Ethnoveterinary practices of medicinal plants in Selected Districts of West Gojjam Zone, North Western Ethiopia

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Research

Abstract

Background: In most parts of Ethiopia, the use of medicinal plants to treat different livestock diseases are common. However, the depletion of plant resources and the accompanied erosion and subsequent loss of traditional knowledge posed a threat to this practice. This demonstrates the fact that documentation of ethnoveterinary knowledge is mandatory to reverse the current trend. Hence, the current investigation was aimed at the documentation of ethnoveterinary practices of medicinal plants in selected districts of West Gojjam zone.

Methods: Ethnoveterinary data were collected from 30 kebeles (the smallest administrative structure in Ethiopia) at West Gojjam Zone in Amhara region, Ethiopia. The ethnoveterinary data were collected from 30 key and 399 general informants aged $\geq$ 20 years. Ethnoveterinary data were collected through semi- structured interviews, focus group discussion, and accompanied field walks with individual informants. Descriptive statistics were employed to summarize the data. Ranking methods such as Preference Ranking and Direct Matrix Ranking were used. To draw a graph we used SPSS software version 27.

Results: A total of 53 ethnoveterinary medicinal plants were identified belonging to 33 families and 51 genera. Asteraceae and Solanaceae were the most represented families, with five plants species each, followed by Lamiaceae and Euphorbiaceae with four plants each. The most frequently used plant parts to treat livestock diseases were leaves. Crushing was the most common method of remedy preparation followed by pounding. Most of the remedies were administered through orally. The respiratory, spiritual, and injury-related conditions had high Informant Consensus Factor (ICF) value, while *Cucumis pustulatus* and *Withania somnifera* showed the highest Fidelity Level (FL) for blackleg and spiritual illnesses, respectively. Preference ranking identified *Clerodendrum myricoides* as the most preferred for treating anthrax. Direct matrix ranking highlighted *Olea europaea* and *Eucalyptus globulus* for their multiple uses in the study area. Similarly, firewood collection had 31 the most plant use diversity in the study area.

Conclusion: This study highlights the vital role of ethnoveterinary practices of medicinal plants in treating livestock diseases in Ethiopia's West Gojjam Zone, emphasizing the wealth of traditional knowledge held by local healers. Despite this valuable knowledge, the research reveals threats from agricultural expansion and urbanization, which jeopardize its preservation. To safeguard these resources, it is crucial to document the knowledge, integrate it into policies, and involve communities in conservation efforts, ensuring their continued availability for future generations and supporting both veterinary care and biodiversity.

Keywords: Ethnoveterinary, medicinal plants, indigenous knowledge, West Gojjam Zone, Amhara region

Background

Among other African countries, Ethiopia stands first in its livestock population with 66 260 988 cattle, 38 013 272 sheep and 45 716 092 goat (ESS, 2021). The livelihood of 130 million Ethiopians is based on agriculture (Zegeye *et al.* 2022). Animal diversity is very important in agricultural settings. Most, the farmers' (almost 85%) of the farmers' use animals for farming the land because of poverty, and acute shortage of modern farming equipment in rural areas (Yigezu 2021). It is very important to save the animals from diseases so that they can deliver better/improved agricultural productivity. In many developing countries, including Ethiopia, a significant obstacle to livestock production is the lack of health services for livestock care (Kebede *et al.* 2014). In Ethiopia, animal diseases are the primary concern for livestock owners (Gizaw *et al.* 2021). Common health issues affecting livestock include parasitic infections, bacterial diseases, and nutritional deficiencies (Bekele *et al.* 2018). Inadequate facility of animal health services, primarily a public sector responsibility by livestock caretakers is considered as the biggest barrier to improving animal health and production (Gizaw *et al.* 2021). Thus, ensuring animal health is crucial for encouraging high agricultural production (Tufa *et al.* 2018). According to the data, Ethiopia is seriously suffering from animal yield loss due to diseases and parasites (Larkins *et al.* 2023). The loss could reach up to 8-10% per year for cattle, 12-14% for sheep, and 11-13% for goats, and as high as 56.9% for poultry, which brings about heavy losses to farmers and pastoralists in the country (Larkins et al., 2023). The diseases causing major losses include fasciolosis, internal parasites like *Haemonchus contortus*, and other important diseases of livestock. Various health issues plague the cattle population in Ethiopia, including black leg, anthrax, bloating, and eye diseases, which notably hinder cattle production (Feyera *et al.* 2017, Feyisa *et al.* 2021, Asfaw *et al.* 2022, Abebe, 2022, Oda *et al.* 2024). In most cases, pastoralists employ traditional methods of treating animal diseases using plants (Xiong & Long 2020). Ethnoveterinary medicines are herbs that traditionally used for treating health problems in livestock, which are much cheaper compared to modern medication (Berhanu *et al.* 2020). Animals have been suffering from health problems, which may be effectively treated using medicinal plants (Hassan *et al.* 2014). Pastoralists and farmers worldwide have used these herbal remedies in treating cattle diseases for centuries, with the practices deeply embedded in traditional beliefs and practices (Khan *et al.* 2021). This practice provides accessible health solutions, especially for rural areas, by utilizing locally available plants that may require no or minimal processing (Phondani *et al.* 2010). Ethnoveterinary practices are generally considered to be inexpensive, relatively safe, have been used for a long time within a community, and rely on readily available medicinal plant species (Hosseinzadeh *et al.* 2015). The scientific investigation of these traditional methods can lead to the discovery of new therapeutic compounds Hosseinzadeh *et al.* (2015). This, in turn would encourage integration into modern veterinary medicine, thereby contributing to sustainable livestock management (Assefa and Bahiru 2018). In Ethiopia, traditional healing practices have long depended on medicinal plants, with local healers possessing deep knowledge of these plants and their uses to treat a wide range of health issues. Several ethnoveterinary studies across the country have provided valuable insights into the use of medicinal plants in various regions (Wassie *et al.* 2015, Kassa *et al.* 2020, Dinbiso *et al.* 2022, Abebe 2022, Awoke *et al.* 2024, Oda *et al.* 2024). Despite this progress, there is still a need for further research to systematically catalog and document these plants. Traditional ethnoveterinary knowledge has primarily been passed down orally across generations through cultural expressions like folk remedies, songs, proverbs, and storytelling (Hassanali *et al.* 2005). However, the influence of Western culture has led many in the current generation to view these practices as outdated or even taboo, resulting in a decline in the transmission of indigenous knowledge regarding medicinal plants (Giday *et al.* 2009, Giday *et al.* 2010, Ayele *et al.* 2024). In the West Gojjam Zone of Ethiopia, a similar decline in ethnoveterinary knowledge has been observed, paralleling trends seen in other regions where traditional practices and indigenous knowledge systems are being eroded. This decline poses a significant threat to the continued use, transfer, and conservation of medicinal plants, which have historically played a critical role in the health and well-being of livestock. The loss of this knowledge not only jeopardizes the cultural heritage of the communities but also undermines the potential for sustainable utilization of medicinal plant resources that could contribute to both local healthcare and biodiversity conservation efforts. Given the rapid rate at which traditional knowledge is disappearing due to various factors such as modernization, urbanization, and generational shifts, it is increasingly urgent to document and study ethnoveterinary practices before these invaluable resources are permanently lost. This is because ethnoveterinary knowledge encapsulates a wealth of practical, ecological, and cultural insights, offering an alternative or complementary approach to conventional veterinary medicine, especially in rural areas where access to modern healthcare is limited. The systematic survey and documentation of this knowledge is therefore essential, not only to preserve these practices but also to explore their potential applications in modern veterinary science. Different studies have documented the use of ethnoveterinary medicinal plants across various parts of Ethiopia. For example, Awoke *et al.* (2024) investigated medicinal plants used to treat domestic animal diseases in Guraferda District, Bench-Sheko Zone, southwestern Ethiopia. Similarly, Hankiso *et al.* (2024) reported on ethnoveterinary plants and their utilization by the people of Soro District, Hadiya Zone, southern Ethiopia. In Enarj Enawga District, East Gojjam Zone, Birhan *et al.* (2018) described local practices and plant species used in livestock healthcare. Other studies have extended the focus to both human and livestock ailments: Alemneh (2021) in Yilmana Densa and Quarit Districts, and Abebe & Teferi (2021) in Hulet Eju Enese Woreda of East Gojjam Zone. Ethnoveterinary plant use has also been surveyed in western Ethiopia by Birhanu & Abera (2015) in Horro Gudurru Districts, and traditional medicinal plant practices in central eastern Ethiopia were documented by Hunde *et al.* (2006) in the Boosat Sub-District. Collectively, these studies highlight the widespread reliance on medicinal plants for animal and human healthcare throughout Ethiopia. While Ayele *et al.* (2024) conducted an ethnobotanical study focusing on medicinal plants used to treat human diseases in the West Gojjam zone in selected districts such as Dembecha, South Achefer and Sekela; there has been a noticeable gap in research specifically addressing ethnoveterinary knowledge in these districts. However, the specifically the ethnoveterinary study was not conducted in Dembecha, South Achefer and Sekela districts. Hence, the objective of the current study was to conduct the ethnoveterinary medicinal plants utilized in these three districts of the West Gojjam Zone. By doing so, this research was aimed to contribute to the preservation of traditional knowledge, promote the sustainable use of medicinal plants, and provide a foundation for further research and potential applications in veterinary science.

Materials and Methods

Study Area Descriptions

This study was carried out in three districts of the West Gojjam Zone (Dembecha, South Achefer and Sekela) in the Amhara National Regional State, Ethiopia. There are namely Dembecha (lowland), South Achefer (midland), and Sekela (highland) (Figure 1). The administrative center of West Gojjam zone is Finote Selam, located approximately 380 kilometers from Addis Ababa. Currently, the population of this zone is 2,474,254, with 1,220,477 males and 1,253,777 females of which, more than 91% live in rural areas. Approximately, 99.42% of the population belongs to the Amhara ethnic group, while 0.52% is drawn from other ethnic groups. Moreover, 99.43% of the inhabitants speak Amharic as the working language, though other dialects are spoken by 0.57%. According to religious ground, 98.68% of the population identify themselves as Ethiopian Orthodox Christians and 1.19% as Muslims (CSA 2007). The climate of West Gojjam district supports diverse crop production and is characterized by distinct seasons: Bega (Dec 26-Mar 26) is the driest period, Belg (Mar 26-Jun 26) is the short rainy season, and Kiremt (Jun 26-Sep 26) is the main rainy season, with a mean annual rainfall of about 1250 mm and an average temperature ranging from 18°C to 23°C. Soil erosion, driven by deforestation, over-cultivation, overgrazing, and biomass exploitation, is a serious problem (Amsalu and Wubie 2014). Land use was dominated by cultivated land, followed by bushland/pasture, settlement, natural forest, uncultivable land, and other uses (Tefera 2021). Gish Abay is the source of the Abay (Blue Nile) River, which flows into Lake Tana, along with other rivers such as Gilgel Abay, Ribb, Gumera, and Megech, making the lake a major hydrological feature of the region. The zone's vegetation is mainly dry evergreen Afromontane forest, now largely replaced by bushland due to human pressure in most areas. Dry evergreen Afromontane forests are the most threatened in Ethiopia due to agricultural land expansion as they are exposed to high population pressure and thus, conservation measures should be based on scientific evidence since resources for nature conservation are limited (Mucheye and Yemata, 2020). A variety of wildlife exists in this area, although species diversity and distribution are low due to human interference. Some wildlife species still manage to survive by hiding in the dense remnant dry evergreen montane forest, including Leopard (*Panthera pardus*), Menelik's Bushbuck (*Tragelaphus scriptus meneliki*), Warthog (*Phacochoerus africanus*), Bohor Reedbuck (*Redunca redunca*), Olive Baboon (*Papio anubis*), and Hyaena (*Crocuta crocuta*). Various bird species also occur in this vegetation type, such as Wattled Ibis (*Bostrychia carunculata*), etc. Agriculture is the main livelihood, supporting 85.8% of the population, with nearly half the soil suitable for crops such as teff, maize, wheat, barley, finger millet, pea, haricot bean, chickpea, and soybean, as well as oilseeds, vegetables, and fruits. Forest resources are used for construction, fuelwood, charcoal, agriculture, beekeeping, and medicinal purposes, but unsustainable use contributes to forest degradation. Dembecha District: It lies between 1,400- 2,083 meters above sea level, with a mean annual rainfall of 1,100 mm and an average temperature of 22.8°C (Worku 2023). It is bordered to the west by the district of Bure, to the northwest by Jabi Tehnan, to the north by Dega Damot, and on both the east and south by the east Gojjam Zone. South Achefer District: It is standing at an altitude of 1,500 to 2,500 masl. The average annual rainfall is 1,452 mm, and the average temperature is 21°C. The Gilgel abay bounds the eastern part of the district. The district borders the Awi Zone on its south and west, Semien Achefer on the north, and Mecha on its east. Sekela District: It is situated between 1,800 and 2,744 masl, enjoying an average annual rainfall of 1,700 mm with a temperature of 18°C (Worku 2023). It borders Bure to the southwest, Awi Zone to the west, Mecha to the north, Yilmana Densa to the northeast, Quarit to the east, and Jabi Tehnan to the southeast.

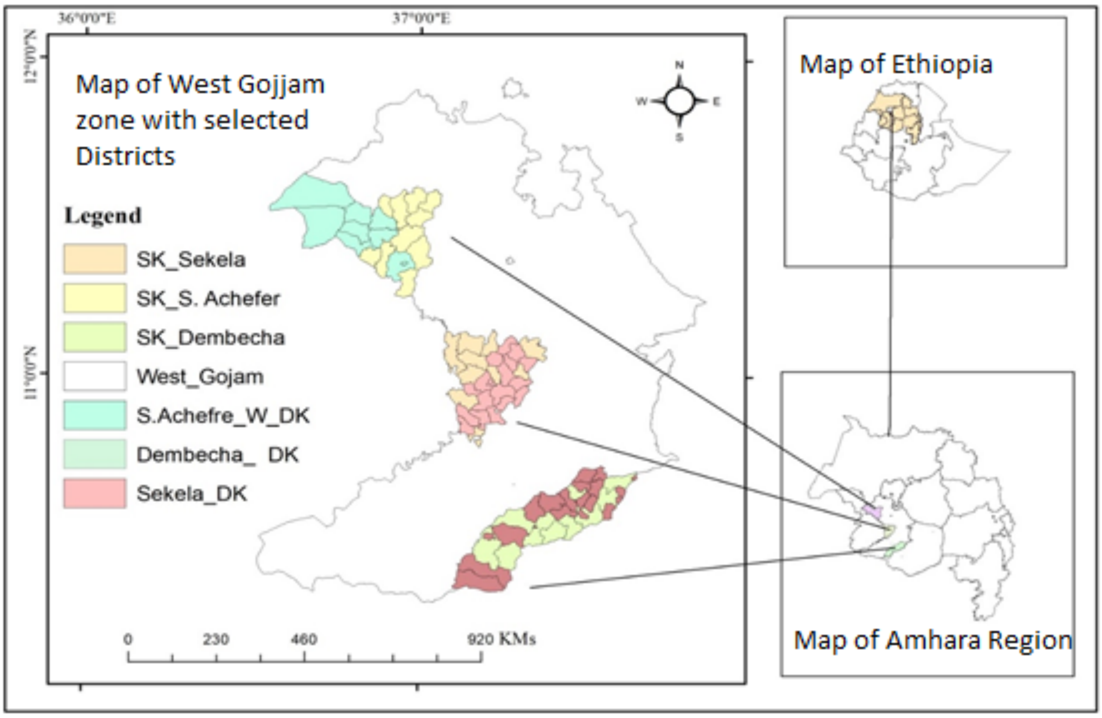

Figure 1. Map of the study sites (SK= sample kebeles; S.Achefer = South Achefer; DK= district kebele) (Source of Map: GIS Software)

Ethnobotanical methods

The Reconnaissance investigation of the study areas

The reconnaissance survey of the study areas was carried out between August 15 to September 22, 2021. The main reason to take place this survey was to select informants, key informants and potential districts based on vegetation coverage. This survey, carried out prior to fieldwork, was crucial for selecting study *kebeles* (the smallest administrative structure in Ethiopia), securing administrative permissions, and locating both informants and key informants. Additionally, it provided an opportunity to familiarize with the area and local culture, ensuring a deeper understanding of the socio-ecological context. Before conducting an ethnobotanical data collection, an official support letter written by the Department of Biology, Bahir Dar University was given to Dembecha, South Achefer, and Sekela districts' higher officers to get legal authorization. Each district officer then wrote a letter to the heads of respective selected *kebeles* (the smallest administrative structure in Ethiopia). The letters were given to each kebele head in person by the researcher. Then, the aim of the study was explained to each head and support was kindly requested in identifying community members with better traditional knowledge. Finally, the ethnoveterinary data was collected.

Selection of study sites, sampling method, and selection of informants

The three study districts (South Achefer, Sekela and Dembecha) were selected from the 14 districts in the West Gojjam Zone based on agroecological data, and due to limited studies undertaken. Accordingly, these districts comprised medium altitude (Woina Dega), low altitude (Kolla) and high altitude (Dega) agroecologies. From these districts, 30 kebelles were chosen, 10 from each district. Gelila, Daba, Lejat, Enamora, Yemehal, Yetsed Wad, Jajirab, Gedeb, and Yezeleqa from Dembecha; Yebodenabashema, Kaire, Guta, Keltafadbretsion, Lalibela, Korench, Kurbaha, Luhudi, Dilamo, and Qat from South Achefer and Surbabifeta, Gitimtrara, Abiyotchora, Lijamiberteta, Abelakirach, Kolellecha, Sewsa, Mageabegira, Gunidil, and Lelimadedana were selected from Sekela. These kebeles were selected based on factors such as population density, presence of traditional healers, availability of contemporary healthcare services, and forest patch coverage (Ayele et al., 2024). Informants and key informants in the study area were selected through systematic random and purposive sampling techniques, respectively. Following the recommendations of local authorities and religious leaders, key informants were selected for interviews according to Martin (1995). The sample size for the ethnobotanical data collection was determined using Cochran's formula (1997), as outlined by Bartlett *et al.* (2001) as follows:

$$n = \frac{N}{1 + N(e)^2}$$

Where, n = sample size for the research, N = total number of households in the study kebeles (210, 511). e = maximum variability or margin of error 5% (0.05),

A total of 399 informants were selected through random sampling, with individuals possessing specialized ethnobotanical knowledge and members of focus groups being purposively selected as key informants. Thirty key informants, including local administrative officials and religious leaders, were selected purposively. In total, 429 informants (399 informants + 30 key informants) were interviewed. Data were gathered from 30 key informants (21 males and 9 females) and 399 general informants (245 males and 154 females) aged $\geq$ 20 years.

Data Collections

Semi-structured interviews and focus group discussions

The ethnoveterinary data was collected from November 28, 2021 to December 22, 2022. Structured interviews, focus groups and accompanied field walks with informants were used to gather ethnoveterinary data. The questionnaire for the semi-structured consisted of information about the sociodemographic of the informants, local names of plant species, livestock diseases treated by each species, parts used, methods of preparation, applications, and routes of administration to treat livestock diseases, conditions of plant part used (fresh or dry) , sources of medicinal plants and types of livestock diseases. Both informants and key informants participated in the semi-structured interviews based on questions prepared ahead of time in English and then translated into the local language, Amharic. Informants were interviewed individually. Guided field walks followed the semi-structured interviews especially with key informants, which created the opportunity for more discussion with informants for practical identification and collection of medicinal plants in the field. Focus group discussions were conducted, according to Martin (1995) and Cotton (1996), to confirm the accuracy of the data and to learn more about local knowledge of medicinal plants. A focus group discussion with six participants was held in each of the kebeles to learn more about ethnoveterinary medicinal plants at the community level. As a result, 30 focus group discussions were held in the districts.

Plant specimen identification

Plant species were documented by their local names, and a preliminary identification was conducted in the field. For species that were difficult to identify on-site, plant specimens were collected, dried, pressed, labeled, and brought back for further identification. The specimens were subsequently identified by comparing them with authenticated samples, illustrations, and taxonomic keys from the Flora of Ethiopia and Eritrea (volumes 1-7), available at the National Herbarium of Ethiopia at Addis Ababa University. Finally, the dried specimens were deposited in the Herbarium of Bahir Dar University for preservation

Data Analysis

The information on the ethnoveterinary medicinal plants was summarized using descriptive statistics (percentage and frequency). The 2013 MS Excel spreadsheet was used to perform summary calculations and create bar graphs and pie charts.

The ***Informant Consensus Factor (ICF)*** was employed to assess the level of agreement among plant users regarding the use of medicinal plants for treating various disease categories in the study areas (Tariq *et al.* 2014). The ICF values range from 0 to 1, with values closer to 1 indicating a higher level of agreement among respondents on the significance of certain plant species in treating diseases (Table 3).The ICF was calculated using the following formula:

$$\mathbf{ICF} = \frac{nur - nt}{nur - 1}$$

Where nur = number of use citations for each disease, nt= number of species used

Fidelity level (FL): In ethnobotany, the fidelity level of medicinal plants is an important index showing the degree a plant species is preferred or more frequently used for medicinal purposes in the particular cultural or ecological context (Ugulu 2012).

It was calculated as the proportion of informants reporting that a plant species is used for medicine, in relation to the total number of informants surveyed. The degree of fidelity will, therefore, be higher when the plant is more utilized and important within a given tradition; the contrary would show that the species is used infrequently or irregularly. Such a measure can help in indicating culturally significant species, informing conservation priorities, and advancing our understanding of the relationship between local communities and their natural environment in particular about plant diversity and sustainability. According to Ugulu (2012), the fidelity level value was estimated as follows:

FL = Ip/Iu × 100, where Ip is the number of respondents who reported the utilization of medicinal plants for a specific main ailment and Iu is the total number of respondents who mentioned the same plant for any ailment (Table 4).

Preference ranking*:* The preference ranking was conducted after Martin (1995) and Cotton (1996) for the most important medicinal plants used in the treatment of a particular illness, as traditional healers (key informants) usually treat it. Thus, a total of 10 informants were asked to give a value from 1-5. The informants gave value 5, which means medicinal plants with high potential for healing anthrax, but 1 was given for plants with less healing potential for anthrax. Finally, each value was summed and ranked (Table 5).

Direct matrix ranking*.* The direct matrix ranking was done according to Martin (1995). To compare the many uses of one plant species to those of another in the use categories, direct matrix ranking is crucial (Medicinal, fence, food, fodder, charcoal, construction, furniture, and firewood). In light of this, the values were scaled from 0 to 5 based on comparisons between plants species used in multipurpose categories. The multipurpose tree species were selected out of the total medicinal plants identified. In this study, 10 key informants were purposefully chosen based on their responses during the interview. They were asked to assign a rating from 0 to 5 (where 5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used, and 0 = not used) for each plant species category. The ratings assigned by the informants were then summed and ranked (Table 6).

Ethical clearance

Ethical approval for this study was obtained from the Department of Biology, Bahir Dar University as evidenced by the official approval letter. I submitted this written letter to the relevant district authorities, who then forwarded it to the administrators of each kebele. After receiving the necessary permissions, I contacted the informants directly, explaining the purpose of the research. I made it clear that their participation was voluntary and that their data would be used solely for academic and research purposes. After providing this information, I obtained verbal consent from each informant and the required ethnobotanical data were collected.

Results

Sociodemographic characteristics of the informants

Out of the total informants, 62.47 and 37.76% were males and females, respectively. Age wise, 55.01% of the informants belonged to 42-62 years followed by over 62 years, which accounted for 24.00 % of the total informants. Informants from the age of 20-41 were small constituting only 21% of the informants (Table 1). Most of the informants were found to be farmers, which accounted for 74.36 % of the total informants followed by church servants (8.86 %) and local healers (6.99%). Traders or merchants were the least represented in the present study (Table 1). Literacy status shows that 85.9% (368 individuals) are literate, with only 14.1% (61 individuals) being illiterate.

Table 1. Demographic information of the informants

Category		Total	Gender		Local healer	Farmer	Teacher	Church servant	Shop keeper	Traders
			M	F	10	71	3	10	2	4
Age	20-41	90	70	20						
	42-62	236	137	99	15	170	12	25	10	4
	>62	103	60	43	5	78	4	13	4	4
	Total	429	268	162	30	319	19	38	17	12
Education status	Literate	368								
	Illiterate	61								
	Total	429								

Table 2. List of medicinal plants used to treat livestock diseases in West Gojjam zone (compiled from three districts: Dembecha, South Achefer, and Sekela). G.F. = Growth forms, C.No. = Collection number

Scientific name	**Local name**	**Family**	**G.f.**	**Plant part**	**Disease treated**	**Mode of preparation of remedies**	**Route**	**C.No.**
Achyranthes aspera L.	Telenji	Amaranthaceae	Herb	Leaves	Leech	The leaves crushed and mixed with water, added drop wise through nose	Nasal	AA45
Acokanthera schimperi (A. DC.) Schweinf.	Merenz	Apocynaceae	Shrub	Root	Rabies	The root is pounded and the powder mixed with water and then drunk in the morning for seven days for dogs	Oral	AA99
Ajuga integrifolia Buch.-Ham. Ex D. Don.	Armagusa/Ets e libawit	Lamiaceae	Herb	Leaves	Black leg	Leaves are crushed, pounded and mixed with water then given to cattle	Oral	AA22
Allium sativum L.	Nechshinkurt	Alliaceae	Herb	Seed	Leeches	Seed is crushed and mixed with water and poured into the nose in both openings	Nasal	AA15
Aloe adigratana Reynolds.	Eret	Aloaceae	Herb	Leaves	Cough	The fleshy leaves are soaked in water for one day and drank in the morning	Oral	AA39
Artemisia abyssinica Sch. Bip. ex A. Rich.	Chikugn	Asteraceae	Herb	Root and leaves	Diarrhea	The root and leaves are crushed and mixed with water and then given to goat and sheep until recovery	Oral	AA52
Buddleja polystachya Fresen.	Anfar	Loganiaceae	Shrub	Root and leaves	hemorrho ids	The root and leaves are crushed, mixed with the pounded seed of *Lepidium sativum* and then applied to the affected part with the mixing of aloe sap	Derm al	AA77
Calpurnia aurea subsp. aurea (Ait.) Benth.	Digita	Fabaceae	Shrub	Fruit	Stomacha che	The fruit is crushed, mixed with water and then drank	Oral	AA8
				Leaves	Ecto-parasite	The leaves are crushed and applied on the affected part	Derm al	
Cicer arietinum L.	Shimbira	Fabaceae	Herb	Seed	Leech	The seed is properly pounded and the powder mixed with water then given to cattle	Oral	AA101
Citrus aurantiifolia (Christm.) Swingle.	Lomi	Rutaceae	Shrub	Fruit	Leech	The juice of *Citrus aurantiifolia* is mixed with salt and then added through nostrils	Nasal	AA92
Clausena anisata (Willd.) Benth.	Limich	Rutaceae	Shrub	Root and leaves	Swelling on the body	The root and leaves are crushed and mixed with water, and then the mixture is given to domestic animals to drink	Oral	AA252
Rotheca myricoides (Hochst.) Steane and Mabb.	Misirch	Lamiaceae	Shrub	Leaves	Anthrax	The leaves are crushed and mixed with water and then given to cattle	Oral	AA211

Clutia abyssinica Jaub. & Spach.	Fiyelefeji	Euphorbiaceae	Shrub	Root	Anthrax	The roots of *Thalictrum rhynchocarpum*, *Dodonaea angustifolia, and Tragia cinerea, Rhus retinorrhoe* are pounded and mixed with ale (tela= local beer) and then given to cattle	Oral	AA66
Combretum collinum Fresen.	Yeqola abalo	Combretaceae	Shrub	Leaves	Diarrhea	The leaves are pounded, mixed with coffee and then given to the cattle	Oral	AA25
				Leaves	Eye disease	The leaves are crushed and a drop of juice applied on diseased eye	Eye	
Croton macrostachyus Del	Misana/Bisana	Euphorbiaceae	Tree	Leaves	Bloat	The fresh leaves are pounded and mixed with water and then drank	Oral	AA222
Cucumis pustulatus Naud. ex Hook.f.	Yemidir embuay	Cucurbitaceae	Herb	Root	Diarrhea	The root is crushed and pounded, then mixed with milk and drank	Oral	AA111
				Fruit	Sheep coughing	The fruit is pounded, mixed with hot water and a pinch of salt, then drunk.	Oral	
				Root	Blackleg	The root is pounded and mixed with water then given to cattle	Oral	
Datura stramonium L.	Atsefaris/Astenagir	Solanaceae	Herb	Leaves	Wound	The leaves are crushed and applied on affected part	Dermal	AA165
Echinops kebericho Mesfin.	Kebercho	Asteraceae	Shrub	Whole part	Sudden illness	The whole plant is placed on the fire, then smoke is directed onto the cattle	Nasal	AA34
Dodonaea angustifolia L. f.	Kitkita	Sapindaceae	Shrub	Stem	Broken part	The stem is tied on broken part	Tie	AA41
Erythrina brucei Schweinf.	Korch	Fabaceae	Tree	Bark	Wound	The powdered bark is mixed with Vaseline and applied to the affected area.	Dermal	AA137
				Leaves	Eye diseases	The crushed leaves are dissolved in a solvent, and drops are applied to the diseased eye.	Eye	
Eucalyptus globulus Labill.	Nech bahirzaf	Myrtaceae	Tree	Bark	Mich	The bark is then put on fire and smoked on the cattle	Nasal	AA280
Euphorbia abyssinica Gmel.	Kulkual	Euphorbiaceae	Tree	Milk	Rabies	*Euphorbia abyssinica milk* is given to a mad dog in the morning before food	Oral	AA291
Grewia ferruginea Hochst.ex A.Rich.	Alenquata	Tiliaceae	Shrub	Latex	Diarrhea	Latex is mixed with water and salt, then given to cattle as a drink.	Oral	AA7
Hagenia abyssinica (Bruce ex Steud.) J.F.Gmel.	Kosso	Rosaceae	Tree	Fruit	Stomachache	The fruit is crushed and mixed with water and then given to the cattle	Oral	AA17
Juniperus procera Hochst. ex Endl.	Yehabesha tsid	Cupressaceae	Tree	Leaves	Leech	The leaves is crushed and mixed with water and then given to cattle through nostril	Nasal	AA29

Justicia schimperiana (Hochst. ex Nees) T. Anders.	Sensel /Smiza	Acanthaceae	Shrub	Leaves	Swelling	The leaves are crushed and given to the diseased livestock	Oral	AA108
				Leaves	Coccidiosis	The leaves are crushed and mixed with water and then given to hens by adding injera	Oral	
				Leaf	Rabies	Leaves of *Justicia schimperiana* and *Salix mucronata subsp. subserrata* are crushed, and the juice is given to the dog in the morning before food for three consecutive days.	Oral	
Lagenaria siceraria (Molina) Standley.	Qil	Cucurbitaceae	Herb	Fruit	Anthrax	The fruit is squeezed and mixed with water; then filtrate is administered to the cattle for five consecutive days	Oral	AA265
Lepidium sativum L.	Feto	Brassicaceae	Herb	Seed	Black leg	The seed is pounded, and mixed with water then given to cattle to drink	Oral	AA277
				Seed	Bloating	The crushed seed mixed with water then given to cattle to drunk	Oral	
Maesa lanceolata Forssk.	Qelewa/Qilaba	Myrsinaceae	Shrub	Leaves and fruit	Anthrax	The leaves and fruit are crushed, mixed with water and then given to cattle to drunk	Oral	AA113
Nicotiana tabacum L.	Tinbaho	Solanaceae	Herb	Leaves	Leech	The leaves are crushed and mixed with salt and pepper, and then drops are given through nostrils	Nasal	AA10
Ocimum lamiifolium Hochst. Ex Benth.	Damakese	Lamiaceae	Herb	Leaves	Febrile illness	The leaves are crushed and mixed with water and then given to livestock to drink	Oral	AA71
Osyris quadripartita Decn.	Qeret	Santalaceae	Shrub	Leaves	Broken skin	The leaves are tied around the broken part	Tie	AA88
Otostegia integrifolia Bent.	Tinjut	Lamiaceae	Shrub	Leaves	Mich	The leaves are dried, fired, smoked to the cattle	Nasal	AA27
Pergularia daemia (Forssk.) Chiov.	Yayit hareg	Asclepiadaceae	Climber	Leaves	Eye disease	The leaves are crushed, and the juice is applied on the diseased eye	Eye	AA56
Phytolacca dodecandra L' Herit.	Mekan endod	Phytolaccaceae	Shrub	Root and leaves	Rabies	The root and leaves are crushed and pounded then given to the dog	Oral	AA64
Plantago lanceolata L.	Gorteb	Plantaginaceae	Herb	Root and leaves	Eye diseases	The root and leaves are crushed and a drop of juice applied on the diseased eye	Eye	AA238
Prunus persica L	Kok	Rosaceae	Tree	Leaves	Sudden illness	The leaves are crushed and soaked with water and then given to cattle	Oral	AA19
Rhamnus prinoides L'Herit.	Gesho	Rhamnaceae	Shrub	leaves	Leech	Fresh leaf, together with *Nicotiana tabacum*, pepper are mixed with water and goat butter, and then given through the nose	Nasal	AA36
Ricinus communis L.	Gulo/Chakima	Euphorbiaceae	Shrub	Root	Gastrointestinal disorder	The root is crushed and mixed with water and then given to cattle at the morning	Oral	AA97

Rumex nepalensis spreng.	Tult	Polygonaceae	Herb	Root and leaves	Stomachache	The root and leaves are crushed and mixed with water and then drunk	Oral	AA84
Rumex nervosus Vahl.	Embuacho	Polygonaceae	Shrub	Leaves	Leech	The crushed leaf is mixed with water then given to cattle	Nasal	AA28
Sida schimperiana Hochst.ex A. Rich.	Chifrg	Malvaceae	Herb	Root	coccidiosis	The root of *Sida schimperiana* and the leaf of *Catha edulis* are mixed with each other and pounded then mixed with water. The formulation is given with enjera and given to hen	Oral	AA20
Silene macrosolen A.Rich.	Wogert	Caryophyllaceae	Herb	Root and leaves	Sudden illness	The roots and leaves are dried, and the cattle is inhaled as smoke	Nasal	AA60
Solanecio gigas Vatke.	Yeshikoko gomen/Boz	Asteraceae	Herb	Leaves	Diarrhea	The leaves are crushed and mixed with water and then given to the cattle	Oral	AA35
				Leaves	Black leg	The leaves are crushed and mixed with water and then given to the cattle	Oral	
Solanum incanum L.	Enbuay	Solanaceae	Shrub	Fruit	Eye diseases	A portion of the fresh fruit is homogenized and applied to the diseased eye of the cattle	Eye	AA75
Solanum anguivi Lam.	Zerch embuay	Solanaceae	Herb	Seed	Tick	The affected part of the body is washed with the juice	Dermal	AA85
Syzygium guineense (Wild.) DC.	Doqma	Myrtaceae	Tree	Bark	Stomachache	The bark is crushed and mixed with water, and then given to the cattle as a drink	Oral	AA264
Tagetes minuta L.	Gimme/Gime	Asteraceae	Herb	Leaves	Black leg	The leaves are crushed and mixed with water and then given to the cattle as a drink	Oral	AA197
Thalictrum rhynchocarpum Dill. & A. Rich.	Sirebizu	Ranunculaceae	Herb	Root and leaves	Anthrax	The root and leaves are crushed and mixed with water, and then given to the cattle as a drink	Oral	AA207
Verbascum sinaiticum Benth.	Yayiya joro/Qetetina	Scrophulariaceae	Herb	Leaves	Nose bleeding	The leaves are crushed and the juice is given through nostrils	Nasal	AA61
Vernonia amygdalina Del.	Girawa	Asteraceae	Tree	Leaves	Any wound	The leaves are squeezed and applied to the wound until recovery	Dermal	AA81
Withania somnifera L.	Gizawa	Solanaceae	Shrub	Root and leaves	Spiritual illness	The root and leaves are crushed and mixed with water and then given to the livestock as drinking or smoking, and spraying also recommended	Nasal	AA103
Zingiber officinale Roscoe.	Zingibil	Zingiberaceae	Herb	Stem	Bloating	The stem is crushed and mixed with water and then given to cattle as a drink	Oral	AA127

Diversity of ethnoveterinary medicinal plants

A total of 53 ethnoveterinary medicinal plants, representing 33 families and 51 genera, were identified at the study sites (Table 2). The local name, family name, scientific name, plant parts used, and preparation techniques of these medicinal plants were documented. The Asteraceae and Solanaceae families, each with five species, were the most frequently mentioned plant species, followed by Lamiaceae and Euphorbiaceae families, each with four species. Other families such as Fabaceae, Cucurbitaceae, Rutaceae, Myrtaceae, and Rosaceae, each contributing two species were mentioned by the informants. The remaining 24 species belonged to 24 different families (Table 2).

Growth forms of medicinal plants

Herbs comprised of most of the growth form in the present study, accounting for 22 (41%) of the species. This was followed by shrubs, which represented 21 (40%) of the species (Figure 2). About 17 % of the medicinal plants used for ethnoveterinary medicine were trees. Climber growth form was the least used representing only 2 % of the total growth forms

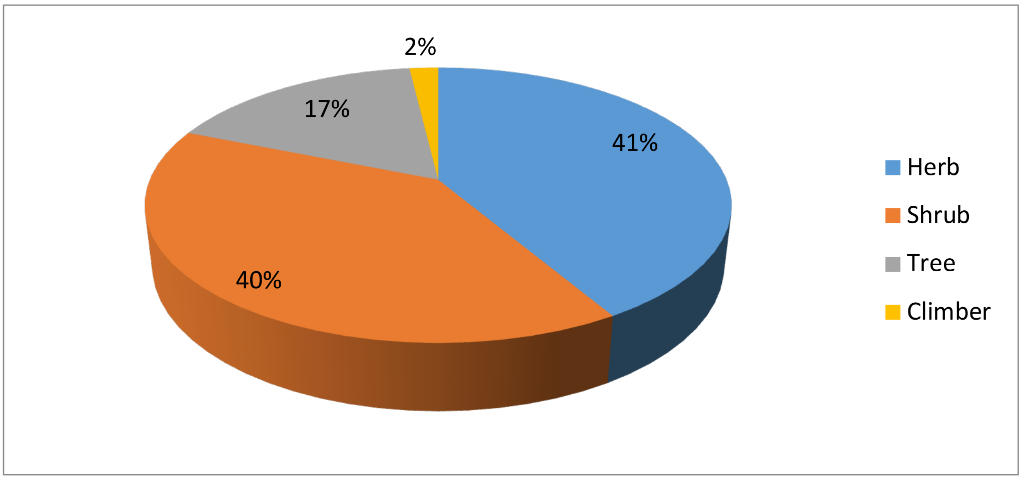

Figure 2. Growth form of ethnoveterinary medicinal plants at study sites.

Plant parts used for the preparation of the remedies

The leaves were found to be the most frequently used plant parts (96.23%) for the preparation of ethnoveterinary remedies. The second frequently used plant part for ethnoveterinary remedy preparation was the mixture of roots and leaves, accounting for 32.08%, followed by roots and fruits (Figure 3). By contrast, the combined form of fruits with leaves and whole plant were rarely used plant parts in the preparation of remedies for treating livestock diseases (Figure 3).

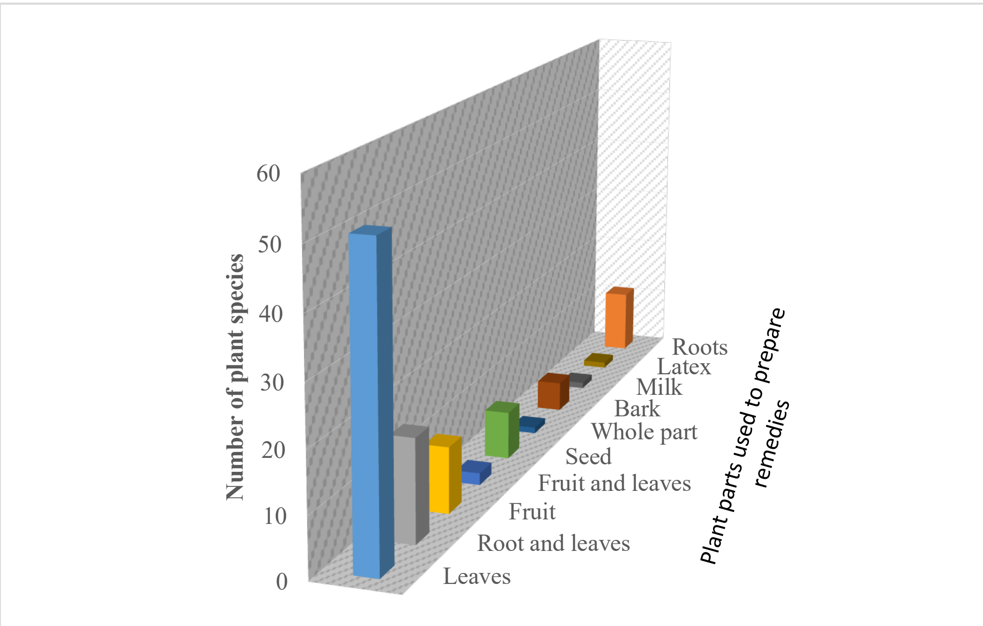

Figure 3. Plant parts used to prepare remedies at study sites

Method of preparation

The local traditional healers prepared the remedies using various methods in the study area. Most of the remedies were prepared by crushing 37 (69%), followed by pounding 16 (30%) (Figure 4). In the present study, squeezing plant parts was the least mode of remedy preparation.

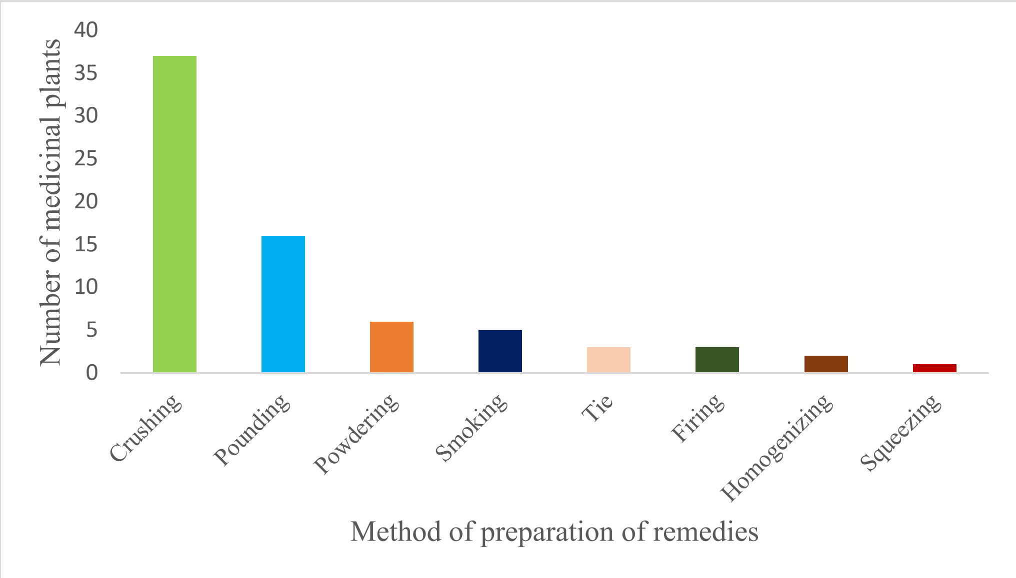

Figure 4. Method of preparation of remedies at the study sites

Route of administration

The predominant route of administering ethnoveterinary processed remedies was oral, which was applied to 36 species. This, in turn, followed by nasal administration, applied to 9 species and dermal application, which encompasses 6 species (Figure 5).

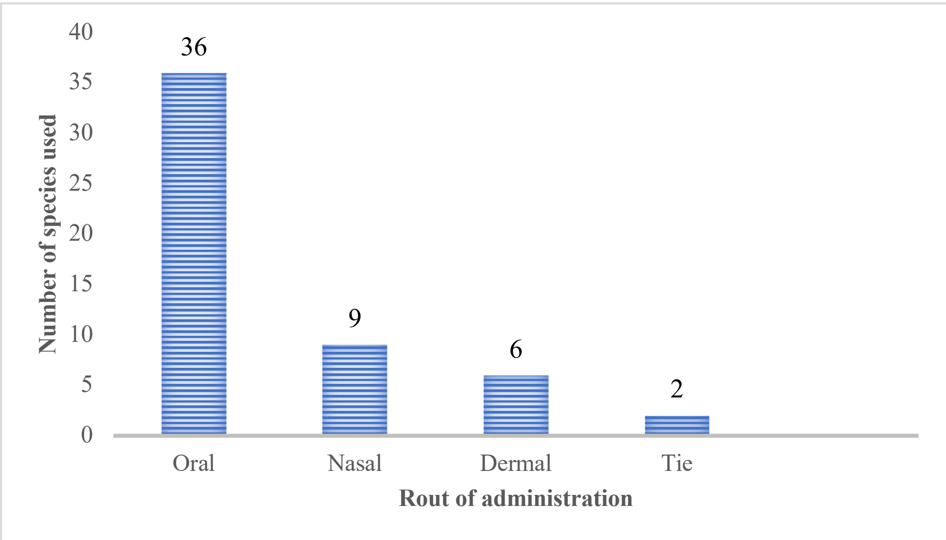

Figure 5. Mode of route of administration

Informant Consensus Factor (ICF)

The ICF values calculated for each category of disease show that there is great consensus among informants regarding the medicinal plant uses in ethnoveterinary practices. The ICF values showed strong consensus for spiritual or psychological conditions (1.000). This was followed by respiratory conditions (0.996), and injury- related conditions (0.984). On the other hand, gastrointestinal issues and febrile conditions had ICF values of 0.970 and 0.971, respectively (Table 3).

Fidelity Level (FL)

In the study area, a total of eight commonly used ethnoveterinary medicinal plants were identified, which have variable fidelity levels for the treatments of various livestock ailments in the study area. The FL% for each plant species has been calculated on the basis of the proportion of informants who reported its use against a particular ailment. Among them, the species *Cucumis pustulatus* expressed the highest FL level, which is 96.08%, mainly for the treatment of blackleg. Thus, it shows its importance in the communities culture and is widely used for this condition. The plant *Withania somnifera* was used for spiritual illness and had a high FL level of 94.29%, showing its importance in managing both physical and spiritual health issues in the community. Other plants utilized for livestock ailments like *Datura stramonium* for the treatment of wounds and *Echinops kebericho* for sudden sicknesses were almost equally high in their fidelity levels: 90.70% and 92.31%, respectively (Table 4).

Table 3. Informant Consensus Factor

Diseases Category	nt	nur	ICF
Parasitic Infections	9	189	0.957
Infectious Diseases	13	208	0.942
Respiratory Conditions	2	269	0.996
Gastrointestinal Issues	14	429	0.97
Injury-Related Conditions	5	256	0.984
Inflammatory or Swelling Conditions	3	123	0.984
Febrile or Sudden Illnesses	4	103	0.971
Spiritual or Psychological Conditions	1	98	1

Table 4. Fidelity level of most commonly used ethnoveterinary medicinal plants in the study area

Plant species	Used to treat	Ip	Iu	FL %
Cucumis pustulatus	Blackleg	49	51	96.08
Datura stramonium	Wound	39	43	90.7
Withania somnifera	Spiritual illness	33	35	94.29
Dodonaea angustifolia	Broken part	28	31	90.32
Echinops kebericho	Sudden illness	24	26	92.31
Erythrina brucei	Eye diseases	26	29	89.66
Calpurnia aurea	Stomachache	39	44	88.64
Artemisia abyssinica	Diarrhea	37	41	90.24

Preference ranking

The preference ranking was calculated for five most important medicinal plants used to treat anthrax. Based on the preference of key informants *Clerodendrum myricoides* species was ranked first, followed by *Thalictrum rhynchocarpum* used to treat anthrax (Table 5).

Table 5. Preference ranking of ethnoveterinary medicinal plants used to treat anthrax at the study sites (Note: KI=key informants)

List of medicinal plants	**Key informants**												
	KI1	KI2	KI3	KI3	KI4	KI5	KI6	KI7	KI8	KI9	KI10	Total	Rank
Clerodendrum myricoides	4	5	5	5	1	3	4	3	4	4	4	42	1st
Clutia abyssinica	2	4	3	2	4	1	3	2	3	3	2	29	3rd
Lagenaria siceraria	1	3	2	2	2	3	1	2	1	2	5	24	5th
Maesa lanceolate	3	2	2	2	3	1	3	2	3	3	2	26	4th
Thalictrum rhynchocarpum	5	3	4	3	4	4	2	4	4	2	3	38	2nd

Direct matrix ranking

In this study, we contrasted the various applications of five species of medicinal plants for their multipurpose uses in the current study. A total of 13 key informants were contacted for their opinions in order to determine the multiple uses of medicinal plants in the study areas. According to the results of the direct matrix ranking, Olea europaea ranked first, followed by *Eucalyptus globulus* (Table 6). Similarly, ethnoveterinary medicinal plant species used for firewood collection had the highest use diversity.

Table 6. Direct matrix ranking of five ethnoveterinary medicinal plant species from study sites

Name of plant species	Use diversity categories							
	Medicinal	Furniture	Construction	Fence	Charcoal	Firewood	Total	Rank
Syzygium guineense	3	3	4	3	2	5	20	5th
Olea europaea	5	4	5	4	4	4	26	1st
Hagenia abyssinica	4	5	4	3	4	4	24	3rd
Croton macrostachyus	4	4	3	3	4	4	22	4th
Eucalyptus globulus	3	4	5	4	4	5	25	2nd
Total	19	20	21	17	18	22		
Rank	4th	3rd	2nd	6th	5th	1st		

Proportion of medicinal plants used for treating livestock diseases

There are different types of ethnoveterinary medicinal plants used to treat various livestock diseases in the study areas (Figure 7). The highest numbers of plant species were used to treat leeches, wound treatment and sudden disease conditions each with seven plant species. Eye diseases and diarrhoea were the second group of livestock disease treated with higher number of plant species, each with six species. Livestock diseases such as anthrax, bloating, coccidiosis, and febrile illnesses were treated with five plant species each (Figure 6). Black leg, donkey haemorrhoids, nasal bleeding, rabies, and leech infections were livestock diseases treated by the least number of plant species (Figure 6).

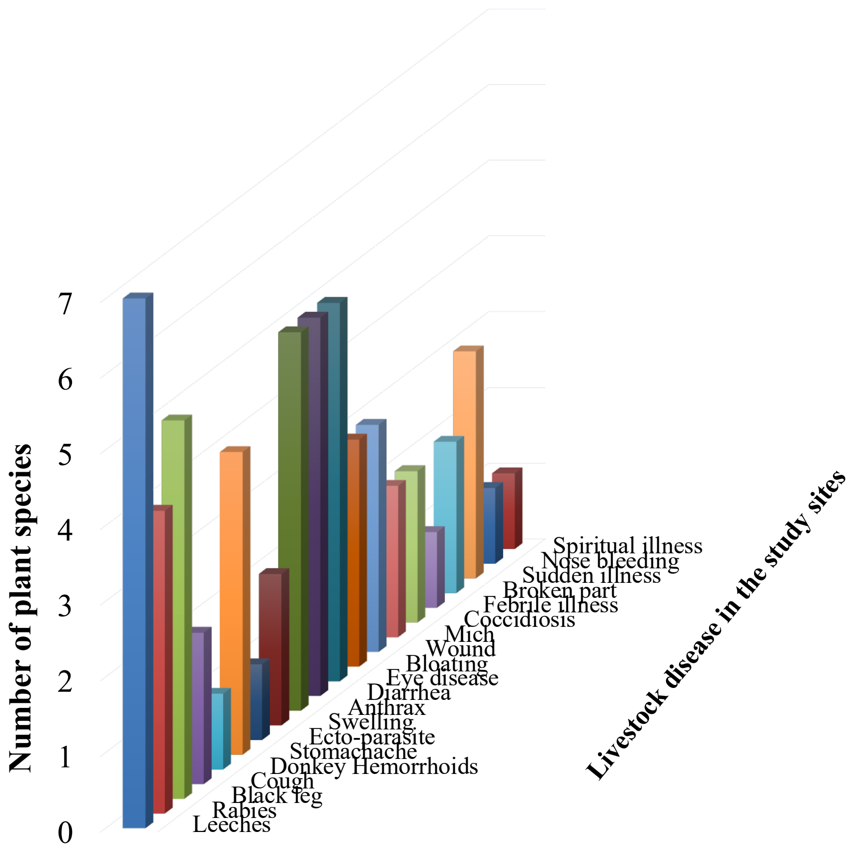

Figure 6. Proportion of medicinal plants used to treat different livestock diseases

Discussion

A relatively low number of ethnoveterinary remedies were used to treat livestock diseases in many of the study areas. In different parts of the study areas showed that less number of ethnoveterinary plants were reported in Gera district by Gonfa et al. (2020); in the Omusati and Kunene regions, in Namibia by Eiki et al. (2022); in Mojana Wodera district by Abebe (2022) and in Bensa Woreda (Tekle 2015). However, the present study documented more ethnoveterinary plants in comparison to the above previous study areas, indicating richer plant diversity in the current surveyed area. The current study showed that the most predominant growth forms were herbs. This finding was inconsistent with other earlier studies in Bale Mountains

(35 species, 47.3%) reported by Yinger et al. (2007) & harbs as the most dominant habits by Feyera et al. (2017). Herbs are important plant parts because they are more accessible and in flower every year, so that they play a significant role in traditional veterinary practices (Romha et al., 2015, Dilbato et al. 2023).

The present results indicated that the most used plant part for drug preparation was leaves, which agreed with earlier ethnoveterinary studies (Dilbato et al. 2023); Abebe 2022) that showed leaves to be the primary plant part used. In contrast, roots may affect plant regeneration adversely and may lead to extinction, as cited by Tadesse et al. (2019). The traditional healers acknowledge the leaves' effectiveness in treating various ailments in animals, and this calls for the selection and harvesting of leaves for proper plant parts. Selection for proper plant parts for harvesting is important for sustainability in that it maintains the regenerating power of the plant; for instance, root harvesting is not recommended unless there is the adoption of sustainable practices to prevent over-harvesting and hence plant depletion. Poor methods of harvesting lead to the extinction of some plant species (Papageorgiou et al. 2020). Appropriate and viable harvesting methodologies, therefore, need to be in place so that medicinal plants could continuously be made available for future applications, hence their value in traditional medicinal use and development of ecological balance should be maintained.

The most preparation methods at the study sites were found to be crushing and pounding, which agrees with previous studies where crushing was recognized as the most used technique by Romha et al. (2015), and Majeed et al. (2020). According to traditional healers, this is because crushing improves the extraction efficiency of biologically active compounds, hence increasing the bioactivity of the plant parts. This justifies the notion that proper sample preparation technique plays an important role in ensuring full therapeutic potential of plant specimens (Krakowska-Sieprawska et al. 2022).

Ethnoveterinary medicinal plants can be administered via various methods: orally, by having remedies consumed and absorbed through the digestive tract, often involving the crushing of plant parts and mixing them with water or other liquids for cattle to ingest. In consistent to this result in various parts of Ethiopia, processed remedies were mostly administered through oral route (Feyera et al. 2017, Yinger et al. 2007). Traditional healers often prefer oral administration of medicinal plants when treating cattle because it is an efficient way to deliver therapeutic compounds to the animals (Tichy & Novak, 1998, Palombo 2011). By administering plant-based remedies through drinking water, feed, or oral dosing, and the active ingredients can be absorbed into the bloodstream and target internal issues such as digestive disorders, infections, or inflammation. This method is less stressful for the animals, especially when compared to injections, and allows for easier integration into daily care routines. The nasal route is preferred to apply plant remedies through the nostrils, such as using juice or crushed plant parts to address respiratory issues.

In dermal route, processed remedies are directly applied to skin or the affected area, following utilizing preparations like crushed leaves combined with other substances to treat wounds or irritations. A portion of the plant (such as a stem) is tied to the affected or broken area or wound, typically for the treatment of fractures or injuries.

The high ICF values obtained in most of the disease categories indicated a high cultural consensus in the community. They support the perceived efficacy of these plant-based treatments in ethnoveterinary practices. For instance, the highest ICF value was obtained for respiratory conditions (0.996), indicating virtual agreement on its remedy. In contrast to the present study, the highest ICF value had the external parasites and skin problems in selected districts of southern Ethiopia (Romha et al. 2015). This may represent both its prevalence and traditional treatments of effectiveness in the community. Spiritual/psychological problems have an absolute consensus of ICF = 1.000, supposing that this category is culturally perceived in a peculiar manner, with a certain remedy likely to be very important. In other study showed that yoke sore (wound) had the highest informant consensus factor (ICF) value (1.00), followed by leech infestation (0.92) and endoparasite infections (0.90) (Feyisa et al. 2021). Similarly, gastrointestinal problems ICF = 0.970, injury conditions ICF = 0.984, and febrile illness/sudden problems ICF = 0.971 indicated highly unanimous information, assuming that these sicknesses are generally received and plant remedies are developed to treat them. By contrast, the somewhat lower ICF values for parasitic infection (0.957) and infectious diseases (0.942) point either toward greater ranges of treatments or variable perceptions of treatment efficacies, which might then indicate the possible need for a greater variety of remedies in addressing those conditions.

The highest level of fidelity for many of the ethnoveterinary plants among the respondents in the study area shows the deeply rooted knowledge and belief in those plants for traditional healing by the community. The *Cucumis pustulatus* species had the highest fidelity level at 96.08%, suggests that it is important in treating blackleg, which is a common disease among livestock in the study area, on the other hand, *Withania somnifera* is generally used to treat spiritual illness with a FL of 94.29% indicating evidence that animal health encompasses body and spirit. Unlike the present study, *Nicotiana tabacum*, *Malva parviflora*, and *Calpurnia aurea* showed the highest fidelity level (100%) and rank order priority (100%) for treating leech infestations, retained placenta, and snake poisoning, respectively (Feyisa et al. 2021). The plants of high fidelity class include *Datura stramonium* and *Echinops kebericho*, restricted to the treatment of wound and sudden ailments.

Plants with low fidelity levels include *Erythrina brucei* and *Calpurnia aurea*, at 89.66% and 88.64%, respectively, probably deal with more general purposes in medicinal use or serve as alternative medicine for similar conditions. These findings again underscore the two most influential factors in plant selection for medicinal applications: local ecological availability and community cultural tradition. The fact that certain plants are used consistently across specific diseases is evidence not only of their perceived effectiveness in treating certain ailments but also of the depth of cultural tradition regarding plant knowledge passed down through generations.

This knowledge is very important for the preservation of traditional practices and may introduce perspectives for further research on the pharmacological properties of these plants, in search of new treatments against animal diseases. Besides this, the high level of fidelity indicates a dependence that is stable, probably determined by factors such as the low availability of modern veterinary services or simply a cultural preference for traditional remedies. The preference ranking of the ethnoveterinary medicinal plants used in treating anthrax, as done by the key informants had some variations in the selected medicinal plants. *Clerodendrum myricoides* was highly preferred and ranked first, meaning it is widely used and highly supported by the informants for the treatment of anthrax. This was closely followed by *Thalictrum rhynchocarpum*, ranked second and hence was also one of the important plants in local ethnoveterinary practices. Coming third, with 29, was *Clutia abyssinica*, emerging as one of the commonly used plants, while less favored were *Maesa lanceolata* and *Lagenaria siceraria,* ranked 4th and 5th, respectively. Results from the fidelity level showed a clear preference *for Clerodendrum myricoides* and *Thalictrum rhynchocarpum*, suggests an indication of their potential importance in local medicinal knowledge and practices in the controlling anthrax in livestock. The ranking further shows that though some plants are more widely favored compared to others, this may be in regard to perceived efficacy, availability, or traditional knowledge.

At the study sites, multipurpose species, particularly *Olea europaea,* are facing significant threats due to their frequent harvesting for non-medicinal uses, including construction, furniture-making, fencing, charcoal production, and firewood. Without sensible and effective conservation measures, the extinction of this species is imminent. Research finding indicates that many multifunctional medicinal plants are at risk Hassan et al. (2014), highlighting the urgent need of these medicinal plants for sustainable management practices. To mitigate this threat, it is imperative to promote the prudent use of such valuable medicinal plants and explore alternative approaches to their application, thereby ensuring their survival and continued contribution to both human health and biodiversity conservation.

Interviewed traditional healers showed that medicinal plants used in treating livestock diseases were quite diverse, with a complexity of local knowledge. Among these leeches infestation represented one of the most common types of diseases, and there were seven medicinal plant species identified for treating them, specifically *Achyranthes aspera, Cicer arietinum, Citrus aurantiifolia, Juniperus procera, Nicotiana tabacum, Rhamnus prinoides, and Rumex nervosus*. Furthermore, the healers indicated a number of animal diseases treated with medicinal herbs for 20 different conditions, showing the wide range of therapies available from plant-based remedies. The conditions most frequently mentioned by informants include parasites of leeches infestation, diarrhoea, and anthrax diseases, most of which require multiple plant species to treat due to their complex nature. This is in agreement with works earlier conducted by Abraha (2007), Assefa and Bahiru (2018), and Asfaw et al. (2022). Relatively rare conditions, such as haemorrhoids of donkeys, febrile illness, ectoparasites, and bleeding from the nose, were treated associated with one or two species only; since treatment approaches are so simple. These results indicated the close linkage of plant remedies to animal health, which calls for further research to fully understand the diversity and specificity of plant species to various diseases treatments. This would contribute to such studies supporting conservation, adding in depth knowledge to sustainable ethnoveterinary practices, and linking traditional knowledge with state-of-the-art of modern scientific methodology.

Conclusion and Recommendation

The study documented 53 ethnoveterinary medicinal plants from 33 families and 51 genera, with Asteraceae and Solanaceae being the most represented. Herbs (41%) and shrubs (40%) were dominant, and leaves (96%) were the most frequently used plant part, with remedies mainly prepared by crushing (69%) and administered orally (68%). Informant Consensus Factor (ICF) showed strong agreement, particularly for spiritual/psychological (1.0), respiratory (0.996), and injury-related (0.984) conditions, while Fidelity Level (FL) analysis highlighted Cucumis pustulatus (96.1%) for blackleg, Withania somnifera (94.3%) for spiritual illness, and *Echinops kebericho* (92.3%) for sudden sickness. Preference ranking identified *Clerodendrum* *myricoides* as the top anthrax remedy, and *Olea europaea* as the most multipurpose species. However, anthropogenic influences such as agricultural expansion, urban growth, and the migration of traditional healers threaten the preservation of this knowledge and the plants themselves. This underlines the urgency of documenting ethnoveterinary knowledge and integrating it into policy, as veterinary medicine can benefit greatly from such resources. The study emphasizes the role of local communities in conservation and recommends systematic documentation, community involvement, biodiversity monitoring, education-based capacity building, and public awareness to ensure sustainable use and preservation of ethnoveterinary medicinal plants.

Declarations

List of abbreviations: ICF- Informant Consensus Factor; FL- Fidelity Level; ESS- Ethiopian Statistics Service

Ethical Approval and Informed Consent: All participants give their consent to the information**.**

Consent for publication: Not applicable

Availability of data

The data used in this investigation are included in this manuscript.

Competing interests: Not applicable

Authors' Contributions

A.A., A.S., A.B.M., W.A., and G.Y. were involved in conceptualization, data collection, original manuscript drafting, and methodology, data curation, review, and super vision.

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