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Research Article

Herbal knowledge on plants treating human and livestock diseases in Womberma District, Amhara Regional State, North West Ethiopia

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Abstract

Ethnobotanical studies are particularly important in regions with high ethnic, linguistic, and religious diversity. This study documented medicinal plants and associated traditional knowledge used by different ethnic groups in Womberma District, Ethiopia. Data were collected between February and September 2021 through semi-structured interviews, focus group discussions, guided field observations, and market surveys. The data were analyzed using informant consensus factor (ICF), fidelity level (FL), preference ranking, direct matrix ranking, and one-way ANOVA. A total of 105 medicinal plant species were recorded, including 82 (78.1%) used for human ailments, 11 (10.5%) for livestock ailments, and 12 (11.4%) for both. Herbs were the dominant growth form (44.8%), while leaves were the most commonly used plant part (33.3%). Most remedies were prepared from fresh materials (65.9%) and administered orally (54.5%). Respiratory ailments showed the highest ICF value (97%). *Zehneria scabra*, *Rumex nervosus*, *Piper nigrum*, and *Acmella caulirhiza* exhibited 100% fidelity levels for treating MICH, evil eye/spirit, ascariasis, and tonsillitis, respectively. Significant variation was observed among ethnic groups in the number of medicinal plants cited (P = 0.001). The findings highlight the continued importance of traditional medicine in Womberma District. However, limited conservation efforts threaten these valuable medicinal resources, emphasizing the need for their sustainable management and conservation.

Keywords*:* Conservation, Ethnic groups, Indigenous knowledge, Threats, Ethnobiology

1. INTRODUCTION

Ethnobotany is the study of the relationships between people and plants, particularly how plants are used for food, medicine, shelter, clothing, fuel, and other essential needs (Alemu et

al., 2024). It aims to document and preserve traditional knowledge related to plant utilization, including medicinal practices used for both human and livestock healthcare (Alemu et al., 2024; Derso et al., 2024). Human societies have long depended on plants for their survival and well-being, and much of today's biological, economic, and cultural heritage is rooted in generations of plant knowledge and innovation (Voeks and Nyawa, 2011). The close interaction between humans and plants has played a fundamental role in shaping livelihoods and healthcare systems worldwide (Posey, 1999).

Medicinal plants continue to serve as the primary source of healthcare for a large proportion of the global population, particularly in developing countries. Approximately 90% of people in these regions rely on traditional medicine for their healthcare needs, with medicinal plants forming a major component of these practices (Bako et al., 2005). In Ethiopia, traditional medicine remains an integral part of healthcare, with about 80% of the human population and 90% of livestock depending on traditional remedies. Furthermore, nearly 95% of these remedies are derived from medicinal plants (Mekonnen et al., 2022; Birhan et al., 2023).

Despite their widespread use and importance in treating various diseases (Demisse et al., 2001; Mounkaila et al., 2017), medicinal plants and the indigenous knowledge associated with them are increasingly threatened. Factors such as population growth, agricultural expansion, overgrazing, and deforestation have contributed significantly to the decline of medicinal plant resources and traditional knowledge systems (Jeddi et al., 2021; Bitew et al., 2022; Misganaw et al., 2025). Moreover, ethnobotanical research in Ethiopia remains inadequate relative to the country's rich floristic diversity and cultural heterogeneity, particularly in areas inhabited by multiple ethnic groups (Mesfin et al., 2009).

Womberma District offers a unique opportunity for ethnobotanical investigation due to its cultural diversity and ecological richness. The district is inhabited by several ethnic groups, including the Amhara, Agew, Oromo, and Gumuz communities, which have coexisted peacefully for generations. This long-standing interaction has facilitated the exchange and preservation of traditional medicinal knowledge, resulting in a rich and diverse ethnobotanical heritage. Such multicultural settings often contribute to the accumulation and transmission of valuable indigenous knowledge regarding medicinal plant use.

In addition, Womberma District encompasses diverse agroecological zones, ranging from lowland to midland environments. These ecological variations support a wide range of plant

species, including numerous medicinal plants utilized by local communities. The combination of cultural diversity and biological richness makes the district an important area for documenting traditional medicinal practices and plant resources.

Therefore, this study was undertaken to document medicinal plants used for human and livestock healthcare and to record the associated indigenous knowledge of the ethnic communities in Womberma District. Documenting this knowledge is essential for preserving cultural heritage, supporting biodiversity conservation, and providing a foundation for future pharmacological, ethnobotanical, and community-based healthcare research.

2. MATERIALS AND METHODS

2.1 study area

Womberma District is located in the West Gojjam Zone of the Amhara Regional State, Ethiopia. The district is inhabited by diverse ethnic groups, including the Amhara, Oromo, Gumuz, and Agew peoples, with a total population of 134,077. It is bordered by Awi Zone to the north, Benishangul-Gumuz Regional State to the west, Oromia Regional State to the south, and Burie Zuria District to the east. Geographically, the district lies between 10°10′00″ and 10°40′00″ N latitude and 36°40′00″ and 37°00′00″ E longitude (Figure 1).

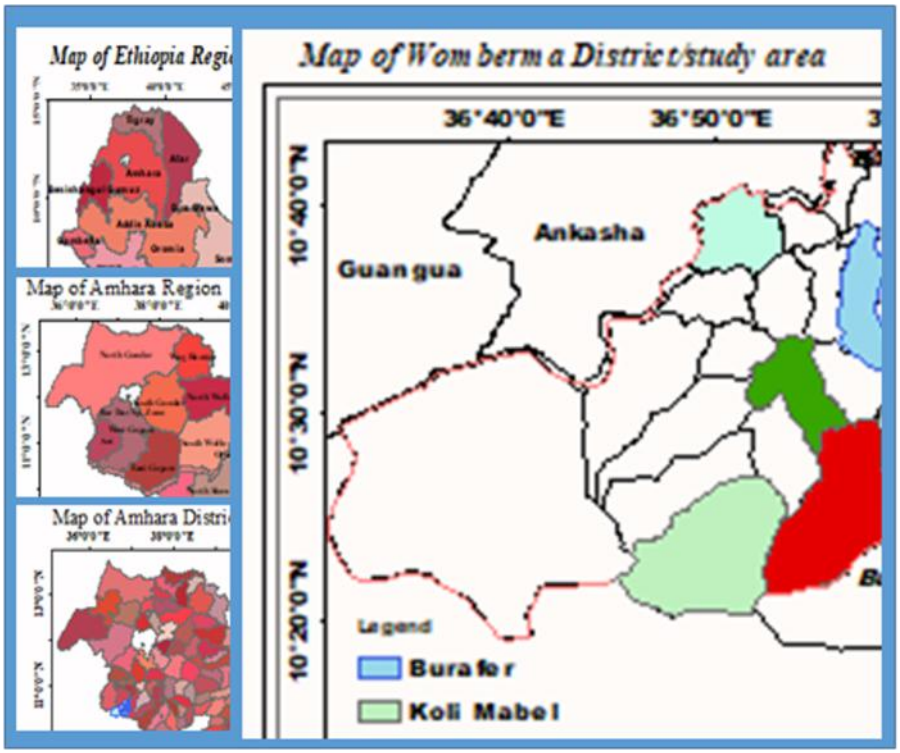


Figure 1. Map of Ethiopia, Amhara regional state at Zonal and District level respectively, and Womberma District developed by GIS accessed mapping agency, Ethiopia.

2.2 Study site and informant selection

Five kebeles, Koli Mabil, Weynma Ases, Wogedad Yayishal, Wazingis Wogereb, and Burafer, were purposively selected from the 21 kebeles of Womberma District based on their ethnic diversity, vegetation cover, and the availability of traditional medicinal knowledge. Within each selected kebele, households were stratified according to ethnic affiliation, and informants were sampled from each stratum.

According to administrative records, Koli Mabil had a population of 1,979 distributed across 312 households, including 221 mixed Amhara–Oromo–Gumuz households, 61 Oromo households, and 30 Gumuz households. Wazingis Wogereb had 10,500 residents in 1,932 households, of which 1,906 were mixed Amhara–Agew households and 26 were Agew households. Weynma Ases contained 7,184 people in 1,960 households, comprising 1,888 mixed Amhara–Oromo households and 72 Oromo households. Wogedad Yayishal had 8,025 residents in 1,842 households, all belonging to the Amhara ethnic group. Similarly, Burafer had 6,072 residents in 957 households, all of whom were Amhara.

A total of 132 informants, including 120 general informants and 12 key informants, were selected using a combination of random and purposive sampling techniques. The sample size was determined following the formula proposed by Kothari (2004):

$$n = \frac{z^2 pq}{e^2}.$$

where n is the required sample size, Z is the standard normal deviate corresponding to the desired confidence level, p is the probability of success, q = 1 − p is the probability of failure, and e is the acceptable sampling error. This formula was applied because the study population was less than 10,000.

The selected informants comprised 105 Amhara, 15 Oromo, 6 Gumuz, and 6 Agew participants. Both male and female informants, aged between 25 and 88 years, were interviewed. In addition, 12 key informants representing different ethnic groups and selected kebeles participated in focus group discussions to validate and enrich information on medicinal plants and associated indigenous knowledge.

2.3 Ethical consideration

Prior to data collection, an official support letter was obtained from Debre Markos University. Additional permission letters were subsequently secured from the Womberma District

Administration and addressed to the respective kebele chairpersons. After obtaining the necessary permissions, the objectives and significance of the study were clearly explained to the participants, and oral informed consent was obtained from traditional healers before conducting the interviews.

2.4 Ethnobotanical data collection tools and techniques

Primary data were collected through semi-structured interviews, focus group discussions, field observations, and market surveys. Secondary data were obtained from relevant literature and socio-demographic records available from district administrative offices. Interviews were conducted primarily in Amharic, with translation into Awigni, Gumuz, and Afan Oromo provided whenever necessary to facilitate effective communication with informants.

2.5 Plant specimen collection and identification

Medicinal plant specimens reported by informants for their therapeutic uses were collected, labeled, pressed, and dried following standard herbarium procedures. Species identification was carried out at the Debre Markos University (DMU) Herbarium using the Flora of Ethiopia and Eritrea. The identifications were further verified through comparison with authenticated reference specimens housed at the National Herbarium of Addis Ababa University.

2.6 Ethnobotanical data analysis

Data on medicinal plant preparation methods, routes of administration, ailments treated, dosage practices, plant parts used, growth forms, threats, and conservation status were analyzed using descriptive statistics, including frequencies and percentages. Variations in medicinal plant knowledge among different socio-demographic groups, including ethnic communities, were assessed using one-way analysis of variance (ANOVA). In addition, ethnobotanical analytical tools such as the Informant Consensus Factor (ICF), Fidelity Level (FL), preference ranking, and direct matrix ranking were employed to evaluate the cultural significance, effectiveness, and utilization patterns of medicinal plants.

2.6.1 Informant Consensus Factor (ICF)

The Informant Consensus Factor (ICF) is used to identify the most important disease categories within a study area and to determine potentially effective medicinal plant species used for treating those ailments. It is calculated using the following formula (Heinrich, 1998):

$$\text{ICF} = \text{Nuc-NS/ Nuc } -1\frac{n_{ur}-n_t}{n_{ur}-1};$$

Where n_{uc} is the number of citations in disease category, n_t, Ns= number of species used.

2.6.2 Preference Ranking

This method involves requesting informants to identify medicinal plants commonly used to treat a specific disease of interest within the study area or community. The identified species are then ranked according to their perceived effectiveness or preference, with the most important species assigned the highest score and the least preferred given the lowest score (typically 1). The scores provided by all informants are summed, and species with the highest aggregate values are considered the most preferred medicinal plants in the study area.

2.6.3 Direct Matrix Ranking

Direct matrix ranking, an extension of preference ranking, is used to evaluate plant species based on their multiple use values (Martin, 1995; Cotton, 1996). This method helps identify the various uses of medicinal plants and assess the level of anthropogenic pressure exerted on them within the community. Informants assigned use scores to each species based on their importance for different purposes (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used, and 0 = not used). The scores were averaged for each species, and the resulting mean values were used to rank the plants accordingly.

2.6.4 Fidelity Level Index

The Fidelity Level Index is a widely applied approach in ethnomedicinal studies used to assess and compare the relative healing importance of medicinal plants. Fidelity Level (FL) is determined using the formula: $FL = (Ip / Iu) \times 100$, where Ip refers to the number of informants who independently report using a particular plant species to treat a specific ailment, and Iu represents the total number of informants who cite that plant for any medicinal use (Alexiades, 1996).

3. RESULTS AND DISCUSSION

3.1. Medicinal plants in the study areas

A total of 105 medicinal plant species, representing 72 genera and 53 families, were collected, identified, and documented in the present study, indicating a high level of medicinal plant diversity in the study area. This richness is comparable to findings from other regions of Ethiopia, including Sekela District, which reported 121 species (Dessie and Amsalu, 2024), and Dibatie District, with 170 species (Anbessa et al., 2024). Such variation in species richness across study areas may be attributed to differences in ecological conditions, vegetation types, sampling intensity, and the extent of indigenous knowledge.

Among the recorded plant families, Fabaceae was the most dominant, contributing 11 species (10.47%), followed by Asteraceae with 8 species (7.62%) (Table 1). The dominance of Fabaceae may be explained by its wide ecological adaptability, evolutionary success, nitrogen-fixing capability, and effective dispersal mechanisms across diverse environments (Oyebanji et al., 2023).

Regarding the sources of medicinal plants, the majority of species were harvested from the wild (70.47%), followed by home gardens (20.95%), while 8.57% were obtained from both wild and cultivated sources. This pattern aligns with reports from other ethnobotanical studies in Ethiopia, including Enemay District (55.43%) (Birhan et al., 2023) and Sekela District (70%), which similarly highlight a strong reliance on wild-harvested medicinal plant resources. This dependence underscores the need for conservation strategies to ensure the sustainable utilization of these species.

In the study area, a total of 52 human ailments were treated using 94 medicinal plant species, of which 82 species were used exclusively for human healthcare and 12 were used for both human and livestock ailments. In contrast, livestock healthcare involved a smaller number of species, with 13 ailments treated using 23 medicinal plants (Table 1). This disparity may reflect the greater diversity of human health conditions recognized by local communities, as well as a higher reliance on traditional medicine for human healthcare needs.

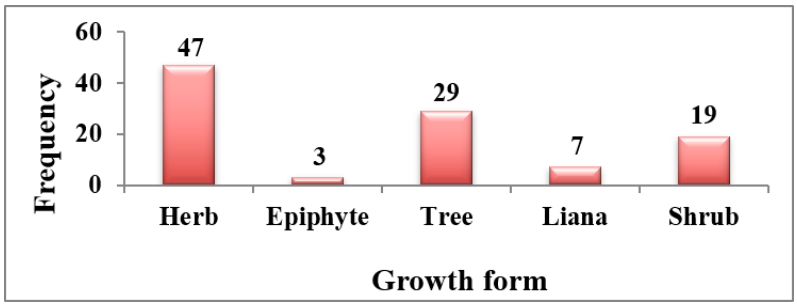


Figure 2. Habits of medicinal plants in Womberma District

3.2. Habit of medicinal plants in the study area

The analysis of growth forms of the recorded medicinal plant species revealed that herbs were the most dominant life form, comprising 47 species (44.76%), followed by trees with 29 species (27.61%) (Figure 2). This indicates that herbaceous plants represent the largest proportion of medicinal plant resources in the study area. The predominance of herbs may be linked to their wide distribution, rapid growth cycle, and ease of collection, which make them more accessible for traditional medicinal use.

Similar trends have been reported in several ethnomedicinal studies, where herbs were also identified as the most commonly used growth form (Regassa et al., 2017; Megersa et al., 2013; Lulekal et al., 2013; Luizza et al., 2013). However, this pattern differs from findings in other studies in which shrubs were reported as the dominant growth form (Alemayehu et al., 2015; Eshete et al., 2016). These variations are likely due to differences in ecological conditions, vegetation composition, land-use practices, and cultural preferences across study areas.

3.3 Medicinal plant part(s) used to treat both human and livestock ailments in the study area

The results of the present study revealed that leaves were the most commonly used plant parts in the preparation of traditional remedies, accounting for 44 species (33.33%), followed by roots, which were used in 34 species (25.75%) (Figure 3). The dominance of leaves, particularly from herbaceous plants, may be explained by their easy accessibility, simple harvesting process, and minimal preparation requirements compared to underground plant parts. Moreover, leaf harvesting is generally considered more sustainable, as it causes less harm to the plant and allows for continued growth and regeneration.

This pattern is consistent with several ethnomedicinal studies conducted in different regions, which likewise identified leaves as the most frequently used plant part in remedy preparation (Mekonnen et al., 2022; Jima and Megersa, 2018). However, the present findings differ from those reported by Yineger and Yewhalaw (2007), who found roots to be the most commonly used plant part. Such discrepancies may be attributed to variations in cultural practices, plant availability, ecological conditions, and the depth of traditional knowledge across different study areas.

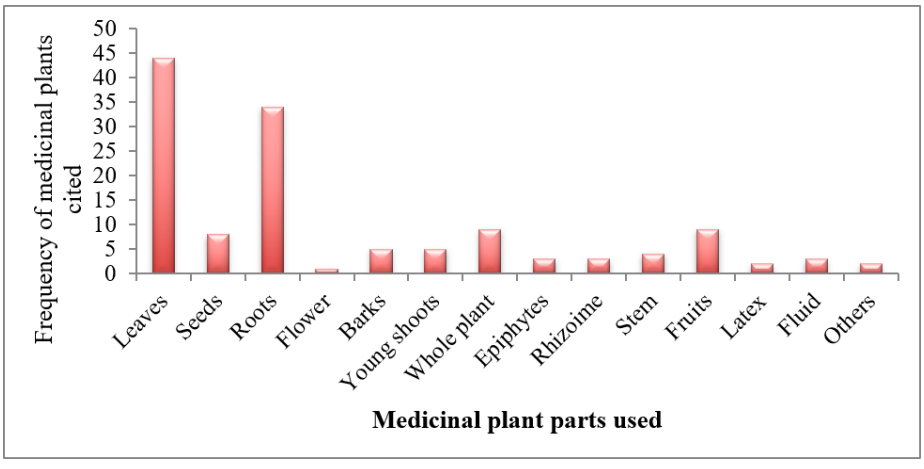


Figure 3. Medicinal plant parts used to treat human and livestock ailments in the study area

Table 1. List of medicinal plants collected in the study area used to treat human and livestock ailments with Habit, Source, Parts used, Route of administration (Ra) and Method ofpreparation (Mp). (Key to abbreviations: Pu - Parts used (R – root, L- leaf, S-Stem, Sb – stem bark, Fl – flower, Fr – fruit, Sd –seed ,St – Shoot , Rh – rhizome, Bu – bulb, Lat – latex ,Wp- (whole part) Ep-Epiphyte, Fs-Fluid Sap ; Ut- Used to treat (H – Human, L – livestock, B- Both) , Ra – Route of administration (O – oral, Dr – dermal, Na – nasal, A, Anal, Ocular -Oc, Auditory-Au).

Local name	Family	Botanical name	Habit	Source	Pu	Ra	Ut		Method of preparation and Dose of the reported medicinal Plants	Collection Number
							Ut	Disease category		
Aemanda(Gumuz)	Vitaceae	*Cyphostemma sp.*	Herb	Wild	R	O	H	Removal of retained placenta and abortion	The fresh root is crushed, filtered, and one cup of the extract is taken orally.	YN019
Aepefiya(Gumuz) Tukirfato (Oromifa) Tobia (Amharic)	Asclepiadaceae	*Calotropis procera* (Ait.) Ait. f.	Shrub	Wild	La	A	H	Hemorrhoid	The tips of 5–10 leaves of *Calotropis procera* are cut to collect the latex, which is then applied to the hemorrhoid each morning until healing occurs	YN004
Agam (Amharic)	Apocynaceae	*Carissa edulis* Forssk . Vahl	Herb	Wild	R	Dr	H	Evil eye	The dried roots of *Carissa edulis*, *Withania somnifera*, *Brucea antidysenterica*, and the dried leaves of *Ruta chalepensis* are crushed, pounded, and powdered, then mixed gently. One spoonful of the mixture is placed in a piece of cultural cotton cloth, tied securely, and worn around the neck.	YN074
Agufato (Oromifa) Gufa (Amharic)	Fabaceae	*Senna singueana* (Del.) Lock	Tree	Wild	L	Dr	L	Wound	The fresh leaves of *Senna singueana* are squeezed	YN025
Alequato (Amharic) Tsanki(Awigni) Tokonu (Oromifa)	Tiliaceae	*Grewia ferruginea* Hochst. ex A. Rich.	Shrub	Wild	Sb	O	L	Removal of retained placenta	The fresh leaves of *Senna singueana* are squeezed	YN034
						Dr	H	Removal of Skin parasites	The fresh leaves of *Grewia ferruginea* are crushed and filtered, and the resulting liquid is used to gently wash the hair..	
Amel (Amharic) Lilu (Oromifa)	Fabaceae	*Piliostigma thonningi* (Schumach.)	Tree	Wild	L	O	H	Gastro-intestinal parasite	Chew 5–7 fresh leaves of *Piliostigma thonningii*	YN029

		Milne-Redh			L	O	L	Gastro-intestinal parasite	Chewing 5-7 fresh leaf of *Piliostigma thonningi*	
Amikala (Amharic) Dihori (Awigni)	Acanthaceae	*Hygrophila auriculata* (Schum.)	Herb	Wild	WP	Dr	H	Eczema	The entire plant of *Hygrophila auriculata* is traditionally burned to produce ash, which is then mixed with butter. This mixture is applied to areas affected by eczema each morning until the condition is believed to improve.	YN085
Andahula (Amharic) Anduki (Awigni)	Crassulaceae	*Kalanchoe petitiana* A. Rich.	Herb	Wild	L	Dr	L	Neck swelling	Five to ten leaves of *Kalanchoe petitiana* are crushed and applied to the swollen area as a dressing	YN084
Areg Rsa (Amharic)	Cucurbitaceae	*Zehneria scabra* (Linn.f.) Sond.	Liana	Both	L	Na	H	Sun strike (MICH)	A handful of fresh leaves of *Zehneria scabra* is boiled in water to make a decoction, which is then used for fumigation.	YN 070
Ashikamo/qamo(Amharic) Ashikambo(Oromifa)	Anacardiaceae	*Rhus vulgaris* Meikle	Tree	Wild	Fr	O	H	Gastro intestinal parasite	Eating the fruit of *Rhus vulgaris*	YN036
Asitenagir (Amharic) Liflifie (Awigni) Manji (Oromifa)	Solanaceae	*Datura stramonium* L.	Herb	Wild	L	Dr	H	Dandruff	Squeezing the fresh leaf of *Datura stramonium* and creamed the area of dandruff (dose not specified)	YN051
Ater (Amharic) Atiri(Awigni)	Fabaceae	*Pisum sativum* L.	Herb	Wild	WP	Na	L	Flu.	The dried whole plant of *Pisum sativum* is burned, and the resulting smoke is used to fumigate the sheep (dose not specified).	YN104
Atuch(Amharic) Attuchi (Oromifa)	Verbenaceae	*Verbena officinalis* L.	Herb	Wild	R	O	H	Diarrhea Tonsillitis	Chewing the fresh root equal to the size of minimum finger of *Verbena officinalis*	YN020
Azamir (Amharic) Dinkifi (Awigni)	Melianthaceae	*Bersama abyssinica* Fresen.	Shrub	Wild	L	O	H	Ascaris	Squeezing the fresh leaf of *Bersama abyssinica* and one cup taken orally for one day	YN057
					R	Na	H	Evil eye	The dried root of *Bersama abyssinica* burnt in fire to have sniffed	
Azo-Hareg (Amharic)	Ranunculaceae	*Clematis simensis* Fresen.	Liana	Wild	L	O	H	Skin TB	Squeezed the fresh leaf of *Clematis simensis* and obtaining the liquid and	YN021

Idefitii(Oromifa)									one spoon taken orally for 3 days.	
					R	O	H	Tonsillitis	Chewing the fresh root of *Clematis simensis*	
Bashikado (Oromifa)	Phyllanthaceae	*Flueggea neowawaraea* W.Haydes	Tree	Wild	R	O	H	Stomach ache	Chewing the root of *Flueggea neowawaraea*	YN032
Berberie (Amharic) Bierbier(Awigni)	Solanaceae	*Capsicum annuum* L.	Herb	Both	Fr	O	L	Bloating	Pounding the fruit of *Capsicum annuum* and homogenizing with water and taken orally one cup for one day	YN087
Berita (Gumuz)	Portulacaceae	*Portulaca oleraceae* L.	Herb	Both	Wp	O	H	Gastritis	Powdering the dried whole parts of *Portulaca oleraceae* and two spoon flour eaten with porridge	YN097
Biwula(Gumuz)	Convolvulaceae	*Ipomoea carnea* Jacq	Shrub	Both	L	O	H	Snake bite	Chewing the fresh leaf of *Ipomoea carnea*.	YN002
Buna (Amharic) Bun (Awigni)	Rubiaceae	*Coffea arabica* L.	Tree	HG	Sd	D	H	Wound	The seed of *Coffea arabica* is roasted, ground into a powder, and then applied directly to the wound area.	YN076
Chifrig(Amharic) Karraabi(Oromifa)	Malvaceae	*Sida schimperiana* Hochst. ex A. Rich.	Shrub	Wild	R	O	H	Toothache	Chewing the fresh root of *Sida schimperiana* without swallowing	YN037
					L	O		LIFEA	The leaf of *Sida schimperiana* is crushed and applied to the affected area, then secured with a traditional cotton cloth.	
Dabakeded (Amharic)	Scrophulariaceae	*Verbascum sinaiticum* Benth.	Herb	Wild	R	Na	H	Evil eye	The root of *Verbascum sinaiticum* is burnt in fire for fumigating.	YN047
Damakesey (Amharic)	Lamiaceae	*Ocimum lamiifolium* Hochst. ex. Benth.	Shrub	Both	L	Na	H	Sun strike	Fresh leaf squeezed and sniffed the juice	YN046
								Headache		
								Common cold		
Defeq(Amharic) Boguwa(Gumuz)	Combretaceae	*Terminalia laxiflora* Engl. & Diels.	Tree	Wild	Ep	O	B	Diarrhea	The epiphyte of *Terminalia laxiflora* is crushed and filtered to obtain a liquid, which is then taken orally, one cup at a time.	YN015
Dich (Amharic)	Astraceae	*Echinops sp*.	Herb	Wild	R	O	H	Taeniasis	The fresh root is crushed and mixed with water to make an infusion, and one cup is taken daily for three days.	YN023

Duba(Amharic) Patu(Awigni)	Cucurbitaceae	*Cucurbita pepo* L.	Herb	HG	Sd	O	H	Gastritis	One hundred seeds of *Cucurbita pepo* are roasted, pounded, and mixed with water and salt, then consumed with injera.	YN100
Embuacho (Amharic)	Polygonaceae	*Rumex nervosus* Vahl.	Herb	Wild	S	O	H u	Ascariasis	Chewing the fresh stem of *Rumex nervosus.*	YN067
Embuay Jercho(Amharic)	Solanaceae	*Solanum marginatum* L.f.	Herb	Wild	Fr	O	L	Eye infection	The fruit of *Solanum marginatum* is crushed and filtered, and the resulting liquid is applied directly to the infected eye.	YN041
					Ep	Au	H	Ear ache resulting in pus	The epiphytes of *Solanum marginatum* are heated over a fire, squeezed to extract the liquid, and one drop of this liquid is applied to the infected ear.	
Endod (Amharic) Sibitie (Awigni)	Phytolaccaceae	*Phytolacca dodecandra* L'Her.	Shrub	Wild	R R	O Dr	H	Rabies	The fresh root of *Phytolacca dodecandra* is crushed, filtered, and then mixed with milk (dose not specified).	YN072
								QUAQUCHA (a kind of wounds on skin)	The fresh leaf of *Phytolacca dodecandra* is squeezed, and the extracted liquid is applied directly to the area affected by "QUAQUCHA."	
					R	O		Abortion	The root of *Phytolacca dodecandra* is powdered, mixed with water, and one cup is taken orally at a time.	
Engua(Gumuz) Ader (Amharic)	Fabaceae	*Dichrostachys cinerea* (L.) Wight & Arn.	Tree	Wild	R	Na	H	Evil eye	The dried root of *Dichrostachys cinerea* is burned over a fire, and the smoke is used for fumigation.	YN014
Enset (Amharic)	Musaceae	*Ensete ventricosum* (Welw.)	Tree	HG	Sd	Dr	H	Wound	The seed of *Verbascum sinaiticum* is crushed and pounded, then applied directly to the wound area.	YN081
Ensilal (Amharic)	Apiaceae	*Anethum graveolens* L.	Herb	HG	L	O	H	Ascariasis	he fresh leaf of *Anethum graveolens* is squeezed and filtered to obtain a liquid, and one cup is taken each morning for three days before breakfast.	YN049
								Taeniasis		
Erd (Amharic)	Zingiberaceae	*Curcuma longa* L.	Herb	HG	Rh	O	H	Alzheimer	The rhizome of *Curcuma longa* is pounded into a powder, and one	YN099

									spoonful is consumed by mixing it in tea.	
Eret (Amharic) Erbatakuro (Oromifa)	Aloaceae	*Aloe adigratana* Reynolds	Herb	Both	Fs	Dr	H	Wound	The leaf of *Aloe adigratana* is cut to extract the fluid sap, which is then applied to the wound area.	YN056
Fatsa (Gumuz)	Asclepiadaceae	*Leptadenia hastate* (Pers.) Decne.	Shrub	Wild	Fs	Dr	H	Thorn injury	The young stem of *Leptadenia hastata* is cut to extract the fluid sap, which is then applied to the injured area.	YN011
Geber Embuay (Amharic)	Solanaceae	*Solanum dasyphyllum* Schumach.	Herb	Wild	Fr	Dr	H	Lumpy skin	The fruit of *Solanum dasyphyllum* and the leaf of Solanecio gigas are crushed and mixed, and the resulting paste is applied to the area affected by lampy skin.	YN098
Gesho (Amharic) Geshu (Awigni)	Rhamnaceae	*Rhamnus prinoides* L'Herit.	Shrub	HG	St	O	H	Tonsillitis	Chewing the young shoot of *Rhamnus prinoides*	YN063
Gibito (Amharic) Gibtsi (Awigni)	Fabaceae	*Lupinus albus* L.	Herb	Both	Sd	O	H	Hypertensio n	The seed of *Lupinus albus* is soaked for 4–5 days, and a handful is eaten daily.	YN068
Girawa (Amharic) Kukitsi (Awigni) Ebicha (Oromifa)	Asteraceae	*Vernonia amygdalina Del.*	Shrub	HG	L	O	H	Malaria	The leaf of *Vernonia amygdalina* is squeezed to extract the liquid, and one cup is taken orally at a time.	YN071
Gomero (Amharic) Arengal (Oromifa)	Capparidaceae	*Capparis tomentosa* Lam.	Shrub	Wild	R	O	H	Toothache	he root of *Capparis tomentosa* is thoroughly washed and then chewed.	YN026
Goriteb (Amharic) Kurtivi (Awigni) Gorxobi (Oromifa)	Plantaginaceae	*Plantago lanceolata* L.	Herb	Wild	L	Dr	H	Body cutting	The fresh leaf of *Plantago lanceolata* is squeezed, and two drops of the extracted liquid are applied to the cut area.	YN069
					R	O		Anthrax	Chewing the root of *Plantago lanceolata.*	
Gulo(Amharic) Chakimie(Awigni) Chakime(Oromifa)	Euphorbiaceae	*Ricinus communis* L.	Tree	HG	L	Dr	H	Ache	The fresh leaf of *Ricinus communis* is squeezed, and the extracted liquid is applied to the area of ache.	YN039
					R	O		Remove retained placenta	The root of *Ricinus communis* is crushed, filtered, and mixed with water, and one cup of the mixture is taken orally.	
					R	O		Anthrax	The roots of *Ricinus communis* and *Rumex nepalensis* are crushed together, filtered, and the resulting	

									liquid is taken one cup daily for three days.	
Holl(Amharic) Huda(Oromifa)	Olaceae	*Ximenia americana L.*	Tree	Wild	Fr	O	H	Ascariasis	Eating the fruit of *Ximenia americana*	YN031
					L	O	L	Coccoides	Squeezing 5-7 fresh leaf of *Ximenia Americana* and take it	
Horch/Korch (Amharic) Walensu(Oromifa)	Fabaceae	*Erythrina abyssinica* Lam. ex DC.	Tree	Wild	L	Dr	L	Wound	The dried leaf of *Erythrina abyssinica* is pounded and applied directly to the wound area..	YN028
Kebericho (Amharic) Atintsi(Awigni)	Asteraceae	*Echinops kebericho* Mesfin	Herb	Wild	R	Na	H	Evil eye	The root of *Echinops kebericho* is burned over a fire, and the resulting smoke is used for fumigation.	YN082
							L	Flu.	The root of *Echinops kebericho* is burned together with donkey dung, and the smoke is used to fumigate the horse.	
Kitkita (Amharic)	Sapindaceae	*Dodonaea angustifolia* L. f.	Shrub	Wild	L	Dr	L	Skin parasite	The leaf of *Dodonaea angustifolia* is crushed, filtered, and the resulting liquid is used to wash the skin.	YN053
					St	Dr	H	Eczema	The dried shoot of *Dodonaea angustifolia* is powdered, mixed with butter, and applied as a cream to the area affected by eczema	
Kok (Amharic) Kuki (Awigni)	Rosacaea	*Prunus persica* L.	Tree	HG	St	O	H	Tonsillitis	The young shoot of *Prunus persica* is chewed directly.	YN061
Kulqual (Amharic) Aebirera (Gumuz) Kulkuli (Awigni) Adanie (Oromifa)	Euphorbiaceae	*Euphorbia abyssinica* Gmel.	Tree	Wild	La	A	H	Homoroid	The tip leaf parts of *Euphorbia abyssinica* are cut to extract the latex, which is then applied to the area affected by hemorrhoids.	YN003
						O		Hepatitis	Five to seven tip leaf parts of *Euphorbia abyssinica* are cut to extract the latex, which is then mixed with powdered Eragrostis tef and prepared as porridge to be eaten.	
Lebilabit/Tebasit (Amharic) Enguba (Oromifa)	Plumbaginacea e	*Plumbago zeylanica* L.	Herb	Wild	S	Dr	H	Ascariasis	The stem of *Plumbago zeylanica* is crushed, placed on a traditional cotton cloth, and then tied around the abdomen.	YN035
Lomi (Amharic) Lumini (Awigni)	Rutaceae	*Citrus aurantiifolia* (Christm.)	Shrub	HG	Fr	Dr	H	Itch	The fruit of *Citrus aurantiifolia* is squeezed, and the extracted juice is	YN060

									applied to the area affected by itching.	
						O		Nausea	The fruit of *Citrus aurantiifolia* is squeezed, and one cup of the juice is taken orally.	
Lutt (Amharic)	Malvacea	*Malva verticillata* L.	Shrub	Wild	L	O	H	Constipation	Squeezing 5-7 the fresh leaf of *Malva verticillata* and then taken orally	YN050
							L		Cooking 5-7 the fresh leaf of *Malva verticillata* and then eating	
Mekimeko (Amharic)	Polygonaceae	*Rumex abyssinicus* Jacq.	Herb	Wild	S	O	H	Ascariasis	Chewing the stem of *Rumex abyssinicus*	YN066
					R			Gastritis	Crushed the fresh root of *Rumex abyssinicus* following filtration and then taken one cup orally	
Meriz Enchet (Amharic) Lolo (Oromifa)	Apocynaceae	*Acokanthera schimperi* (A. DC.) Schweinf.	Tree	Wild	S	Dr	L	Donkey's wart	The tip of a small branch of *Acokanthera schimperi* is burned, and the heat is used to warm honey, which is then applied to the area affected by warts.	YN024
					L	Na	L	Skin parasite	Fumigating the hen with burning *Acokanthera schimperi*.	
Michir(Amharic)	Rubiaceae	*Rubia cordifolia* L.	Herb	Wild	R	O	H	''TILAWO GI''	Chewing the fresh root of *Rubia cordifolia*	YN089
								Impotency		
								Ache		
Misana(Amharic) Asisi(Awigni)	Euphorbiaceae	*Croton macrostachyus* Del.	Tree	Both	Fs	Dr	H	Ring warm	"Cut 5–10 cm of *Croton macrostachyus* tips, extract the latex, and apply it as a cream to the affected skin.".	YN058
					L	O	H	Gonorrhea	Squeeze seven *Croton macrostachyus* tips, collect the liquid, and take orally once in the morning before breakfast.".	
					Ep	O	L	''WORCHO GI''	Crush fresh *Croton macrostachyus* epiphytes, filter to obtain the liquid, and use as needed	
Miwa (Gumuz)	Fabacea	*Pterocarpus lucens* Guill.& Perr	Tree	Wild	Sb	O	H	Snake bite	Chewing the stem bark of *Pterocarpus lucens*	YN016

Mogn Fikir/Aseded(Amharic) Shimgigi(Oromifa)	Asteraceae	*Xanthium strumarium L.*	Herb	Wild	L	Dr	H	Dandruff	Squeezing 5-7 fresh leaf of *Xanthium strumarium* and then creamed the area of dandruff	YN101
Mogn Girar (Amharic) Lafto guracha (Oromifa)	Fabaceae	*Acacia amythethophylla* Steud. ex A. Rich.	Tree	Wild	R	Na	H	Evil eye	Burn the root of *Acacia amythethophylla* for fumigation	YN033
Mutign Embuay (Amharic)	Solanaceae	*Solanum macracanthum* A. Rich.	Shrub	Wild	R	O	H	Acne	Chewing the fresh root of *Solanum macracanthum* with salt	YN090
Nech Shinkurit (Amharic) Fuchi Shinkurchi (Awigni)	Alliaceae	*Allium sativum* L.	Herb	HG	Bu	Dr	H	Visceral leishmaniasis	Heat one Allium sativum bulb and apply it to treat visceral leishmaniasis	YN052
						Na		Common cold	Creshed one bulb of *Allium sativum* and sniffed	
						Na		Evil eye	Crush a bulb of *Allium sativum* with fresh *Ruta chalepensis* leaves and sniff the mixture	
Neem (Amharic)	Meliaceae	*Azadirachta indica* A. Juss.	Tree	HG	L	O	L	Coccoides	Squeezing 5-10 fresh leaf and drinking the juice until cured	YN096
Nug (Amharic) Linguhi(Awigni)	Asteraceae	*Guizotia abyssinica* (L.f.) Cass.	Herb	Wild	Sd	O	H	Dry cough	Roast a handful of *Guizotia abyssinica* seeds, powder them, boil in water, and take orally once	YN080
Qil (Amharic) Kibi (Awigni)	Cucurbitaceae	*Lagenaria siceraria* (Mollina) Standl.	Herb	Wild	Sd	Dr	H	Head wound	Roast and powder *Lagenaria siceraria* seeds, mix with butter, and apply as a cream to the head wound	YN040
Serdo (Amharic) Kiewi (Awigni)	Poaceae	*Cynodon dactylon* (L.) Pers.	Herb	Wild	Wp	Oc	L	Eye infection	Squeeze the whole *Cynodon dactylon* plant and apply the liquid to the infected eye	YN086
Seret (Amharic)	Asteraceae	*Artemisia absinnthium* L.	Herb	HG	St	O	H	Stomach cramps	Chewing 3-5 young shoot of *Artemisia absinnthium*	YN043
Le-koda kintarot medihanit (Amharic)	Fabacea	*Sesbania sp.*	Shrub	Wild	L	Dr	H	Skin warts	Squeeze 5–7 fresh leaves and apply the liquid to skin warts.	YN105
Shiferaw (Amharic)	Moringaceae	*Moringa stenopetala* (Bak. f.) Cuf.	Tree	HG	Sd	Dr	H	Skin allergic	Roast and powder *Moringa stenopetala* seeds, mix with powdered *Hordum vulgare* (barley), prepare as a soup, and apply to areas of skin allergy (dose not specified)	YN048

Shimgug (Amharic) Tasiejua (Awigni)	Boraginaceae	*Cynoglossum coeruleum* Hochst. ex A.DC.	Herb	Wild	L	O	H	Sun strike	Squeeze fresh Cynoglossum coeruleum leaves and drink one cup orally.	YN059
Shito Bahirzaf (Amharic)	Myrtaceae	*Eucalyptus citriodora* Hook.	Tree	Both	L	Na	H	Common cold	Boil 10–15 fresh *Eucalyptus citriodora* leaves in water and use the steam for fumigation	YN042
Siga (Gumuz) Minamino (Oromifa)	Combretaceae	*Anogeissus leiocarpa* (A. DC.) Guill. & Perr.	Tree	Wild	Sb	O	H	Diarrhea	Chew the inner stem bark of *Anogeissus leiocarpa*	YN008
Sire Bizu (Amharic)	Ranunculaceae	*Thalictrum rhynchocarpum* Dill. & A. Rich.	Herb	Wild	R	O	H	Cancer	Squeezing 5-10 fresh leaf of *Thalictrum rhynchocarpum* and taken orally before bed for 3-4 days	YN091
Smiza (Amharic) Lili(Awigni)	Acanthaceae	*Justicia schimperiana* Hochst. ex Nees T. Anders.	Shrub	HG	L	O	L	Coccoides	Squeezing 3 fresh leaf of *Justicia schimperiana* and given orally every beginning of night until cure	YN083
Telenj(Amharic)	Amaranthaceae	*Achyranthes aspera* Lam.	Herb	Wild	L	Dr	H	LIFEA	Crushed 3 fresh leaf of *Achyranthes aspera* and then dressing the area of ‘‘LIFEA’’	YN092
Tena-adam(Amharic) Naruki(Awigni) Ciladami(Oromifa)	Rutaceae	*Ruta chalepensis* L.	Herb	HG	L	O	H	Common cold	Immersing the fresh leaf of *Ruta chalepensis* in to tea and taken orally	YN055
Tisha (Gumuz)	Celastrus	*Maytenus senegalensis* (Lam.) Exell	Tree	Wild	Wp	O	H	Poison attack	The whole part burnt in fire to get the ash and then homogenized with one cup water then taken orally	YN007
Tosign(Amharic) Kushmie(Awigni)	Lamiaceae	*Ocimum basilicum* L.	Herb	HG	L	Na	H	Headach	Rub fresh *Ocimum basilicum* leaves and sniff the aroma	YN093
Tult/Yebere Milas (Amharic)	Polygonaceae	*Rumex nepalensis* Spreng	Herb	Wild	R	O	H	Tonsillitis	Chewing the fresh root of *Rumex nepalensis*	YN054
					L	Dr		LASH	Squeeze 5–10 fresh *Rumex nepalensis* leaves and apply the liquid to the LASH area	
Tunjut(Amharic)	Lamiaceae	*Otostegia integrifolia* Benth.	Shrub	HG	Wp	Na	H	Evil eye	The dried whole parts of *Otostegia integrifolia* buring in fire to have fumigated	YN077

Washita (Amharic) Botoro(Oromifa)	Bignoniaceae	*Stereospermum kunthianum* Cham	Tree	Wild	L	O	L	‘‘Wajjima’’ Bloating	Tap the bloated area with a stick of *Stereospermum kunthianum*	YN030
					Sb	O	H	Snake bite	Chewing the bark of *Stereospermum kunthianum*	
Wazila(Gumuz)	Vitaceae	*Cyphostemma junceum* (Webb) Descoings ex Wild & rummond	Herb	Wild	R	D	H	Lumpy skin	Crush and filter fresh *Cyphostemma junceum* root, then apply the liquid as a cream to lumpy skin	YN018
Wodadisho (Gumuz)	Thymelaeaceae	*Gnidia Pinifolia* L.	Herb	Wild	R	O	H	Bloating	The fresh root of *Gnidia pinifolia* is crushed, filtered, and one cup of the resulting liquid is taken orally daily for three days.	YN010
Woira (Amharic)	Oleaceae	*Olea europaea* L. subsp. cuspidata.	Tree	HG	Wp	Na	H	Evil eye	The whole plant of *Olea europaea* is burned, and the resulting smoke is used for fumigation.	YN078
Worq Bemeda (Amharic)	Moraceae	*Dorstenia barnimiana* Schweinf.	Herb	Wild	R	O	H	Leprosy Malaria Gastro intestinal Parasite	The fresh root of *Dorstenia barnimiana* is crushed, filtered, mixed with milk, and one cup is taken orally once daily until cured.	YN075
Wugirti (Gumuz) Wugirt(Amharic)	Caryophyllaceae	*Silene macrosolen* A. Rich.	Herb	Wild	F	O	H	Taeniasis	Pounding the fruit of *Silene macrosolen* with the seed of Guizotia *abyssinica* and then taken orally before breakfast	YN005
Yankua(Gumuz) Gizewa(Amharic)	Solanaceae	*Withania somnifera* (L.) Dunal	Shrub	Both	Wp	Na	H	Evil eye Sun strike	Crushed the dried whole parts of *Withania somnifera* to have fumigated	YN012
Yayit Hareg (Amharic) Yintsi Ahara (Awigni)	Menispermaceae	*Stephania abyssinica* (Dillon & A. Rich.) Walp.	Liana	Wild	R	O	L	Removal of retained placenta	Squeezing 10 fresh leaf of Stephania *abyssinica* and taken orally	YN088
					L	O	H	Syphilis	The fresh root of *Stephania abyssinica* is crushed, filtered, and one spoon of the liquid is taken orally each day for three days before breakfast.	
Yedega Abalo(Amharic) Abali(Awigni)	Simaroubaceae	*Brucea antidysenterica* J. F. Mill.	Tree	Wild	Sd	Dr	H	Eczema	The seed of *Brucea antidysenterica* is powdered and applied directly to the area affected by eczema.	YN079

					Fr	O	H	Diarrhea	The fruit of *Brucea antidysenterica* is crushed, mixed with honey, allowed to ferment for five years, and one cup of the mixture is taken orally.	
					L	Oc	L	Eye infection	Squeezing 5-7fresh leaf of *Brucea antidysenterica* and then applying the liquid on the area of infection	
Ye-ebab nikisha Medihanit (Amharic)	Dracaenaceae	*Dracaena afromontana* Mildbr.	Herb	Wild	R	O	H	Anthrax	Chewing the fresh root	YN022
								Snake bite		
Ye-fiyel Chew (Amharic)	Oxalidaceae	*Oxalis corniculata* L.	Herb	Wild	Wp	O	H	Abdominal parasite	Chewing the whole parts of *Oxalis corniculata*	YN065
						Na		Visceral Leishmaniasis	Squeezing the fresh leaf of *Oxalis corniculata* and then taken through nasal	
Yekondo Berbere Zaf (Amharic) Endadibi(Awigni)	Piperaceae	*Piper nigrum* L.	Tree	HG	Fr	O	H	Tonsillitis	Chewing the dried fruit of *Piper nigrum*	YN064
Yemich Medihanit	Lamiacea	*Permna Schimperi* Enngl.	Shrub	Wild	L	O	H	Sun strike	Squeezing the fresh leaf of *Permna schimperi* and then taken one cup orally	YN094
Yemidir Berbere (Amharic)	Asteraceae	*Acmella caulirhiza* Del.	Herb	Wild	Fl	O	H	Tonsillitis	Chewing the fresh flower of *Acmella caulirhiza*	YN062
Yemidir Embuay (Amharic) Yidiwula (Oromifa)	Cucurbitaceae	*Cucumis ficifolius* A.Rich	Liana	Wild	R	O	H	Rabies	The fresh root of *Cucumis ficifolius* is crushed, filtered, mixed with milk, and one cup is taken daily for three days.	YN027
Yesetan Merfe(Amharic)	Asteraceae	*Bidens pilosa* L.	Herb	Wild	L	Na	H	Nose bleeding	Rubbing the fresh leaf of *Bidens pilosa* and to have sniffed	YN073
Yewof Mar/Kuradedey (Amharic)	Curbitacea	*Momordica foetida* Schumach.	Liana	Wild	L	Na	H	Evil eye	The fresh leaf of *Momordica foetida* is rubbed, and the aroma is then sniffed.	YN045
					R	O		Renal disease	The fresh root of *Momordica foetida* is crushed, filtered, mixed with honey, and one cup of the mixture is taken orally until cured..	

Zeguargingia (Gumuz) QeyGirar (Amharic)	Fabacea	*Acacia seyal* Del	Tree	Wild	R and Sb	O	L	Diarrhea	The fresh root and stem bark of *Acacia seyal* are pounded, filtered, mixed with water, and one cup of the resulting liquid is taken orally at a time.	YN017
Zenibaba/Chifar (Amharic)	Arecaceae	*Phoenix reclinata* Jacq.	Tree	Both	L	Oc	L	Eye infection	The fresh leaf of *Phoenix reclinata* is squeezed, and the extracted liquid is applied to the infected area.	YN044
Zinjibil(Amharic) Zingibili(Awigni) Jibibila(Oromifa)	Zingiberaceae	*Zingiber officinale* Roscoe.	Herb	HG	Rh	O	H	Tonsillitis	Chewinng the the root / rhizome of *Zingiber officinale*	YN102
								Stomach cramps	The root/rhizome of *Zingiber officinale* is pounded and mixed with water to form a homogeneous mixture.	
Hareg/Ye-sewunet ebitet Medihanit (Amharic)	Asclepiadaceae	*Dregea schimperi* (Decne.) Bullock	Liana	Wild	L	Dr	H	Lumpy skin	Squeezing the fresh leaf and then creamed the lump skin	YN103
Temesgia(Gumuz) Shabuch(Amharic)	Combretaceae	*Combretum collinum* Fresen.	Tree	Wild	Sb	O	H	Stomach cramps	Chewing the stem bark	YN001
Zelela (Gumuz)	Capparidaceae	*Maerua angolensis* DC.	Tree	Wild	L	D	H	Fire burning	The fresh leaf is squeezed, and the extracted liquid is poured onto the area affected by burning.	YN006
Engochit (Amharic)	Unidentified	Unidentified	Herb	Wild	Rh	O	H	Impotency and stomach cramps	Chewing the rhizome	YN038
Hareg/ Ye-Tilawogi Medihanit (Amharic)	Fabaceae	*Glycine wightii* (Wight & Arn.) Verdc.	Liana	Wild	R	O	H	TILA-WOGI	Chewing the fresh root	YN095
Janguya (Gumuz)	Capparidaceae	*Boscia sp.*	Tree	Wild	R	O	H	Malaria	The fresh root is crushed, filtered, and one cup of the resulting liquid is taken orally daily for three days.	YN013
Yebereha Endod (Amharic) Dodoshiya (Gumuz)	Unidentified	Unidentified	Herb	Wild	L	Dr	H	KUAKUCHA	The fresh leaf is squeezed, and the extracted liquid is applied to the area affected by KUAKUCHA.	YN009

3.4 Preparation condition of plant remedies in the study area

The results showed that herbal remedies were prepared in different forms depending on the type of ailment treated. Fresh plant materials were the most commonly used, accounting for 87 preparations (65.9%), followed by concoctions with 16 preparations (12.12%) (Figure 4). The dominance of fresh materials may be linked to the belief that freshly harvested plants contain higher levels of active constituents and are more easily accessible for immediate use.

This observation aligns with previous studies reporting a similar preference for fresh plant materials in the preparation of traditional remedies (Sori et al., 2004; Abebe, 2011; Kefalew et al., 2015). However, Balemie et al. (2004) found that some traditional healers also prepare remedies in dried form for storage and sale, as drying improves shelf life and eases transportation.

In addition, Amenu (2007) reported that the practice of storing prepared remedies at home is rare and limited to only a few practitioners. This limited storage practice can hinder timely access to medicinal plants, especially since many species are seasonal and not available year-round. As a result, the reliance on fresh plant materials may restrict remedy availability during off-season periods.

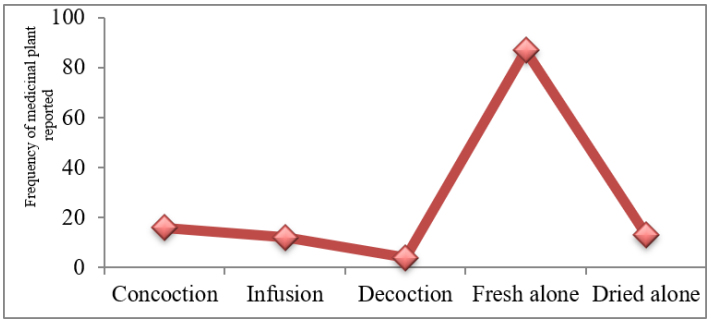


Figure 4. Condition of preparation and its frequency in the study area

3.4 Route of administration of medicinal preparation to treat human and livestock ailments in the study area

The study documented multiple routes of administration for medicinal plant remedies used in treating both human and livestock ailments, including oral, dermal, nasal, ocular, anal, and other methods. Among these, oral administration was the most commonly reported route, accounting for 72 remedies (54.54%), followed by dermal application with 33 remedies (25%) (Figure 5). In particular, oral administration was used in 67% of human treatments and 89% of livestock treatments.

The predominance of oral administration suggests that most of the conditions treated in the study area are internal in nature. Oral delivery is often favored in traditional medicine because it is considered effective for systemic treatment and is relatively easy to administer. These findings are consistent with earlier ethnomedicinal studies that also identified oral administration as the primary route for administering plant-based remedies (Addisie et al., 2012; Chekole et al., 2015; Tuasha et al., 2018; Amesalu et al., 2015; Kefalew et al., 2015).

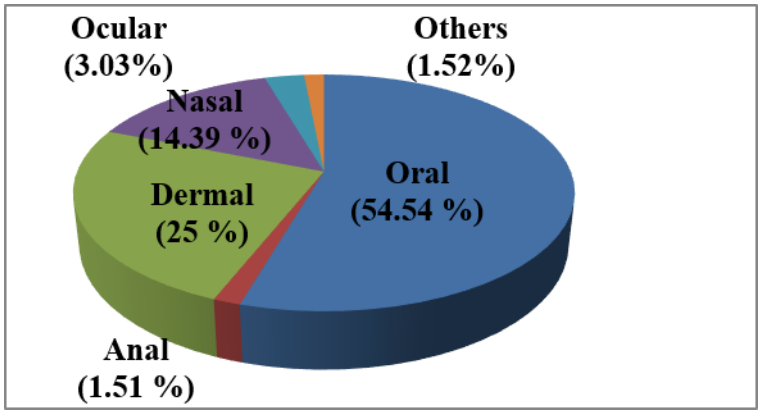


Figure 5. Route of administration of medicinal preparation to treat human and livestock ailments in Womberma District.

3.5 Solvents, additives, dosage, antidotes and side effects of the plant remedies

Most plant remedies were prepared by combining different plant species, with water commonly used as a solvent, and various additives incorporated such as butter, honey, salt, tea, 'YE TEF DABO', yoghurt, and coffee. Similar uses of solvents and additives in traditional medicine have also been reported by Abdurhman (2010).

With regard to dosage, local communities relied on a range of informal measurement units, including finger length (for roots, barks, and stems), spoons (for powdered materials), and counting (for leaves, seeds, fruits, and flowers). Additional measurement tools included the little finger, spoon, 'JOG', a full hand, water glass, and tea cup. The absence of standardized dosing is a well-recognized limitation of traditional medical systems (Getahun, 1976; Yirga, 2010), although the tip of the index finger is often used as a common reference measure (Mekonnen et al., 2022). Dosage levels were typically adjusted based on the patient's sex, age, physical condition, and overall health status, as similarly reported by Jima and Megersa (2018).

Some herbal preparations were reported to cause side effects, including vomiting, diarrhea, headache, nausea, gastritis, burning sensations in the mouth, wound formation, and oral bleeding.

In such cases, traditional practitioners recommended antidotes such as coffee, milk, yoghurt, or 'BESSO' to alleviate or counteract the adverse effects.

3.6. Importance of Medicinal Plants in the Study Area

3.6.1 Informant Consensus Factor (ICF)

In the present study, the highest Informant Consensus Factor (ICF) was observed for respiratory-related ailments (0.97), followed by ailments associated with the evil eye/spirit (0.95) (Table 2). A high ICF value reflects strong agreement among informants regarding the use of particular medicinal plants to treat these ailment categories, indicating their perceived efficacy and widespread recognition within the community.

Table 2. Results of informant consensus factor for more prevalent health problem of the district

More prevalent disease categories	List of plant species used and number of citations in the bracket	n_{ur}	n_t	ICF
Gastro intestinal disorder and parasitic infection	*Flueggea neowawaraea(9), Artemisia absinthium (24), Zingiber officinale(90), Piliostigma thonningi(3), Rhus vulgaris(10), Portulaca oleraceae(3), Cucurbita pepo(18),Verbena officinalis(6),Terminalia laxiflora*(4), *Anogeissus leiocarpa(9), Brucea Antidysenterica(6), Acacia seyal(8), Malva verticillate (16),Echinops sp.(19), Anethum graveolens(11), Silene macrosolen(12), Dorstenia barnimiana(5), Rumex abyssinicus(12), Plumbago zeylanica(61), Ximenia americana(3), Rumex nervosus(12), Bersama abyssinica(7), Ricinus communis(7), Citrus aurantiifolia(3)*	358	24	0.93
Dermatological problem	*Citrus aurantiifolia(20), Xanthium strumarium(7), Datura stramonium(42,) Hygrophila auriculata(5), Brucea antidysenterica(3), Dodonaea angustifolia(4), Solanum dasyphyllum(2), Cyphostemma junceum(3), Dregea schimperi(1), Sesbania sp.(9), Calotropis procera(11), Euphorbia abyssinica(22), Clematis simensis(2), Grewia ferruginea(6), Oxalis corniculata(16), Allium sativum(8), Moringa stenopetala(18), Dorstenia barnimiana(3),Sida schimperiana(2), Achyranthes aspera(8), Phytolacca dodecandra(19), Croton macrostachyus(15), Rumex nepalensis(10)*	236	23	0.91
Respiratory problem	*Verbena officinalis(4), Clematis simensis(6), Ocimum lamiifolium(10), Rhamnus prinoides(34), Prunus persica(31), Allium sativum(52), Guizotia abyssinica(78), Ruta chalepensis(73), Rumex nepalensis(12), Piper nigrum(17), Acmella caulirhiza(12), Zingiber officinale(90) Eucalyptus citriodora(42)*	461	13	0.97
Evil eye/sprit	*Carissa edulis(3), Bersama abyssinica(5), Verbascum sinaiticum(2), Dichrostachys cinerea(7) Echinops kebericho(70), Rubia cordifolia(2), Acacia amythethophylla(12), Allium sativum(22), Otostegia integrifolia(26), Olea europaea* L. subsp. cuspidata (72),*Withania somnifera(17), Momordica foetida(7),Glycine wightii(4)*	249	13	0.95
Acute sickness	*Zehneria scabra(31), Ocimum lamiifolium(21), Phytolacca dodecandra(11), Lupinus albus (24), Vernonia amygdalina(87), Plantago lanceolata(12), Ricinus communis(3), Thalictrum rhynchocarpum(7), Dorstenia barnimiana(15), Withania somnifera(4), Dracaena afromontana(2), Permna Schimperi(24), Cucumis ficifolius(5), Boscia sp.(6)*	246	14	0.94

By contrast, studies from Sedie Muja District in South Gondar, Ethiopia, and Debre Libanos reported the highest ICF values for ailments related to the evil eye (0.90) and the common cold (89%), respectively (Mekonnen et al., 2022; Tuasha et al., 2018). These differences in ICF values across study areas highlight geographical variation in both disease prevalence and the extent of shared traditional knowledge. Such variability may be influenced by differences in environmental conditions, local health challenges, cultural beliefs, and the distribution of specific ailments.

3.6.2 Simple preference ranking

Preference ranking was carried out for seven medicinal plant species used in the treatment of tonsillitis, based on assessments provided by ten key informants. The findings revealed that *Acmella caulirhiza* ranked highest, with a total score of 60, indicating its perception as the most effective remedy for tonsillitis. It was followed by Zingiber officinale, which obtained a score of 56. In contrast, Verbena officinalis received the lowest score of 21, ranking it as the least effective species (Table 3).

The strong preference for *Acmella caulirhiza* reflects its frequent use and high perceived therapeutic value in managing tonsillitis. When multiple plant species are available for treating the same ailment, local communities typically prioritize those regarded as most effective, based on accumulated traditional knowledge and repeated practical experience. The top ranking of *Acmella caulirhiza* therefore underscores its potential pharmacological importance and highlights the need for further phytochemical and pharmacological studies to substantiate its traditional application.

Differences in disease prevalence, ecological conditions, and local knowledge systems across regions may influence both the diversity and number of plant species reported for similar health conditions. For example, a study conducted in Berbere District, Bale Zone of Oromia Regional State, southeastern Ethiopia, documented a wide variety of medicinal plants used to treat stomachache and wounds; however, *Stephania abyssinica* and *Olea europaea* subsp. *cuspidata* were identified as the most preferred remedies for these respective ailments (Jima and Megersa, 2018).

Table 3. Simple preference ranking of medicinal plants used to treat Tonsillitis

Medicinal plants	Respondents (R_1-R_{10})										Total	Rank
	R_1	R_2	R_3	R_4	R_6	R_5	R_7	R_8	R_9	R_{10}		
Rhamnus prinoides	3	1	4	4	3	3	2	3	1	6	30	5th
Rumex nepalensis	4	4	7	6	4	4	1	6	3	3	42	4th
Piper nigrum	6	5	3	2	5	6	7	4	7	2	46	3rd
Zingiber officinale	5	7	5	7	6	5	5	7	5	4	56	2nd
Acmella caulirhiza	7	6	6	5	7	7	6	5	4	7	60	1st
Verbena officinalis	1	3	2	1	2	1	3	1	2	5	21	7th
Prunus persica	2	2	1	3	1	2	4	2	4	1	22	6th

3.6.3 Direct Matrix Ranking

A total of 70 medicinal plant species (66.67%) were reported to have additional non-medicinal uses in the study area. Among these, ten multipurpose species with more than five use categories were selected for direct matrix ranking. The results showed that Croton macrostachyus ranked first, followed by Eucalyptus citriodora, Acokanthera schimperi, and Dodonaea angustifolia (Table 4).

Table 4. Direct Matrix Ranking For this exercise ten key informants were chosen to assign values based on use criteria (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used, 0 = not used) for each species

Medicinal plant species	Use criteria							Total	Rank
	Charcoal	Fire wood	Construction	Fence	Food	Medicine	Furniture		
Ximenia Americana	3	4	1	2	3	1	0	14	7th
Vernonia amygdalina	0	5	0	5	0	5	0	15	6th
Piper nigrum	0	4	0	3	3	2	0	12	9th
Olea europaea L. subsp. Cuspidate	2	4	1	4	0	4	1	16	5th
Eucalyptus citriodora	4	5	5	3	0	4	3	24	2nd
Dodonaea angustifolia	3	4	3	3	0	5	0	18	4th
Croton macrostachyus	4	5	3	5	0	5	3	25	1st
Carissa edulis	0	2	1	2	2	3	1	11	10th
Bersama abyssinica	3	4	0	2	0	4	0	13	8th
Acokanthera schimperi	5	4	4	5	0	3	2	23	3rd

The high ranking of these multipurpose species reflects their intensive utilization pressure, as they are widely used for fuelwood, construction, fencing, and various household purposes in addition to their medicinal value. Such extensive use makes these species particularly vulnerable to overharvesting and local depletion in the absence of effective management and replanting strategies. Conversely, species with fewer use categories are generally subjected to lower harvesting pressure and are therefore more likely to be naturally conserved. Similar findings

have been reported in previous studies, which highlight that multipurpose utilization significantly increases the risk of depletion of medicinal plant resources (Mekonnen et al., 2022).

3.6.4 Fidelity Level Index (FLI)

The fidelity level (FL) of each medicinal plant was determined by the proportion of informants who reported its use for specific ailments, which helps identify species that are most preferred and culturally significant. Plants primarily used to treat a single ailment or a narrow group of related conditions generally show higher FL values, indicating strong community agreement regarding their effectiveness. In this study, *Zehneria scabra*, *Rumex nervosus*, Piper nigrum, and *Acmella caulirhiza* each recorded an FL of 100% for the treatment of MICH, evil eye/spirit, ascariasis, and tonsillitis, respectively (Table 5).

However, the importance of particular medicinal plants for specific ailments varies across regions, reflecting differences in indigenous knowledge systems, disease occurrence, and cultural practices. For example, *Olea europaea* subsp. *cuspidata* exhibited the highest FL (0.93) for treating evil eye in the present study, whereas Allium sativum was reported to have the highest FL (0.70) for the same condition in a previous study (Mekonnen et al., 2022). These variations underscore the role of geographic, cultural, and ecological factors in shaping the selection and utilization of medicinal plants in traditional healthcare systems.

Table 5. Fidelity level index of most frequently reported diseases corresponding with some of healing plants.

Disease treated	Medicinal plants	Ip	Iu	Ip/Iu	FL (%)
MICH	*Zehneria scabra*	31	31	1	100
	Ocimum lamiifolium	21	31	0.67	67.7
	Withania somnifera	4	21	0.19	19
Evil eye/sprit	*Echinops kebericho*	60	74	0.81	81
	Allium sativum	22	52	0.42	42
	Olea europaea L. subsp Cuspidata	72	77	0.93	93
	Withania somnifera	17	21	0.8	80
Ascariasis	*Bersama abyssinica*	7	12	0.58	58
	Rumex nervosus	12	12	1	100
	Anethum graveolens	11	36	0.3	30
	Rumex abyssinicus	12	16	0. 75	75
Tonsillitis	*Rumex nepalensis*	12	22	0.545	54.5
	Piper nigrum	17	17	1	100
	Acmella caulirhiza	12	12	1	100
	Zingiber officinale	72	90	0.8	80

3.7 Threats and Conservation Practices toMedicinal Plants in the Study Area

Medicinal plants in the study area are under pressure from a range of anthropogenic and natural factors. Human-induced threats include logging for firewood, construction activities, agricultural expansion, overgrazing, charcoal production, and bushfires, alongside drought as a natural stressor. Among these, agricultural expansion emerged as the most significant threat, followed by overgrazing (Figure 6). These results align with previous studies that similarly emphasize the dominant role of human activities in the depletion of medicinal plant resources (Cunningham, 2001; Giday, 2001).

In response to these challenges, local farmers apply indigenous knowledge to conserve key medicinal species within farmlands, home gardens, and live fences. Several species, including *Portulaca oleracea, Ocimum lamiifolium, Aloe adigratana, Moringa stenopetala, Otostegia integrifolia, Withania somnifera, Ipomoea carnea, Zehneria scabra*, and *Olea europaea* subsp. *cuspidata*, are intentionally cultivated in home gardens for regular medicinal use. Maintaining medicinal plants in home gardens is a practical and strategic conservation approach that ensures their sustainable availability and convenient access when needed (Asfaw, 2001). Such community-based conservation practices are essential for reducing pressure on wild populations while supporting the continuity of traditional healthcare systems.

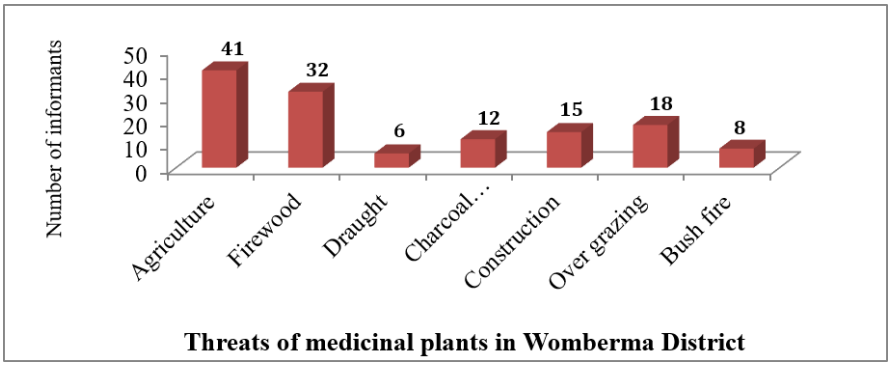


Figure 6. Major threatened factors of medicinal plants with its number of informants.

3.8 Socio demographic variables associated with traditional medicinal knowledge.

Of the 132 informants, 64.39% were male and 35.61% female. Most were over 50 years old (46.96%), uneducated (42.42%), and primarily farmers (87%), with Amhara being the dominant ethnic group (79.54%).

Statistical analysis showed significant variation in medicinal plant knowledge across demographic groups. Males reported higher knowledge than females ($P < 0.05$), likely due to

differences in mobility and access to plant resources. Older informants (>50 years) had significantly greater knowledge, reflecting accumulated experience and continued reliance on traditional practices, while younger individuals reported fewer species, possibly due to modernization. Those without formal education demonstrated higher knowledge than educated respondents, suggesting reduced transmission of ethnobotanical knowledge through formal schooling.

Ethnicity also significantly influenced knowledge levels ($P < 0.05$), with Agew informants reporting the highest number of species, followed by Gumuz, Oromo, and Amhara. This variation may be linked to differences in lifestyle, environmental interaction, and cultural transmission of medicinal knowledge.

Table 6. Socio demographic variables in association with medicinal plant knowledge

Socio demographic variables		Number of Informants	Medicinal plant Knowledge in Percentage	Mean and standard deviation of medicinal plants cited respectively	P-value
Age in Years	25-35	23	7.09%	4.91 ± 4.28	0.006*
	36-50	47	31.76%	10.77 ± 6.5	
	>50	62	59.88%	15.71 ± 7.378	
Sex	Male	85	75.7%	14.16 ± 8.146	0.000*
	Female	47	24.31%	8.28 ± 5.072	
Education level	Illiterate	56	47.71%	14.03 ± 6.99	0.000*
	Read and write	30	26.43%	13.57± 8.08	
	Primary school	23	19.33%	13.39 ± 6.985	
	Secondary school	18	5.08%	4.5 ± 2.7	
	College Diploma	1	0.37%	6.00 -	
	First Degree	4	1.06%	4.25 ± 2.5	
Ethnicity	Amhara	105	71.81%	10.9 ± 7.24	0.001*
	Oromo	15	14.43%	14.33 ± 7.6	
	Gumuz	6	5.33%	15.17 ± 5.845	
	Agew	6	8.41%	22.33 ± 8.9	

*Significant difference at (**P < 0.05**)

CONCLUSIONS AND RECOMMENDATIONS

The study shows that local communities possess extensive indigenous knowledge of medicinal plants used to treat both human and livestock diseases. Herbs were the dominant life form, and leaves were the most commonly harvested parts, mainly due to their accessibility. Remedies were typically prepared from fresh materials, often in mixtures with water and other additives, and mainly administered orally.

Medicinal plant knowledge varied significantly with sex, age, education, and ethnicity, with males, older individuals, and those without formal education generally showing higher

knowledge levels. Certain species, such as *Acmella caulirhiza* (for tonsillitis) and *Olea europaea* subsp. *cuspidata* (for evil eye/spirit), were highly valued by the community. However, medicinal plants face threats from agricultural expansion, overgrazing, and overharvesting, which may lead to their decline if not properly managed.

Overall, traditional medicinal knowledge remains vital for primary healthcare in the area, particularly where access to modern health services is limited. The study recommends promoting cultivation in home gardens and farmlands, encouraging sustainable harvesting practices, documenting indigenous knowledge, especially among younger generations, and conducting further pharmacological validation of key species. Integrating traditional medicine with modern healthcare and strengthening supportive policies are also essential for long-term conservation.

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