaves	D		Dermal	Eczema	MM298
69.*Jasminum abyssinicum* Hochst. ex DC., Oleaceae	Hagichu/ Toshichu	L	Shoots	D		Dermal	Eczema	MM161
	Hagichu/ Toshichu	L	Leaves	F		Nasal	Epilepsy	MM161
70.*Juniperus procera Hochst Hochst. ex Endl.* , Cupressaceae	Abash Homa	T	leaves	F		Oral	Typhoid	MM287
	Abash Homa	T	leaves	F		Oral	Uterine pain	MM287
	Abash Homa	T	Barks	F		Oral	Tonsillitis	MM287
71.*Justitia schimperana*	Gulbanna	S	Leaves	F		Oral	Abdominal complaints	MM243
(Hochst.ex Nees) T.Anders, Acanthaceae	Gulbanna	S	Leaves	F		Oral	Jaundice	MM243
	Gulbanna	S	Leaves	F		Oral	Malaria	MM243
	Gulbanna	S	Buds	F		Oral	Rabies	MM243
72.*Kalanchoe petitiana A.Rich*, Acanthaceae	Hanchura	H	Seeds	D		Oral & Dermal	labour facilitation	MM289
	Hanchura	S	leaves	F		Dermal	Rheumatism	MM289
73.*Kniphofia foliosa* *Hochst.*, Asphodelaceae	Onshololuta	H	Roots	F		Oral	Pertussis	MM69
	Onshololuta	H	Roots	F		Oral	Goiter	MM69
74.*Lepidium sativum* L. , Brassicaceae	sunfa	H	Seeds	D	31	Oral	Pertussis	MM234
	Sunfa	H	Seeds	D	31	Oral	Sunburn	MM234
	sunfa /feto	H	Seeds	D	31	Oral	Abdominal complaints	MM234
	Sunfa	H	Seeds	D	31	Oral	Heart failure	MM234
	sunfa /feto	H	Seeds	F	31	Oral	Micha	MM120
75.Leucas Calostachys Oliv , Lamiaceae	Qibbatora	H	Leaves	F		Oral	Abdominal complaints	MM186
76.*Leucas stachydiformis*	Xinbebela	H (P)	Leaves	F		external	Eye ache	MM13
(Hochst. ex Benth.) Briq. , Lamiaceae	Xinbebela	H (P)	Leaves	F/D		Oral	Abdominal complaints	MM13
	Xinbebela	H (P)	Leaves	F		Oral	Ascariasis	MM13
77. *Linum usitatissimum* L., Linaceae	Talba	H	Seeds	D		Oral	Breast pain	MM248
	Talba	H	Seeds	D		Oral	stomachache	MM248
	Talba	H	Seeds	D		Oral	Constipation	MM248
	Talba	H	Seeds	D		Oral	Amoebiasis/Giardiasis	MM248
	Talba	H	Seeds	D		Oral	Uterine pain	MM248
78.*Lysimachia ruhmeriana* Vatke , Primulaceae	Wosha bashinqa	H	Roots	F		Oral	Cough	MM02
	Wosha bashinqa	H	Roots	F		Oral	Tonsillitis	MM02

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79.*Melia azedarach* L., Meliaceae	Milla	T	Barks	F		Oral	Intestinal worms	MM290
80. *Mentha spicata* L., Lamiaceae	Naanna	H	Leaves	F	24, 27	Oral	Hypertension	MM350
81.*Mikaniopsis clematoides* *(A.Rich) M.Redh.,* Asteraceae	Bukukuta	L(H)	Roots	F			Glandular disease	MM303
82.*Millettia ferruginea* (Hochst.) Bak.., Fabaceae	Hengezena	T	Barks	F		Oral	Pertussis	MM 379
83.*Momordica foetida* Schumach, Cucurbitaceae	Wori rebuta	L(H)	Buds	F		Oral	Tonsillitis	MM01
	Wori rebuta	L(H)	Leaves	D		Dermal	wound /cut	MM01
	Wori rebuta	L(H)	Roots	F	71, 83	Oral	Atrophy	MM01
	Wori rebuta	L(H)	Shoots	F		Dermal	Herpes zoster	MM01
84.*Monopsis stellariodes* (Presl) Urb., Lobeliaceae	Dukuchita	H	Leaves	F		Auricular	Ear ache	MM299
85.*Nicotiana tabacum* L., Solanaceae	Tumbe-oo	H	leaves	F	19, 38	Oral	Herpes zoster	MM207
86.*Nigella sativa* L. , Ranunculaceae	Gambelata Xagutta	H	Seeds	D		Oral	Abdominal complaints	MM239
	Gambelata Xagutta	H	Seeds	D		Oral	Cough	MM239
87.*Ocimum urticifolium* Roth.S.Lat , Lamiaceae	Barxxula/Mic-hi zebu	S	shoots	F		Oral	Febrile	MM120
	Barxxula/Mic-hi zebu	S	Leaves	F		Oral	Abdominal complaints	MM120
88.*Ocimum lamiifolium* Hochst. ex Benth.	Minatofa	H	leaves	F		Nasal	Headache	MM352
Hochst. Ex Benth., Lamiaceae	Minatofa	H	leaves	F		Oral	Febrile	MM352
	Minatofa	H	leaves	F		Nasal	Micha	MM191
89.*Olea europaea L. ssp. cuspidata*(Wall. ex DC.) Cifferri , Oleaceae	Weirra	T	Leaves	F	38, 105	Oral	Odontalgia	MM353
90.*Olinia rochetiana* A. Juss. , Oliniaceae	shoo'emolutta	S	Barks	F		Oral	Pertussis	MM131
	shoo'emolutta	S	Barks	F		Oral	Odontalgia	MM131
	shoo'emolutta	S	Barks	F		Oral	Abdominal complaints	MM131
	sho'emolutta	S	buds	F		Optical	Eye ache	MM131
91.*Oncocalyx g1abratus* (Engl.) M. Gilbert , Loranthaceae	chati kurumu	S	Shoots	F	9	Oral	Gonorrhea	MM354
92.*Orthosiphon suffrutescens* J. K , Lamiaceae	Anganbisha	H (P)	Leaves	F		Nasal	Micha	MM89
93.*Osyris quadripartita* Decne , Santalaceae	Ka'arruta	S	Barks	F		Oral	Jaundice	MM355
94.*Oxalis corniculata* L., Oxalidaceae	Shimale /Chichile	H	Shoots	F		Dermal	Eczema	MM170
	Shimale	H	Shoots	F		Dermal	Scabies	MM170
	Shimale	H	Shoots	F		Dermal	Hemorrhoid	MM170
	Shimale	H	Roots	F		Oral	Sore throat	MM170
	Shimale	H	Shoots	F		Dermal	wound /cut	MM170
	Shimale	H	leaves	F		Oral	Tonsillitis	MM170
95.*Pavetta abyssinica* Fresen , Rubiaceae	Fugi Miqichuta	S	Buds & Seeds	F		Nasal	Epilepsy	MM253
	Fugi Miqichuta	S	Leaves	F		Nasal	Epistaxis	MM253
	Fugi Miqichuta	S	Seeds	D		Oral	Malaria	MM253
	Fugi Miqichuta	S	Buds & Seeds	D		Oral & Dermal	Evil eye	MM253
	Fugi Miqichuta	S	Buds/ Seeds	F		Oral & Dermal	Rheumatism	MM253
96.*Pavonia urens* cav, Malvaceae	Merqeqena	H	Roots	F		Oral	Abdominal complaints	MM206
	Merqeqena	H	Roots	F		Oral	Constipation	MM206
97.*Persicaria senegalensis* (Meisn.) Sojak Preslia, Polygoniaceae	Olaqaa	H	whole plant	F	63	Oral	Abortifacient	MM294
98.*Phaseolus vulgaris L.*, Fabaceae	Wokitta	H		D		Oral	Jaundice	MM356
99.*Phytolacca dodecandra L Herit.*, Phytolaccaceae	Harraanja	S	Roots	F		Dermal	Scabies	MM357
100.*Piper capense* L., Piperaceae	Ximzi	H	Fruits	F	21	Oral	Sore throat	MM173
101.*Plantago africana* Verdc., Plantaginaceae	Boqqe	H	Roots	F		Oral	Sore throat	MM359
102.*Plantago lanceolata* L., Plantaginaceae	Boqqe	H	whole plant	F		Dermal	Hemorrhoid	MM360
	Boqqe	H	Roots	F		Oral	Tonsillitis	MM360
	Boqqe	H	whole plant	F		Nasal /Dermal	Jaundice	MM360
103.*Plectranthus punctatus subsp. edulis* (Vatke) Morton , Lamiaceae	Sheshe dinikata	H	Leaves	F		Oral	Malaria	MM297
104 Podocarpus *falcatus* (Thunb.) Mirb. , Podocarpaceae	Zagib aqomaada	T	Gum	D		Oral	Pertussis	MM361
	Zagib aqqommada	T	Gum	D		Oral	Anorexia	MM361
	Zagba	T	Gum	D		Dermal	Atrophy	MM361
	Zagibba	T	Gum	D		Dermal	Eczema	MM361
105 *Premna schimperi* Engl., Lamiaceae	Xoxxanqqetta	T	Leaves	F		Dermal	Eye ache	MM99/02
106 *Prunus africana* (Hook. f.) Kalkm , Rosaceeae	Gerbbaa	H	Barks	F		Oral	Nephropathy	MM101/02
107 *Punica granatum* L., Punicaceae	Romana	S	Seeds	D	88	Optical	Eye ache	MM375

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108 Pycnostachys abyssinica Fresen , Lamiaceae	Tontona	S	whole plant	F		Oral	Antiemetic	MM176
	Tontonna	S	whole plant	F		External	Cholera	MM176
	Tontonna	S	Leaves	F		External	Insectifuge	MM176
	Tontona	S	Leaves	F	76, 104	Oral	Ascariasis	MM176
	Tontonna	S	Roots	F		Oral	Malaria	MM176
	Tontona	S	Leaves	F		Oral	Micha	MM29
	Tontona	S	Leaves	F	76, 104	Oral	Diarrhea	MM176
	Tontonna	S	Leaves			Optical	Eye ache	MM176
	Tontona	S	Leaves	F		Oral	Abdominal complaints	MM176
109.*Ranunculus murlifidus* Forssk, Ranunculaceae	Anshichuta'	H	Leaves	F		Dermal	Glandular disease	MM17
	Anshichuta'	H	Shoots	D		Dermal	Eczema	MM17
110.*Rubia cordifolia* L., Rubiaceae	Ha'ruta	L/H	Roots	F		Oral	Micha	MM364
111.*Rumex abyssinicus* Jacq., Polygoniaceae	Shishonda	H	Roots	F		Oral	Nephropathy	MM362
	Shishonda	H	Roots	F		Oral	Jaundice	MM362
112.*Rumex nepalensis* Spreng , Polygoniaceae	Kashala Go'echu	H	Roots	F		dermal	Dandruff	MM18
	Kashala Go'echu	H	Roots	F		Oral	Anorexia	MM18
	Kashala Go'echu	H	whole plant	F		Dermal	Hemorrhoid	MM18
	Kashala Go'echu	H	Roots	F	22, 113	Dermal	wound /cut	MM18
	Kashala Go'echu	H	whole plant	F		Oral	Nephropathy	MM18
	Kashala Go'echu	H	Roots	F		Oral	Tonsillitis	MM18
113.*Ruta chalepensis* L., Rutaceae	Xelachuta	S	Leaves	F		Nasal	Evil eye	MM250
	Xalachuta	H	Leaves	F		Oral	Febrile	MM250
	Xalachuta	H	leaves	F		Oral	Abdominal complaints	MM250
114.*Saccharum officinarum L.*, Poaceae	**Shonkora**	**G**	**Stems**	**F**		**Oral**	**Gastritis**	**MM363**
115.*Salvia nilotica* Jacq , Lamiaceae	Gambela Go'ichu	H	Roots	F		Oral	Abdominal complaints	MM15
116.*Santolina chamaccyparis* L., Asteraceae	Faranje Agufa	H	Leaves	F		Oral	Uterine pain	MM148
	Faranje Agufa	H	Leaves	F		Oral	Febrile	MM148
117.*Schefflera abyssinica(Hochst. ex A.Rich.) Harms,* Araliaceae	Gatame	H	Barks	F		Oral	Tonsillitis	MM108/02
	Gatame	H	Barks	F		Oral	Odontalgia	MM108/02
118 *Schrebera alta Welw., Oleaceae*	Kebela'qa	T	bark	F		Oral	Odontalia & Febrile	MM180
119.*Securidaca longipedunculata* Fresen , Polygalaceae	Sanganna	S	Roots	F/D		Oral	Sudden sickness	MM167
	Sanganna	S	Roots	F/D		Oral	Febrile	MM167
	Sanganna	S	Roots	F/D		Oral	Headache	MM167
	Sanganna	S	Roots	F/D		Oral	Abdominal complaints (	MM167
120.Senna obtusifolia (L.) Irwin & Bameby , Fabaceae	Chachayen hengezena	S	Leaves	F		Dermal	Amooebiasis/Giardiasis	MM14
	Chachayen Hengezena	S	Leaves	F		Dermal	Dandruff	MM14
	Che'aa/Senna	S	Leaves	F		Oral	Diarrhea	MM14
121. *Senna occidentalis* (L.) Link	Che'aa/Senna	S	Seeds	D	135	Dermal	Eczema	MM280
	Che'aa/Senna	S	Seeds	D	31, 135	Oral	Diarrhea	MM280
122.*Senna petersiana* (Bolle) Lock , Fabaceae	Che'aa	S	Roots	F	38	Oral & Dermal	Freckle	MM364
	Che'aa	S	Roots	F	38	Oral & Dermal	Micha	MM133
123. Senna septemtrionalis, (Viv.) Irwin& Bameby, Fabaceae	Sena (Kem)	S	Seeds	D	31	Oral	Burn	MM365
	sena	S	Seeds	F		Oral	Abdominal complaints	MM365
	Senna	S	Seeds	D		Oral	Headache	MM365
124. *Sida schimperiana Hochst. Ex Rich.,* Malvaceae	Xurazoo	S	Stems	D		Dermal	Glandular disease	MM70
	Xurazoo	S	Roots	F		Oral	Diarrhea	MM372
125.*Solanecio mannii (Hook.f.) C. JefJrey ,* Asteraceae	Fugi malaata	S	leaves	D		Oral	Intestinal worms	MM366
126.*Solanum gigantum Jacq., Solanaceae*	Ziza	S	Leaves	F	125	Dermal	Breast Pain	MM208
127.*Solanum incanum* L. , Solanaceae	Maahe'ta	H	Leaves	F		Nasal	Epistaxis	MM278
	Maahe'ta	H	Roots	F		Oral	Abdominal complaints	MM278
	Maahe'ta	S	Roots	F		Nasal	Headache	MM278
	Maahe'ta	S	Seeds	D		Oral	Tonsillitis	MM278
128.Solanum macrocarpon poir., Solanaceae	Buluta	H(P)	Leaves	F		Oral	Chest pain	MM168
	Buluta	H(P)	Leaves	F		Oral	Emaciation	MM168
	Buluta	H(P)	Leaves	F		Oral	Pertussis	MM168
	Buluta	H(P)	Leaves	F		Oral	Jaundice	MM168

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`Scientific and Family names	Local names	Habit	Plant part used	Form used	Mixed with	Route	Ailment treated	voucher no
129.*Stephania abyssinica* (dell ex A.rich) Walp , Menispermaceae	Ma'ira	L(H)	Leaves	F		Dermal	Burn	MM63
	Kalalata	L(H)	Roots	F		Oral	Pneumonia	MM63
131.*Teclea nobilis* Del., Rutaceae	Adarchchu	S	Leaves	F		Oral	Anorexia	MM367
	Adarchchu	S	Leaves	F		Oral	Ascariasis	MM367
130.*Thalictrum rhynchocarpum Dillon & A.Rich* , Ranunculaceae	Filitita	H	Roots	F		Oral	Pertussis	MM328
	Filitita	H	Roots	F		Oral	Evil eye	MM05
	Filitita	H	Roots	F		Oral	Febrile	MM05
	Filitita	H	Roots	F	5	Oral	Jaundice	MM05
	Filitita	H	Roots	F		Oral	Herpes zoster	MM05
	Filitita	H	Roots	D	9, 10, 86	Oral	Snake bite	MM328
132.*Thymus schimperi* Roninger , Lamiaceae	Zazanchut	H	leaves	F		Oral	Hypertension	MM369
133.*Trichilia prieuriana* A. Juss , Meliacae	Beshinqa	T	whole plant	F		Oral	Jaundice	MM370
134.*Trifolium rueppellianum* Fresen, Fabaceae	Godoro-oo'	H	Leaves	F		Auricular	Ear ache	MM371
	Godoro-oo'	H	Leaves	F		Oral	Constipation	MM371
	shu'oota	H	Seeds	F		Oral	Nephropathy	MM254
135.*Trigonella foenum-graecum* L., Fabaceae	shu'oota	H	Seeds	D		Oral	Abdominal complaints	MM254
136.*Triticum polonicum* L., Poace	gardamu	H	Seeds	D		Oral	bone setting	MM345
137.*Urtica simensis* Steudel , Urticaceae	Dobita	H	Roots	F		Oral	Cold	MM373
138.*Venonia urticifolia A. Rich*., Asteraceae	Germoti Xudichu	S	Leaves	F	22, 38	Dermal	Mumps	MM49
139.*Verbena officinalis* L. , Lamiaceae	Modolita	H	Leaves	F		Oral	stomachache	MM133
	Modolita	H	Leaves	F		Optical	Eye ache	MM133
	Modolita	H	Leaves	F	38	Oral	Anorexia	MM133
	Modolita	H	Leaves	F		Oral	Febrile	MM133
	Modolita	H	Leaves	F		Oral	Bleeding	MM133
	Modolita	H	Leaves	F		Nasal	Epistaxis	MM133
	Modolita	H	Leaves	F		Oral	Cough	MM133
	Modolita	H	Leaves	F		Nasal	Micha	MM133
140.*Vernonia amygdalina* Del , Asteraceae	He'ba	S	Buds	F	30	Oral	Rheumatism	MM374
	He'ba	S	Buds	F	30, 31, 71	Oral	Cold	MM374
	He'ba	S	leaves	F		Oral	Plancetal expeller	MM374
	He'ba	S	leaves	F		Oral	Malaria	MM374
	He'ba	S	leaves	F	63	Oral	Bleeding	MM374
	He'ba	S	Leaves	F		Dermal	wound /cut	MM374
	He'ba	S	leaves	F		Oral	Ascariasis	MM374
141.*Vernonia auriculifera* Hiern , Asteraceae	Rejja/barawa	S	Leaves	F		dermal	wound /cut	MM177
142.*Vicia faba* L. , Fabaceae	Bakela	H	Seeds	D		Dermal	Tinea corporis	MM307
143.*Withania somnifera* Dunal , Solanaceae	Gizawa	H	Roots	F		Oral	Evil eye	MM139
	Gizawa	H	Roots	F		Oral	Micha (fibrile)	MM176
144.*Ximenia americana* L.	Hue'la	S	whole plant	F		Dermal	Rheumatism	MM87
145.Zingiber officinale, Oleaceae Rosc.	Jangibelu	H	Rhizomes	F/D		Oral	Abdominal complaints	MM380
	Jangibelu	H	Rhizomes	F		Oral	Tonsillitis	MM380