Traditionally used ethnoveterinary phytomedicines and their associated threats in Yeki district, Southwestern Ethiopia

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Research

Abstract

Background: For generations, communities in Yeki district, Southwestern Ethiopia, have relied on ethnoveterinary phytomedicines (EVPMs) as a primary means of treating livestock ailments. However, this traditional knowledge is increasingly at risk due to environmental degradation, cultural shifts, and lack of documentation. This study aimed to document and analyzes the EVPMs and associated indigenous knowledge used in local livestock healthcare.

Methods: A total of 170 informants were selected through purposive and snowball sampling. Quantitative ethnobotanical tools such as Informant Consensus Factor (ICF), Fidelity Level (FL), Preference Ranking (PR), Pairwise Comparison (PWC), and Direct Matrix Ranking (DMR) were applied. Statistical tests (t-test, ANOVA, correlation, regression) were conducted using R to evaluate knowledge variation among informants.

Results: Fifty medicinal plants from 34 families were recorded for treating 21 livestock ailments, including wounds, trypanosomiasis, rabies, bloating, and diarrhea. Asteraceae, Euphorbiaceae, and Solanaceae were the most cited families. Herbs were dominant, with leaves and roots the most used parts, mainly administered orally. The highest ICF (0.94) was for external parasites, and J. *schimperiana* had the highest FL (94%) for treating intestinal parasites. Agricultural expansion and grazing were major threats. Knowledge of EVPMs significantly varied among informant groups ($P < 0.05$).

Conclusion: The community holds rich ethnoveterinary knowledge with diverse EVPMs, many of which are under threat and lack conservation. Collaborative efforts with institutions like Mizan Tepi University are vital for conservation and scientific validation of these medicinal plants.

Keywords: Ethnoveterinary, Phytomedicines, Threats, Yeki district, Ethiopia.

Background

Ethnoveterinary medicine encompasses traditional knowledge, beliefs, and practices used to maintain animal health, including herbal remedies, diagnostic methods, and husbandry techniques (Ayeni & Basiri 2018, Van *et al.* 2001). It has long supported livestock care, particularly in developing regions where modern veterinary services are limited and often confined to urban areas (Dossou-Yovo *et al.* 2021, MC 1986, Van *et al.* 2001). In rural and remote areas, traditional herbal treatments remain vital due to their affordability, accessibility, and perceived effectiveness (Aziz *et al.* 2020, Wanzala *et al.* 2005, Herrero *et al.* 2013). This approach is increasingly recognized for its role in improving livestock health and welfare at the primary healthcare level (Teixidor-Toneu *et al.* 2020, MC *et al.* 2020). Compared to synthetic drugs, ethnoveterinary phytomedicines offer sustainable, culturally relevant, and cost-effective alternatives (Aziz *et al.* 2018, Silva *et al.* 2020, Martin *et al.* 2001). Livestock play a central role in the livelihoods of many rural populations, contributing to food production, income, labor, and cultural identity (Temesgen 2022, Bachewe *et al.* 2018). Ethiopia, in particular, holds one of the largest livestock populations globally, ranking fifth in cattle stock worldwide, surpassing countries like Argentina and Australia (Bachewe *et al.* 2018). For smallholder farmers, livestock are vital resources that provide food, manure, traction, and income, while also reinforcing food security and social status (Duguma 2013, Duressa *et al.* 2014). However, the sector faces numerous challenges due to widespread animal diseases that reduce productivity, market value, and household income (Bekele, Musa 2009, Kidane *et al.* 2014, Yineger *et al.* 2007). These health issues create a growing disparity between the demand and supply of livestock products (Sori *et al.* 2007), particularly in cultures where livestock are symbols of wealth and social standing. The situation is compounded by poor access to veterinary clinics, medicines, and trained personnel (Giday, Teklehaymanot 2013). In such contexts, ethnoveterinary phytomedicinal species (EVPMs) serve as practical alternatives, especially in areas where modern veterinary care is limited or unaffordable (Lulekal *et al.* 2014). In Ethiopia, various ethnic groups use EVPMs to treat livestock ailments, reflecting the country's rich cultural and botanical diversity (Gemechu 2021, Gensa 2023, Adibaru & Chane 2021, Alemneh 2021, Wendimu *et al.* 2023). Traditional healers play a central role in delivering these services, often at little or no cost (Aerts *et al.* 2017, Awas 2007, Ganesan *et al.* 2015). In Ethiopia, EVPMs are employed to treat common livestock ailments such as anthrax, blackleg, diarrhea, wounds, bloat, intestinal worms, external parasites, and mastitis (Tilahun *et al.* 2019). Some of the prominent plants used in Ethiopian ethnoveterinary medicine include *Croton macrostachyus*, *Solanum incanum*, *Calpurnia aurea*, and *Withania somnifera* (Tilahun *et al.* 2019, Hankiso *et al.* 2024, Oda *et al.* 2024). Nonetheless, the survival of ethnoveterinary knowledge is increasingly threatened by environmental degradation, modernization, and the declining transmission of oral traditions (Yineger *et al.* 2008, Kahsay *et al.* 2020, Eshete & Molla 2022, Asfaw *et al.* 2022). The majority of this knowledge is passed orally, making it vulnerable to loss as elder knowledge-holders age and societal structures shift (Lulekal *et al.* 2014, Eshetu *et al.* 2015, Neja 2022). Without proper documentation and scientific evaluation, valuable practices and medicinal plants risk being forgotten (Kidane *et al.* 2014, Assefa *et al.* 2018, Kassa *et al.* 2020). Yeki District, characterized by its mixed agricultural system, hosts communities with a strong history of using plant-based remedies for livestock diseases. However, efforts to document and validate these practices remain minimal (Yineger *et al.* 2008, Mose *et al.* 2020, Kahsay *et al.* 2020, Feyisa *et al.* 2021, Wendimu *et al.* 2023). Rapid socio-economic changes, rural-urban migration, and a lack of focused ethnoveterinary research further erode this knowledge base (Abebe 2022). Ethnobotany, which explores human-plant relationships based on indigenous and local knowledge, is crucial for preserving such traditions. This knowledge is endangered by deforestation, agricultural expansion, and generational disconnection, which threaten both plant diversity and cultural memory (Awoke *et al.* 2024). A collaborative research approach engaging herbalists, ethnobiologists, veterinarians, and anthropologists could facilitate the integration of traditional practices with modern veterinary care, enhancing sustainable livestock healthcare. According to the 2023 Yeki District Agricultural and Rural Development Office, the district has 38,915 cattle, 10,604 sheep, 26,894 goats, 1,780 donkeys, 1,227 horses, 12 mules, 158,246 poultry, and 116 dogs. Despite this high livestock population, access to modern veterinary services is limited. As a result, many households continue to rely on traditional remedies for conditions such as trypanosomiasis, diarrhea, bloating, ringworm, fowl typhoid, coccidiosis, lice and tick infestations, foot-and-mouth disease, and orf. The increasing human population and the expansion of farmland are also leading to the degradation of natural habitats where medicinal plants grow. These pressures highlight the urgent need to investigate, document, and preserve EVPMs and associated knowledge. Given Yeki District's rich biodiversity and cultural heritage, we hypothesize that substantial traditional knowledge of livestock phytomedicines remains undocumented. Therefore, this study aims to: i) to document the traditional knowledge and use of medicinal plants in the district for treating livestock ailments; ii) to analyze how socio-demographic factors affect the distribution and retention of this knowledge; iii) to compare the findings with existing ethnobotanical data from Ethiopia, iv) to identify the most common health conditions treated and the corresponding plant species used, and v) evaluate community perceptions about the sustainability and conservation of ethnoveterinary plants. Additionally, comparing these findings with national EVPM databases will contribute to a broader understanding of Ethiopia's ethnobotanical heritage and the regional distribution of medicinal plant knowledge.

Materials and Methods

Study area

The study was conducted from March to August 2024 in the Yeki district of the Sheka Zone in southwest Ethiopia. This area is geographically situated between latitudes 7°12' and 7°43' N and longitudes 35°32' and 35°75' E, covering an area of 48,871 hectares with elevations ranging from 1,000 to 2,000 meters above sea level (Figure 1). Tepi town, the district's capital, is located 133 kilometers from Bonga, the regional town, and 611 kilometers southwest of Ethiopia's capital, Addis Ababa. Yeki district shares borders with the Bench Maji Zone to the south, the Gambela Region to the west, Anderacha to the north, and the Keffa Zone to the east. The primary occupations of the local populace include farming and trading. The district is home to a population of 134,519, comprising 68,895 men and 65,624 women, with 24,829 residents (18.46%) living in urban areas. The largest ethnic groups in the district are Kafficho (29.78%), Amhara (29.48%), Oromo (11.67%), Shekkacho (7.45%), Bench (7.33%), Sheko (7.26%), and Majang (6.1%), while other ethnic groups combined account for 1.54% of the population. Amharic is the primary language spoken by 32.91% of the residents, followed by Kafa (28.48%), Oromiffa (11.36%), Sheki-noono (7.55%), Sheko (7.17%), and Bench (6.84%). The remaining 5.69% of the population speaks various other languages (CSA 2017). The district is characterized by extensive forest cover, with dominant indigenous tree species including *Cordia africana*, *Polyscias fulva*, *Pouteria adolfi-friedericii*, *Schefflera abyssinica*, *Croton macrostachyus*, *Prunus africana*, and *Olea welwitschii*. Agricultural practices serve as the primary livelihood for most inhabitants. Income assessments indicate that wild coffee is the leading source of cash income, followed by honey, which is sold in smaller quantities by some households. Other non-timber forest products, such as cardamom and black pepper (*Timiz*), as well as timber for homes, farm tools, fencing, and ladders, are commonly used, primarily for home consumption but also contribute to cash income (Awoke *et al*., 2024). According to climate data collected from the Ethiopian National Meteorological Agency for the years 2001 to 2021, Yeki district recorded monthly temperature lows of 13.1°C, highs of 34.2°C, and an annual average of 21.6°C (Awoke *et al.* 2024). The region receives an average of 1,352 mm of rainfall each year, exhibiting a unimodal rainfall pattern with most precipitation occurring throughout the year. This extensive rainfall contributes to the lush evergreen vegetation of the Afromontane Forest, which supports a diverse array of unique plant species (Kassa *et al.* 2020). In Yeki district, highland regions account for 56% of the agro-ecosystems, while midland (Woynadaga) regions represent 24%, and lowland (wet qolla) regions make up 20% (Awoke *et al.* 2024).

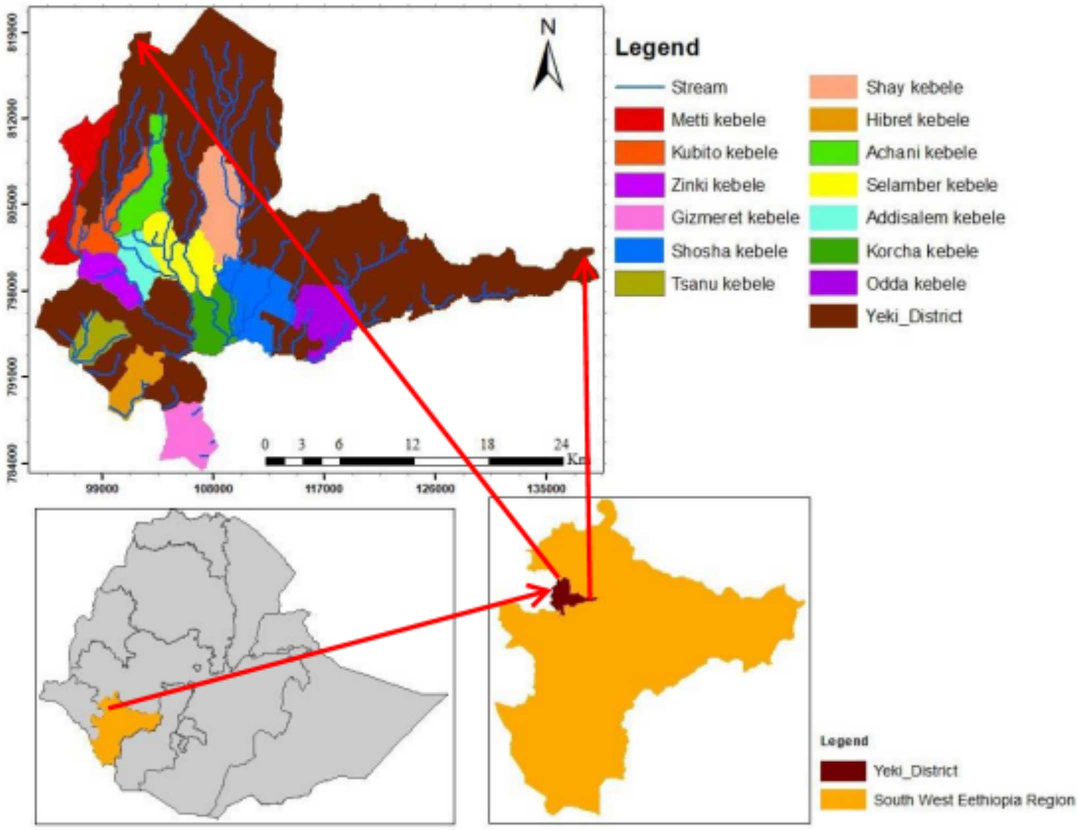

Figure 1. Map of study area (Generated by ArcGIS 10.4.1)

Study Site and Informant Selection

A reconnaissance survey of the study area was conducted to familiarize ourselves with the location and identify potential sample sites. Before engaging with the local population, the research objectives were presented to the district administrator to secure permission and obtain a legal identity letter. This helped facilitate support from Kebele administrators and the local community, ensuring a smooth data collection process. Key informants were also identified and selected during this survey. Sample sites were purposefully chosen based on the availability of vegetation, the presence of residents, and coverage from previous studies. Following the methods outlined by Awoke *et al.* (2024), each Kebele was given equal selection probability, and 10 general informants per Kebele were chosen using snowball sampling, resulting in a total of 130 informants. Additionally, 40 key informants were selected based on recommendations from local authorities, elders, and religious leaders. The informants’ ages ranged from 20 to 85, categorized into three groups: younger (20–41), middle-aged (42–63), and elderly (64–85).

Table 1. Information of selected study sites and sociodemographic summaries of informants

Name	Altitude	GPS Coordinates		Gender		Age categories		
of Kebeles		Latitude (N,S)	Longitude (E,W)	M	F	20-30	31-50	51-85
Metti	1326m	7°14'15"N	35°19'11"E	9	4	1	3	9
Kubito	1410m	7°15'26"N	35°22'27"E	8	3	2	4	7
Zinki	1311m	7°13'00"N	35°22'40"E	9	4	1	3	8
Gizmeret	1257m	7°02'06"N	35°26'33"E	10	3	3	2	10
Shosha	1228m	7°12'26"N	35°28'58"E	11	5	2	4	8
Tsanu	1136m	7°10'38"N	35°21'53"E	8	4	1	3	8
Shay	1516m	7°16'05"N	35°27'01"E	9	3	3	3	6
Hibretfire	1151m	7°09'08"N	35°24'13"E	10	5	2	2	7
Achani	1704m	7°17'22"N	35°23'20"E	9	4	3	4	6
Selamber	1295m	7°13'55"N	35°25'19"E	11	2	2	3	11
Addisalem	1336m	7°14'02"N	35°23'16"E	9	4	2	2	7
Korcha	990m	7°07'36"N	35°24'41"E	8	5	3	3	10
Odda	1507m	7°14'22"N	35°38'25"E	10	3	2	4	6
Total				121	49	27	40	103

Ethnobotanical Data Collection

Ethnobotanical data were collected using semi-structured interviews based on the methodologies of Martin (1995) and Cotton (1996). Interview guides, initially prepared in English, were translated into local languages including Shekkacho, Sheko, Majang, Amharic, and Afaan Oromo to accommodate diverse indigenous groups. Key informants were first interviewed individually to identify prevalent livestock ailments and gather detailed information on ethnoveterinary plants, including local names, plant characteristics, parts used, geographical distribution, flowering and harvesting times, preparation methods, dosages, causes of ailments, symptoms of toxicity, antidotes, and other relevant details. Two focus group discussions were held with knowledgeable participants recommended by local elders and administrators. These sessions explored the distribution, threats, and conservation of traditional phytomedicines through interactive dialogue. Guided field walks facilitated specimen collection and real-time observation of harvesting and distribution practices. A comprehensive market survey covered five major markets: Tepi, Kura, Bechi, Kubito, and Fide to document the availability of ethnoveterinary phytomedicines. Voucher specimens were collected in collaboration with local healers and assistants. Verbal interviews with market retailers, herb vendors, and consumers of both genders provided insights into marketing, cultivation, threats, pricing, and economic significance, consistent with prior studies (Chekole *et al.* 2015; Awoke *et al.* 2024). Geographic coordinates, vernacular names, habitats, and morphological characteristics of each specimen were recorded using GPS. Voucher specimens were pressed, dried, numbered, and identified with reference to the *Flora of Ethiopia and Eritrea* (Hedberg *et al.* 2003). Identification was confirmed by comparison with authenticated samples at the National Herbarium, Addis Ababa University, and verified by taxonomic experts before deposition.

Quantitative Analysis of Ethnobotanical Data

Informant Consensus factor (ICF)

The validity of the information recorded was checked by contacting informants at least twice for the same ideas in order to assess the reliability of the information obtained during the interview. The original information was rejected because it was deemed unreliable if the informants' opinions conflicted with it. Each category's informant consensus factor (ICF) is computed to determine the informants' agreement regarding the reported treatments for the group of illnesses. The ICF was determined in this way:

$$\mathbf{ICF} = \frac{\mathbf{Nur - Nt}}{\mathbf{Nur - 1}}$$

Where Nur is the number of informant use reports for a specific plant-use category and Nt is the total number of taxa or species used for that plant-use category across all informants. The index has a range of 0 to 1, where values close to 1 indicate that informants strongly agree that the same species is used (Uddin and Hassan 2014).

Fidelity Level (FL)

Using a fidelity level (FL), as suggested by Alexiades (1996), the relative healing potential of phytomedicines in treating human ailments was evaluated. The following formula was used to calculate the fidelity level (FL):

$$\mathbf{FL}(\%) = \frac{\mathbf{IP}}{\mathbf{IU}} \times \mathbf{100}$$

Where**, FL**= fidelity level or relative healing potential, **IP** = the number of informants who independently cited the importance of a species for treating a particular ailment (frequency of citation of a species for a particular aliment), and **IU** = the total number of informants who reported the medicinal plant for a given disease (total number of citations of that species)

Jaccard Similarity Index (JSI)

Jaccard's similarity index was employed to assess the similarity in medicinal palnt species composition across studies conducted in various regions of the country. The calculation of Jaccard's similarity index was performed using the following formula:

$$\mathbf{JCS} = \frac{\mathbf{c}}{\mathbf{a} + \mathbf{b} + \mathbf{c}}$$

Jaccard's similarity index quantifies the degree of similarity between two distinct study areas: study area a (the current study area) and study area b (other study areas). This metric is based on the species present in each area, represented as a for study area a and b for study area b, along with the number of common species, denoted as c. JSI values range from 0 to 1, where a value of 1 indicates complete similarity and a value of 0 signifies no similarity. To express JSI as a percentage, it can be multiplied by 100, resulting in a percentage JSI.

Preference ranking

In accordance with (Martin 1995, Cotton 1996), ten key informants have been chosen to evaluate the level of efficacy of seven phytomedicines for diarrhea. The EVPMs with the highest value (7) were thought to be the most effective in treating the illness, while the least effective ones received the lowest value (1). Each species' value was added up, and the total score was used to determine each species' rank. This made it easier to identify the phytomedicines that the community used most successfully to treat the illnesses.

Direct matrix ranking

Direct matrix ranking was used to compare multipurpose EVPMs that informants frequently reported using, in accordance with (Cotton 1996). Out of all the EVPMs, five multipurpose tree species were chosen based on the relative advantages of each plant, and five of these plants' uses were listed. To assign use values for each attribute, ten key informants were selected (5 = best, 4 = very good, 3 = good, 2 = less, and 1 = least used). Medicinal use, construction, charcoal production, furniture, food, firewood value, and agricultural tool value are the seven use values.

Data Analysis

Microsoft Word 2010 was used to collect, compile, classify, and document field data, which included scientific and local plant names, families, life forms, parts used, and habitats. For data analysis, frequency tools such as tables, bar graphs, and pie charts were employed. Descriptive statistics (mean and standard deviation) were calculated using R software version 4.3.2. To assess normality prior to performing a t-test, the Shapiro-Wilk test was conducted. Differences in EVPMs knowledge between genders were analyzed using an independent t-test, while variations in knowledge across gender, educational levels, and informant types were also examined with a t-test. Knowledge differences among age groups were evaluated using ANOVA. Additionally, the relationship between age and reported plants was explored through Pearson correlation and linear regression analyses (Höft *et al.* 1999, Awoke *et al.* 2024).

Results

Sociodemographic Attributes of Informants in the Study Area

A total of 170 people participated in this study. Males made up 71.2% of the participants (n=121), with females making up the remaining 28.8% (n=49). Regarding the informant type, the majority of participants (76.5%, n = 130) were categorized as general informants, with key informants coming in second at 23.5% (n = 40). The study included participants ranging in age from 20 to 85. With 48.8% (n=83) of them falling into the 51–85 age group, the largest percentage was followed by the 31–50 age group with 23.5% (n=40). Participants' educational backgrounds varied from illiteracy to literacy. It was discovered that 59.4% of the participants were illiterate (n=101), with those who had finished elementary school coming in second at 40.6% (n=69) (Table 1).

Phytomedicines Naming Related to Culture in the Study Area

The local community possesses extensive knowledge and cultural beliefs regarding their traditional healthcare system and various social issues. Generally, the people can identify plants in their area by their native names. However, in some instances, when a precise synonym or colloquial name for a particular plant species (often herbs) is hard to find, the names assigned to medicinally significant plants are based on the illnesses they are used to treat. For the Yeki people, any plant with medicinal value is often named after the root word associated with the health issue it addresses, with the suffix "*Atto*" added to indicate its use as a remedy. Similarly, health issues that include the suffix "*Bewo*" in reference to a specific body organ denote ailments affecting that organ. For example, "*Afe Bewo*" refers to eye disorders, while "*Qewe Bewo*" denotes blackleg disease in livestock. Additionally, "*Dingare Atto*" is a remedy for snake bites or snake poisoning.

Taxonomic Diversity of Phytomedicines

A total of 50 EVPMs, categorized into 47 genera and 34 families, were documented in the study area. These plants are utilized to treat a range of 21 ailments affecting livestock (Table 2). The most commonly used families were Asteraceae, Euphorbiaceae, and Solanaceae, each comprising four EVPMs. This was followed by Cucurbitaceae with three species, and Brassicaceae, Boraginaceae, Poaceae, and Zingiberaceae, each represented by two species (refer to Table 2).

Habitat and life forms of phytomedicines

Out of the 50 identified EVPMs, 23 (46%) were sourced from the wild, 12 (24%) from home gardens, 10 (20%) were obtained from both home gardens and the wild, and 5 (10%) were from markets. The results indicated that herbs were the most prevalent plant habit, with 24 species reported, followed by trees (13 species), shrubs (10 species), and climbers (3 species) used for treating livestock illnesses.

Plant parts used and forms of remedy preparations

The analysis of plant parts used in EVPMs remedy preparations identified 10 specific parts of phytomedicines as the primary constituents for addressing different health issues. Based on the total frequency of citations by informants, leaves emerged as the most commonly used plant part, followed by roots, seeds, bark, stems, and latex. Additionally, other plant parts, such as stem bark, latex, seeds, bulbs, stems, tubers, and young shoots, were also utilized in ethnoveterinary practices within the study district, albeit at lower frequencies. Regarding the forms of plant parts used in remedy preparations, the majority (65.6%) of remedies were made from freshly harvested plant parts, while 21.8% were prepared from dried parts, and a small percentage (12.5%) incorporated a mix of fresh and dry plant parts.

Modes of remedy preparation and application

The local people and traditional healers in Yeki district have reported various traditional methods for preparing and applying ethnoveterinary remedies to treat different livestock ailments. Among these methods, pounding and drenching (49.8%) was the most commonly used technique, followed by grinding and drenching (19.2%), and other combinations like pounding, spraying, washing, and pasting (8.9%). Pounding is considered the preferred preparation method in the area, where plant parts are processed, either as single or two or more herbal mixtures, using a wooden mortar and pestle. The pounded material is then soaked in pure water to extract the desired veterinary remedies. Notably, the majority of ethnoveterinary remedies (86.4%) were formulated from single plant species, while only 13.6% consisted of a concoction of two or more medicinal plant species (Table 2). For example, to create a solution for treating diarrhea in livestock, one would crush a handful of *P. guajava* leaves along with a fresh piece of *Z. officinale* root, boil the mixture in one liter of water for 15 minutes, and add half a teaspoon of salt. The solution would then be administered as one liter to cattle and half a liter to sheep, goats, and calves. In most cases, pure water was the primary solvent used to extract the bioactive ingredients from the EVPMs in the study area. Once medicinal plant prepared and ready, traditional healers administer the remedies directly to sick livestock as drenches without sieving. In addition to plant materials and water, other ingredients, such as salt, soot, charcoal, kerosene, food like bread of *Injera*, saliva, milk, blood, butter, whey, and honey are also included in the formulations.

Table 2. List of ethnoveterinary phytomedicines in Yeki district with the mode of preparations and applications

Family	Scientific Name	Local Name	Ha	PU	CPU	Method of medicinal plant Preparation and Mode of Application	RoA	AT	HAB	VN
Acanthaceae	*Justicia schimperiana* (Hochst. ex Nees) T.Anderson	**Shersharo (Kf)**	Sh	St	Fresh	The method involves collecting stems roughly the size of a hand, stripping away the bark, and then inserting them into the cow's vagina.	Vaginal	Retained placenta	Wild	**DA01**
				Lf	Fresh	The process involves crushing the leaves, mixing them with water, and then squeezing the mixture. Next, the liquid is decanted, and an amount equivalent to a glass of water is administered to livestock. For treating chicken ailments , a dose equivalent to half a coffee cup is provided.	Oral	Intestinal parasites		
Aloaceae	*Aloe vera* var. *aethiopica* Schweinf.	**Eret(Am)**	H	Rt	Fresh	During the sixth month of pregnancy, livestock are given a mixture of powdered fresh roots that have been ground and diluted with water after filtration.	Oral	Rh disease	HG, Market	**DA02**
				Lax	Fresh	The process involves extracting the juice, blending it with water, and administering it to the chickens over a period of three days.	Oral	Newcastle		
Amaryllidaceae	*Allium sativum* L.	**Nech-duqisho(Kf)**	H	BU	Fresh	Crushed fresh bulbs are mixed with *Anethum foeniculum*, *Cucumis ficifolius*, and *Lepidium sativum*, and the mixture is administered to cattle along with water.	Oral	Leech	Market	**DA03**
				Bu	Dry	After crushing the bulb, add water and strain the resulting solution. Administer the filtered solution to livestock orally and through the nasal passages.	Oral	Diarrhea		
				Bu	Dry	Take one bulb of *A. sativum* and mix it with one liter of water. Use the resulting mixture to wash the animal once daily until it is completely free of parasites.	Dermal	Ectoparasite		
				Bu	Dry	To administer the solution to the cattle, crush the bulb and mix it with water. After filtering the mixture, provide two coffee cup amounts of the resulting solution to the animal through both its mouth and nose.	Oral	Bloating		
Apiaceae	*Coriandrum sativum* L.	**Dimbilal (Am)**	H	Sd	Dry	Seeds are ground into a fine powder, mixed with water, and delivered orally to livestock such as cattle, sheep, goats, and donkeys in the form of a diluted solution.	Oral	Cough	Market	**DA04**
Apocynaceae	*Gomphocarpus fruticosus* (L.) W.T.Aiton	**Tobit(Am)**	H	Lf	Fresh	The leaf is pulverized and combined with Crinum abyssinicum before being provided to animals.	Oral	Bloating	Wild	**DA05**
				Wh	Fresh	To prepare a mixture for the animal, crush any portion of the plant and combine it with water before administering it.	Oral	Diarrhea		

Araliaceae	*Schefflera abyssinica* (Hochst. ex A.Rich.) Harms	**Getem (Am)**	T	BA	Dry/ fresh	The bark is crushed in combination with salt and subsequently provided to animals as feed.	Oral	Taeniasis	Wild	**DA06**
Asparagaceae	*Dracaena afromontana* Mildbr.	**Mereko(Am)**	Sh	Rt	Fresh	Fresh roots are ground and provided to cattle.	Oral	Blackleg	HG & wild	**DA07**
Asteraceae	*Acmella caulirhiza* Delile	**Gutichaa (Or)**	H	Flw	Fresh	The treatment of ocular diseases in cattle, sheep, dogs, cats, and goats can be accomplished effectively through a technique known as crushing and painting. This procedure entails the pulverization of the suitable medication, which is then applied directly to the affected ocular region of the animal. Such direct application allows the medication to permeate the ocular tissues, thereby delivering targeted therapy for the specific eye condition. This method has demonstrated efficacy in the management of eye disorders across a range of animal species, contributing significantly to their overall health and welfare.	Optical	Eye disease	Wild	**DA08**
				Flw	Fresh	The flowers are subjected to a procedure involving pounding, mixing, and squeezing, which yields a solution comparable to one glass of water, subsequently provided to the cattle.	Oral	Bloating		
	Artemisia abyssinica Sch.Bip. ex Oliv. & Hiern	**Sukundee (Or)**	H	Lf	Fresh	In instances of pain, livestock are treated with a combination of crushed shoots and leaves derived from the *E. globulus* plant. The suggested dosage for sheep and goats is equivalent to 500 milliliters, whereas cows and oxen are prescribed a dosage of one liter.	Oral	Bloating	HG	**DA09**
	Solanecio gigas (Vatke) C.Jeffrey	**Yashikoko gomen(Am**	Sh	Lf	Dry/ fresh	The leaf was crushed and then pounded with *E. kebericho* before being mixed with water.	Oral	Botch	Wild	**DA10**
	Vernonia amygdalina Delile	**Baka (Sh)**	Sh	Lf	Fresh	A liquid equivalent to two cups of coffee is obtained from the pressed leaves and is subsequently administered to sheep, goats, cows, and oxen.	Oral	Abdominal problem	HG/ W	**DA11**
				Lf	Fresh	Cattle, sheep, and goats receive a solution prepared by crushing leaves, combining them with water, extracting the mixture, and subsequently filtering it, yielding a single glass of the resultant solution.	Oral	Diarrhea		

				Lf	Fresh	To prepare the mixture, blend one tea glass of edible oil with a handful of freshly crushed leaves of *V. amygdalina* and two teaspoons of salt. For adult cattle, administer one liter of this preparation, while calves, goats, and sheep should receive half a liter.	Oral	Bloating		
Balsaminaceae	*Impatiens ethiopica* Grey-Wilson	**Insosila(Am)**	H	Rt	Dry/fresh	The root tuber is processed through pounding and crushing, then combined with salt before being provided to the animal as feed.	Oral	Retained placenta	HG & wild	**DA12**
Bignoniaceae	*Stereospermum kunthianum* Cham.	**Qeri (Sh)**	T	Ba	Fresh	The bark of *S. kunthianum* was pulverized, and subsequently, a solution equivalent to one coffee cup was administered to the cattle.	Oral	Bloating	Wild	**DA13**
	Spathodea campanulata P.Beauv.	**Nebelbal (Am)**	T	Lf	Fresh	The leaves of *S. campanulata* were pulverized, and subsequently, a solution equivalent to one coffee cup was administered to the cattle.	Oral	Poison	Wild	**DA14**
Boraginaceae	*Cynoglossum lanceolatum* Forssk.	**Gimet (Am)**	H	Rt	Fresh	The roots are ground into a fine powder, mixed with water, and then soaked, subsequently, the affected area of the Donkey and Horse is gently massaged with the resulting paste of the pulverized root.	Oral	Swelling	Wild	**DA15**
	Ehretia cymosa Thonn.	**Derma(Sh)**	T	Lf	Fresh	The leaf was crushed and soaked in a glass of water to create a solution intended for cattle.	Oral	Febrile illness	Wild	**DA16**
Brassicaceae	*Lepidium sativum* L.	**Feto (Am)**	H	Sd	Dry	To administer ethnoveterinary medicine to cattle, a preparation is created by combining finely ground dry seeds with water. This mixture is subsequently given to the animals as a single glass of water.	Oral	Diarrhea	Market	**DA17**
				Sd	Dry	The diet of the chicken consists of a blend of crushed dry seeds combined with rice grain, which is subsequently mixed with water to create a powdery substance.	Oral	Coccidiosis		
	Brassica carinata A.Braun	**Gomen (Am)**	H	SD	Dry	To prepare the mixture, first grind the seed into a fine powder, then combine it with water before administering it to the animals.	Oral	Anthrax	HG	**DA18**
Caricaceae	*Carica papaya* L.	**Papaya (Am)**	T	Lf	Dry	Administer a half cup of freshly ground *C. papaya* seeds to the affected animal, or alternatively, combine the crushed seeds with water to create a drench suitable for chickens.	Oral	Watery diarrhea	HG	**DA19**
Cucurbitaceae	*Momordica foetida* Schumach.	**Munji (Mg)**	Cl	Lf	Fresh	The foliage of the plants is subjected to a process of boiling and exposure to fumigants as a means of treating cattle afflicted with a particular infection or disease.	Oral	Febrile illness	Wild	**DA20**
				Wh	Fresh	Freshly crushed and consumed immediately in one liter.	Oral	evil spirit		

	Cucumis ficifolius A.Rich.	**Yemidir embuay(Am)**	Cl	Wh	Fresh	To create a decoction, combine water with the specified ingredients and administer it for cattle consumption.	Oral	Intestinal Parasite	Wild	**DA21**
				Wh	Fresh	The powder is prepared and subsequently combined with water before being administered to the cattle.	Oral	Diarrhea		
	Cucumis dipsaceus Ehrenb. ex Spach	**Yeamora Missa(Am)**	H	Rt	Dry	The root is initially dried and ground before being placed in the soil, where it is subsequently combined with water and administered.	Oral	Liver disease	Wild	**DA22**
Euphorbiaceae	*Croton macrostachyus* Hochst. ex Delile	**Shomo(Shk)**	T	Lf	Fresh	The leaf is pulverized and provided to the cattle.	Oral	Dermatophilosis	HG & wild	**DA23**
	Euphorbia abyssinica J.F.Gmel.	**Qualkwal (Am)**	T	Lat	Fresh	The latex extracted from the plant is provided to livestock.	Oral	Rabies	Wild	**DA24**
	Euphorbia tirucalli L.	**Kinchib (Am)**	T	Rt	Fresh	The root is chopped into small fragments, pulverized, and mixed with water to form a solution that is given orally to dogs and cats over a duration of three days, utilizing a single coffee cup for measurement.	Oral	Rabies	Wild	**DA25**
	Ricinus communis L.	**Gulo (Or)**	Sh	Sd	Dry	To obtain the oil, one must first crush a small quantity of *R. communis* seeds and apply heat to them. Furthermore, the dried leaves of *R communis* can be ground into a fine powder for use. The extracted oil or the powdered leaves may then be administered to the wounds of various animals, including dogs, cats, cattle, sheep, goats, and donkeys. It is advisable to repeat this treatment daily until complete healing of the wounds is achieved.	Dermal	Wound	HG/W	**DA26**
				Fr	Fresh	The fruit was crushed and ground, then applied to the udder of a cow.	Oral	Calf diarrhea		
Fabaceae	*Millettia ferruginea* (Hochst.) Hochst. ex Baker	**Yaago(Shk)**	T	Lf	Fresh	Crushed leaves are combined with water and administered to livestock.	Oral	Leaches	HG & wild	**DA27**
Meliaceae	*Melia azedarach* L.	**Nim (Am)**	T	Ba	Dry	To prepare the treatment, take one portion of the bark from *M. azedarach* and combine it with two handfuls of roasted *R. communis* seeds. Grind these ingredients until they achieve a fine powder consistency. Add a small quantity of butter to the mixture and blend thoroughly to form a paste. Carefully restrain the infected animal and gently eliminate any crusts associated with the disease. Apply the paste to the affected skin areas daily for five days, or until the infection shows signs of improvement.	Dermal	Skin disease	HG	**DA28**

				Lf	Fresh/dry	To formulate a medicinal preparation, a modest amount of *M. azedarach* seeds must be collected and ground prior to being heated until they attain a deep brown hue and a viscous texture. Following this, half a liter of water should be incorporated into the mixture to create a paste. This paste is then to be pressed to extract the oil, which can be topically administered to animals suffering from the particular ailment.	Dermal	Ectoparasite		
				Ba	Fresh	To obtain the juice, freshly chopped and crushed pieces of *M. azedarach* bark, approximately the size of a finger, should be extracted and subsequently mixed into the standard diet of livestock.	Oral	Intestinal problem		
Melianthaceae	Basella alba L.	**Azamir(Am)**	T	Rt	Dry/fresh	The root bark is ground into a powder and applied to the affected area of the body.	Dermal	Tumor	Wild	**DA29**
Moraceae	*Milicia excelsa* (Welw.) C.C.Berg	**Kewot(Am)**	T	Sd	Dry	Crushed roasted seeds are incorporated into the feed of cattle to eliminate the disease.	Oral	Bloody diarrhea	Wild	**DA30**
Musaceae	*Ensete ventricosum* (Welw.) Cheesman	**Odu (Sh)**	H	St	Fresh	The stem of this plant, comparable in size to a little finger, is combined with a leaf from the *C. arabica* plant, crushed, and subsequently boiled. The resulting infusion, measuring between 1 to 2 liters, is administered to cows, whereas sheep and goats receive one liter. This therapeutic approach is intended to assist in the expulsion of the placenta.	Oral	Retained placenta	HG	**DA31**
Myrtaceae	*Eucalyptus globulus* Labill.	**Nech bahrzaf (Am)**	T	Lf	Fresh	In periods of discomfort, it is advisable to macerate the leaf of *A. sativum* along with its bulb, combine the mixture with water, and provide one glass of the resulting solution to cattle, sheep, and goats.	Oral	Sudden illness	HG/W	**DA32**
Papaveraceae	*Argemone mexicana* L.	**Yahya eshoh(Am)**	H	Rt	Fresh	The pulverized root is administered to animals along with water.	Oral	Rabies	Wild	**DA33**
Phytolaccaceae	*Phytolacca dodecandra* L'Hér.	**Shorshu (Sh)**	Sh	Rt	Fresh	During a span of three days, the roots are ground into a fine powder, and a solitary glass of liquid is applied to both the Dog and the Donkey.	Oral	Rabies	Wild	**DA34**
				Lf	Fresh	The leaf must be crushed and mixed with water, after which half a coffee cup of the resulting solution should be applied to the chicken.	Oral	Diarrhea		
Piperaceae	*Piper nigrum* L.	**Qundo berbere(Am)**	Cl	Fr	Fresh	The fruit is initially crushed before being served.	Oral	Fungal disease	HG	**DA35**

Poaceae	*Cymbopogon citratus* (DC.) Stapf	**Teji sar (Am)**	H	Rt & Lf	Dry/fresh	The crushed roots and leaves are combined with water and subsequently administered to cattle.	Oral	Blot	HG	**DA36**
	Cynodon dactylon (L.) Pers.	**Serdo sar(Am)**	H	Wh	Fresh	The fresh portion of the plant is masticated and then expelled into the eye of the animal that is experiencing the affliction.	Dermal	Eye ailments	HG & wild	**DA37**
Polygonaceae	*Rumex nepalensis* Spreng	**Germach (Ben)**	H	Rt	Fresh	The root of this plant must be pulverized and subsequently combined with water. The resultant solution, amounting to two cups of coffee, is to be given to cattle, sheep, goats, and oxen.	Oral	Abdominal pain	Wild	**DA38**
				St	Dry	The impacted regions of cattle, sheep, goats, donkeys, and dogs may be addressed through the topical application of a blend consisting of powdered stem and butter.	Dermal	Wound		
				Lf	Fresh	Consume the leaves of *R. nepalensis* by preparing a decoction.	Oral	Rabies		
Primulaceae	*Embelia schimperi* Vatke	**Dupho(Kf)**	Sh	Lf	Fresh	The newly harvested leaf is pulverized, and the liquid component is extracted through decoction for administration to animals.	Oral	Taeniasis	Wild	**DA39**
Rhamnaceae	*Rhamnus prinoides* L'Hér	**Gesho(Am)**	Sh	Lf	Fresh	The utilization of a mixture created by grinding the fresh foliage of *R. prinodes* and mixing it with water is frequently practiced for the care of livestock, in addition to its use for dogs and chickens.	Dermal	Ectoparasite	HG	**DA40**
				Fr	Fresh	In the morning, cattle are drenched with two cups of a solution prepared by crushing fruit and mixing it with water.	Oral	Leech		
Rubiaceae	*Coffee arabica* L.	**Moye(Mg)**	Sh	Sd	Dry	The powdered form of dried seeds is combined with butter and applied to the affected area of the animal's body.	Dermal	Wound	HG & wild	**DA41**
Rutaceae	*Ruta chalepensis* L.	**Tserti (Sh)**	H	Lf	Fresh	In cases of poisoning in cattle, sheep, goats, or dogs, it is advisable to provide a solution of concentrated salt combined with crushed leaves of *R. chalepensis* directly into the mouth of the affected animal.	Oral	Poisoning	HG	**DA42**
				Lf	Fresh	Freshly extracted leaf juice, obtained through crushing and decoction, is combined with the bulb of *A. sativum* and water.	Oral	Stomachache		
Simaroubaceae	*Brucea antidysenterica* J.F.Mill.	**Abalo(Am)**	Sh	Rt	Dry/fresh	The pulverized fresh or dried root is combined with salt and administered to the affected cattle.	Oral	Bloody diarrhea	Wild	**DA43**

Solanaceae	*Datura stramonium* L.	**Nafnifo(Kf)**	H	Lf	Fresh	The method employed to eradicate parasites from livestock consisted of grinding leaves and applying the resulting mixture onto the animals' coats.	Dermal	Ectoparasite	Wild	**DA44**
				Lf	Fresh	The leaves were ground into a fine powder, subjected to compression, and mixed with a minimal amount of water before being provided to livestock as two glasses of the resulting mixture.	Oral	Blotting		
				Lf	Fresh	The foliage was ground into a fine powder, and a solitary coffee cup was designated for an injured cow. One half of this cup was set aside for the calves, whereas two additional cups were allocated for the donkey.	Oral	Rabies		
	Lycopersicon esculentum Mill.	**Timatim (Am)**	H	Lf	Fresh	A mixture of freshly ground leaves combined with clean water is provided to livestock in an amount comparable to that of a standard tea glass.	Oral	Bloating	HG	**DA45**
				Lf	Fresh	The leaves were ground into a fine powder, mixed with one cup of water, filtered, and then introduced into the nasal cavity of the cattle.	Nasal	Leech		
	Nicotiana tabacum L.	**Tinbaho (Am)**	H	Lf	Fresh	The leaf of this specific plant is macerated and mixed with water. Subsequently, a coffee cup filled halfway with the resulting liquid is administered through the nasal passage to eradicate the leech.	Oral	Leech	Wild/ HG	**DA46**
				Lf	Dry	To tackle the problem concerning the impacted animal, submerge a modest amount of *N. tabacum* leaves in a four-liter vessel of water and heat it until boiling. Afterward, add a bar of soap to the mixture. Utilize this solution for washing or as a spray treatment on the afflicted animal.	Dermal	Ectoparasite		
	Solanum incanum L.	**Hidi (Or)**	H	Fr	Fresh	To obtain the juice from a fully ripened, yellow fruit of *S. incanum*, one should carefully mash the flesh while ensuring the skin remains intact. Subsequently, raise the head of the animal and make a small incision in the fruit. Squeeze the extracted juice into the nostril of the sheep or cattle. This process will induce sneezing in the animal, thereby facilitating the expulsion of the larvae.	Nasal	Nasal bot	Wild	**DA47**
Verbenaceae	*Verbena officinalis* L.	**Atuch(Am)**	H	Wh	Fresh	The various components of the plant were crushed and combined with a saline water solution before being administered to the animals.	Oral	Diarrhea	Wild	**DA48**
Zingiberaceae	*Zingiber officinale* Roscoe	**Yanjibelo(Kf)**	H	Rz	Fresh	The rhizome must be pulverized and mixed with rice powder prior to its application to the chicken.	Oral	Newcastle	Market	**DA49**

			Rz	Fresh	The rhizome is pulverized and combined with soot before being administered to the animal via the ocular route.	Optical	Eye disease		
			Rz	Fresh/Dry	To formulate a solution suitable for livestock, begin by grinding a handful of *P. guajava* leaves together with a fresh segment of *Z. officinale* root. Subsequently, immerse this mixture in one liter of water and bring it to a boil for a duration of 15 minutes. After boiling, incorporate half a teaspoon of salt into the solution. The resulting preparation should be administered at a dosage of one liter for cattle and half a liter for sheep, goats, and calves.	Oral	Diarrhea		
Aframomum corrorima (A.Braun) P.C.M.Jansen	**Korerima(Am)**	H	LF	Fresh	The leaves are ground and applied to the injured skin of the body.	Dermal	Swelling & wound	HG	**DA50**

Key: Habit (Ha) (**T**=Tree, **Sh**=Shrub, **H**=Herb, **Cl**=Climber), **PU**=Parts Used ((**Lf**=Leaf, **Rt**=Root, **Ba**=Bark, **Fr**=Fruit, **Sd**=Seed, **St**=Stem, **Lax**=Latex, **Bub**=Bulb, **Flw**=Flower, **Wh**=Whole part, **Rz**=Rhizome). **RoA**=Route of Administration. **Source**=**W**=Wild and **HG**=Home garden. **NUR**=Number of Use Report. **CPU**=Condition of Plants used, **Local Name**: **Or**=Afan Oromo, **Am**=Amharic, **Sh**=Sheko, **Kf**=Kaffnano, **Shk**=Shekinnono,**Mg**= Mjang, **VN**= Voucher Number,**HAB**=Habitat, **AT**= Ailments treated

Routes and dosage of ethnoveterinary remedy administration

In the study area, ethnoveterinary remedies for livestock are administered through various routes depending on the specific ailments encountered. After collecting and preparing the phytomedicines, remedies are applied via five different routes. The most common route is oral administration, followed by dermal and nasal routes, while the remaining methods are used less frequently. Oral application, the predominant method, involves drenching the herbal remedy into the mouth of the affected livestock. Farmers and traditional healers determine the appropriate dosage by visually assessing the animals, taking into consideration factors such as age, sex, physical condition, severity of the disease, type of animal, and pregnancy status. Dosages are measured using a variety of instruments, including water glasses, plastic jugs, coffee cups, tea glasses, and drop counts for decoctions and infusions. For roots and stem bark, finger lengths are used, a pinch is common for powdered plant parts, and for leaves, seeds, fruits, and flowers, quantities are counted. Although there is no standardized dosage, a wide range of doses is applied for treating livestock ailments, starting from a single drop administered through the left nostril or ear, to one to two plastic jugs, equivalent to 1-2 liters. Additionally, the frequency of remedy administration varies, ranging from once a day to as often as needed until the animals recover from their ailments.

Marketability of ethnoveterinary phytomedicines

Out of the five medicinal plant species examined for their marketability in treating livestock ailments, only two *A. Vera* and *A. abyssinica* were actively traded and purchased for their medicinal applications. The other plants listed were primarily sold in bulk for non-medicinal uses but were also utilized as medicine when necessary. In local markets like Tepi, Bechi, Kura, Fide, and Gubito, a bunch of *A. Vera* and *A. abyssinica* averaged 50 Ethiopian Birr. The remaining phytomedicines were largely sold for non-medicinal applications, such as food and spices, but were also used for traditional medicine when the need arose. Examples of these plants include *R. prinoides*, *B. carinata*, *A. corrorima*, *Z. officinale*, *R. chalepensis*, *C. sativum*, and *A. sativum.* This finding aligns with the report by Awoke *et al.* (2024).

Informant consensus factor of ethnoveterinary phytomedicines

To evaluate the consistency of traditional knowledge regarding the use of phytomedicines for various livestock ailments in the study area, the informant consensus factor (ICF) was calculated. A total of 21 livestock ailments were identified in Yeki district, which were categorized into nine different groups. ICF values were calculated for each category based on criteria such as disease type, causes, symptom locations, and signs exhibited by affected animals. The ICF values ranged from 0.50 to 0.94, with external parasitic ailments having the highest ICF value of 0.94. Other categories included respiratory ailments (0.92), dermatological ailments (0.91), and gastrointestinal ailments (0.89) (Table 3). Although gastrointestinal ailments ranked fourth, it was notable for having a high number of medicinal plant citations from informants, following dermatological and respiratory ailments in terms of frequency.

Table 3. Informant Consensus Factor Values of Phytomedicines

Disease categories	Nt	Nur	ICF	Rank
External parasitic ailments	9	144	0.94	3rd
Respiratory disease	11	141	0.92	1st
Dermatological ailments	12	135	0.91	2nd
Gastrointestinal ailments	19	165	0.89	1st
General illness	8	57	0.87	4th
Poison related	9	55	0.85	5th
Reproductive ailments	5	23	0.75	6th
Organ ailments	14	38	0.64	7th
Neurological ailments	10	20	0.52	8th
Musculoskeletal ailments	3	5	0.50	9th

Healing potential of ethnoveterinary phytomedicines

The healing potential of key phytomedicines used for various ailments was assessed by calculating their fidelity levels (FL). The FL values for the most frequently cited phytomedicines in ethnoveterinary treatments are summarized in Table 4. The results indicated a strong consensus (> 79% FL) regarding the selection of EVPMs for treating intestinal parasites, leeches, ectoparasites, bloating, and diarrhea. In contrast, a moderate level of agreement (50-66% FL) was observed for conditions such as rabies, Newcastle disease, and nasal bot, while ailments like mich and coccidiosis showed low agreement (< 50% FL). Notably, high fidelity levels were recorded for *J. schimperiana* (91%), *N. tabacum* (90%), and *M. azedarach* (87%) in the treatment of intestinal parasites, leeches, and ectoparasitic ailments, respectively.

Table 4. FL values of most frequently used ethnoveterinary medicinal plant species

Scientific name	Human Ailments	IP	IU	FL	%	R
J. schimperiana	Intestinal parasites	16	17	0.94	94	1st
N. tabacum	Leech	28	31	0.90	90	2nd
M. azedarach	Ectoparasite	14	16	0.87	87	3rd
A. caulirhiza	Bloating	12	14	0.85	85	4th
V. amygdalina	Diarrhea	4	5	0.79	79	5th
E. tirucalli	Rabies	8	12	0.66	66	6th
Z. officinale	Newcastle	21	37	0.6	60	7th
S. incanum	Nasal bot	12	21	0.57	57	8th
E. cymosa	Mich	21	56	0.37	37	9th
L. sativum	Coccidiosis	16	49	0.32	32	10th

R= Rank. **FL**= Fidelity Level, **Ip** = number of informants who independently cited the importance of a species for treating a particular disease, **Iu** = total number of informants who reported the plant for any given disease.

Preference ranking of ethnoveterinary medicinal plant for treatment of intestinal parasites

The results of a preference ranking conducted by ten key informants on five phytomedicines used for treating intestinal parasites revealed that *J. schimperiana* was the most favored, receiving the top rank (1st) for its effectiveness against the disease, followed by *V. amygdalina* in second place. The other EVPMs were ranked from third to fifth, as shown in Table 5.

Table 5. Preference ranking of MPs reported for treating Intestinal parasites

Phytomedicines	Respondents(R_1-R_{10})											
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}	Total	Rank
J. schimperiana	5	4	5	3	5	4	5	4	5	4	44	1st
V. amygdalina	4	3	4	4	3	5	4	5	4	5	41	2nd
C. ficifolius	3	5	3	1	4	3	3	2	3	2	29	3rd
M. azedarach	1	1	2	2	2	1	2	3	2	3	19	4th
R. nepalensis	2	2	1	5	1	2	1	1	1	1	17	5th

Multipurpose ethnoveterinary medicinal plant species

The result of the average output of the direct matrix ranking score of 10 key informants for five use diversities showed that some multipurpose ethnoveterinary species are highly exploited for firewood, charcoal and house construction and utensils rather than the use of medicinal values. These 1st, 2nd and 3rd ranked plant species became locally endangered due to the relatively highest harvesting activities of each plant species for the sake of various functions like agricultural expansion, construction projects, timber harvesting, charcoal production, firewood collection, and overgrazing (Table 6). Thus, these phytomedicines were used for livestock ailments and they needed conservation priority based on the present status in the communities of the study area.

Table 6. Direct matrix ranking score of five TMPs

Use categories	Plant Species					Total	Rank
	E. cymosa	*M. ferruginea*	*E. schimperi*	*E. globulus*	*C. macrostachyus*		
Firewood	5	5	5	5	5	25	1st
Construction	5	5	4	5	5	24	2nd
Charcoal	5	3	4	5	5	22	4th
AT	4	5	2	5	4	20	5th
Medicine	3	4	5	4	5	21	6th
MT	2	3	3	3	4	15	7th
Food	0	0	3	0	0	3	8th
Total	24	25	26	27	28		
Rank	5th	1st	4th	3rd	2nd		

Key: AT= Agricultural tool, MT= Material culture

Demographic features and medicinal plant knowledge of the informant categories

R software was utilized to conduct a t-test to assess the differences in EVPMs knowledge (MPK) between key and general informants. The results indicated a statistically significant difference between the two groups ($t = 8.5$, $P < 0.05$). Key informants had a notably higher average knowledge of phytomedicines score ($M = 7.6$, $SD = 2.8$) compared to general informants ($M = 3.8$, $SD = 1.5$) (Table 7). Another t-test in R explored the differences in knowledge of phytomedicines between male and female informants. The analysis revealed a statistically significant difference in knowledge of phytomedicines based on gender ($t = 2.7$, $P < 0.05$). Male informants had a significantly higher mean knowledge of phytomedicines score ($M = 6.4$, $SD = 2.3$) than female informants ($M = 4.5$, $SD = 1.1$) (Table 7). A t-test was performed using R to investigate knowledge of phytomedicines differences based on educational background. The results showed a statistically significant difference between illiterate and literate informants ($t = 2.9$, $P < 0.05$). As shown in Table 7, illiterate informants had a higher mean knowledge of phytomedicines score ($M = 4.3$, $SD = 1.9$) compared to literate informants ($M = 3.0$, $SD = 1.3$).

Table 7. Medicinal Plant Knowledge between informants groups (t-test)

Characteristics	**Group of informants**	**N**	**Average ± SD**	**t-value**	***P-value***
Gender	Male	121	6.4± 2.3	2.7	*P<0.05*
	Female	49	4.5 ± 1.1		
Educational level	Illiterate	101	4.3± 1.9	2.9	*P<0.05*
	Literate	69	3.0 ± 1.3		
Informant Type	Key informants	40	7.6 ± 2.8	8.5	*P<0.05*
	General informants	130	3.8 ± 1.5		

Age group (young, middle, and elder) significantly affected medicinal plant knowledge scores, according to an ANOVA in R ($F=15.98$, $p < 0.05$). Age influenced disparities in EVPMs knowledge, as evidenced by the significantly higher variance between age groups ($SS = 467.6$, $MS = 233.8$) than within-groups variance ($SS = 2443.2$, $MS = 14.6$) (Table 8). The old group had significantly higher mean scores ($M = 7.0$, $SD = 4.1$, $p < 0.05$) than the middle group ($M = 5.1$, $SD = 3.8$, $p < 0.05$) and the young group ($M = 2.3$, $SD = 0.4$, $p < 0.05$), according to additional analysis using Tukey's HSD post-hoc tests. Age groups and EVPMs knowledge are positively correlated, as shown by the correlation coefficient of 0.63 (Figure 2). Moreover, the results of the regression analysis showed that, at a significance level of $p<0.05$, the β_0 and β_1 estimates were -3.7 and 0.2, respectively. Age categories and EVPMs knowledge are positively correlated, according to the β_1 estimate, which means that for every increase in age category, the projected value of medicinal plant knowledge increases by 0.2.

Table 8. Age groups with informant medicinal plant knowledge (One way ANOVA)

Source of Variation	Df	SS	MS=SS/Df	F Ratio	*P-value*
Between Groups	k – 1 3-1=2	467.6	233.8	15.98	*P<0.05*
Residual (within)	n-k 170-3=167	2443.2	14.6		
Total	n – 1 170-1=169	2910.8	248.4		

Note: **K**=number of level, **n**=number of observation, **Df**=degree of freedom, **SS**= Sum of Squares, **MS**= Mean of Square, Significant codes: 0.05

Threats of ethnoveterinary medicinal plant species

In the study area, like many other areas, plants face various threats from both natural and human activities. According to reports from eight key informants, the primary threats to EVPMs include agricultural expansion, construction projects, timber harvesting, charcoal production, firewood collection, and overgrazing (Table 9). Informants highlighted that deforestation is largely driven by the demand for new farmland and settlements. Moreover, overgrazing occurs in protected areas without proper awareness, while invasive alien species such as *P. hysterophorus* and *L. camara* hinder the growth of herbaceous EVPMs. These activities result in significant vegetation loss and a decline in the indigenous knowledge held by elders, which risks leaving younger generations without insights into the use and management of these plants. Furthermore, these factors contribute to changes in climatic conditions, posing serious threats to the environment. In response to these challenges, healers and local community members have begun to take small steps toward conserving phytomedicines in the area. For example, several EVPMs that were once wild such as *A. vera*, *I. ethiopica*, *C. macrostachyus*, *R. communis*, *M. azedarach*, *Z. officinale*, *M. ferrugin*, *J. schimperiana*, *E. globulus*, *A. abyssinica*, and *E. ventricosum* are now being cultivated and protected in the gardens of traditional healers for medicinal purposes. This in-situ conservation effort occurs within their natural habitats and includes educational initiatives aimed at raising awareness in the community about the domestication of indigenous ethnoveterinary phytomedicines. These efforts take place in agricultural areas, along roadsides, and in nursery sites while also working to reduce the presence of exotic plants. Ultimately, these actions contribute to the sustainability of the remaining forest patches in the study area.

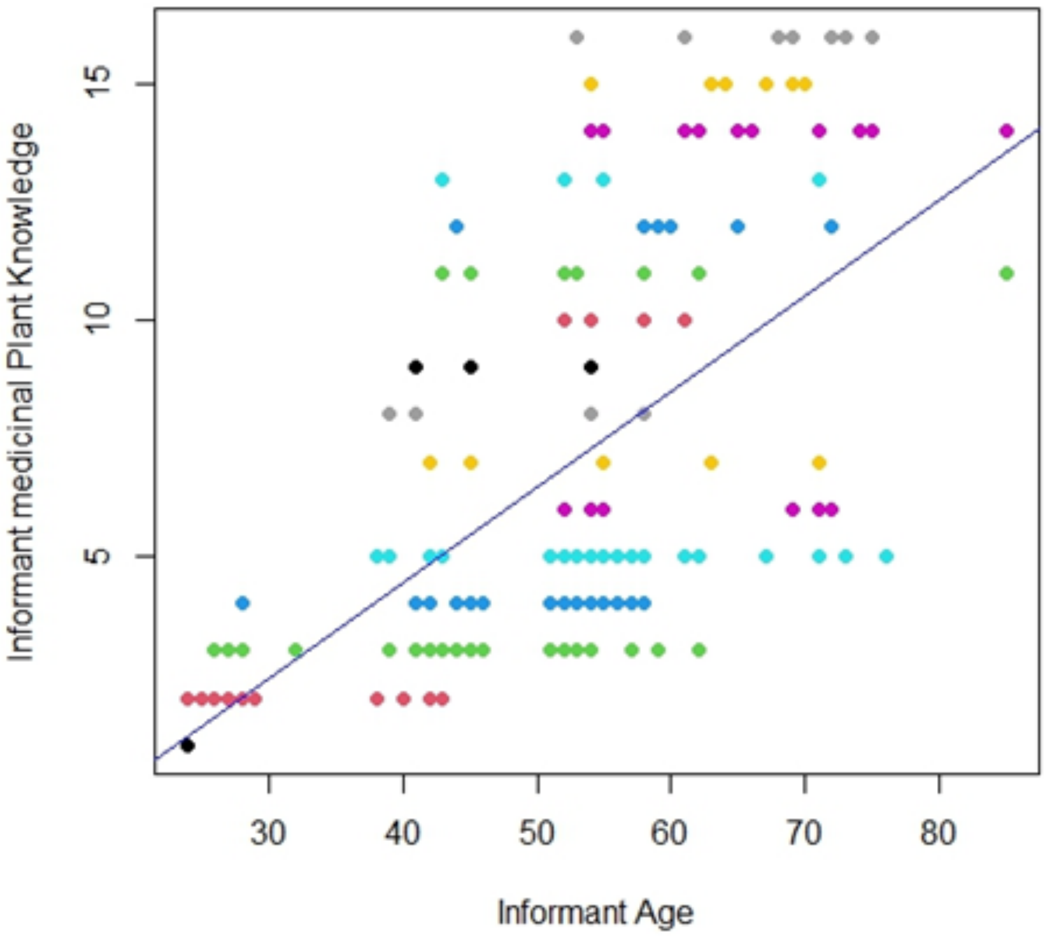

Figure 2. Correlation model of informant phytomedicines knowledge with age categories

Table 9. Threats of ethnoveterinary phytomedicines

Threats of MPs	Respondents									
	R1	R2	R3	R4	R5	R6	R7	R8	Total	Rank
Agricultural expansion	7	6	6	5	7	7	6	7	51	1st
Over grazing	5	7	7	2	5	6	5	7	44	2nd
Invasive species	6	3	2	7	6	5	6	6	41	3rd
Charcoal	4	5	4	7	3	3	7	3	36	4th
Construction	2	2	2	4	4	4	3	4	25	5th
Firewood	3	4	3	6	2	2	1	2	23	6th
Timber	1	1	5	1	4	1	2	1	16	7th

Comparative analysis of EVPMs in Yeki and other regions of Ethiopia

To evaluate cultural similarities among various ethnic communities regarding shared ethnoveterinary plant species and their medicinal applications, we utilized the Jaccard's Similarity Index (JSI). Our comparative analysis highlights both the commonalities and distinctions between our findings and those reported in previous studies. This study compared the traditional ethnoveterinary medicinal uses of the plants with 19 published EVPMs documents from across Ethiopia (Table 10).

Table 10. Jaccard similarity index comparing the current study with earlier studies conducted in Ethiopia

Study Area	Species Number (a or b)	Common species(c)	Jaccard Index	Similarity (%)	References
Yeki	**50**	**-**	**-**	**-**	**Present study area**
Guraferda	31	19	0.19	19	(Awoke *et al.* 2024)
Soro	132	42	0.187	18.7	(Hankiso *et al.* 2024)
Omo gibe	78	25	0.163	16.3	(Wendimu *et al.* 2024)
Dugda	64	21	0.155	15.5	(Oda *et al.*2024)
Jimma	74	21	0.144	14.5	(Yigezu *et al.* 2014)
Ambo	55	17	0.139	13.9	(Berhanu *et al.* 2020)
Siltie	39	14	0.135	13.5	(Gensa *et al.* 2023)
South	49	15	0.131	13.1	(Eshetu *et al.* 2015)
Aleta-Chuko	38	13	0.128	12.8	(Bogale and Neja 2021)
maale and ari	46	14	0.126	12.6	(Kidane *et al.* 2014)
Dallol manna	68	17	0.125	12.5	(Gobana *et al.* 2023)
Kersa	33	16	0.124	12.4	(Gemechu 2021)
Adea Berga	59	15	0.12	12	(Feyisa *et al.*2021)
Ada’ar	49	12	0.108	10.8	(Giday&Teklehaymanot 2013)
Ankober	51	12	0.106	10.6	(Lulekal *et al.* 2014)
Enarj Enawga	34	10	0.106	10.6	(Birhan *et al.*2018)
Ensaro	44	11	0.104	10.4	(Asfaw *et al.* 2022)
Quarit	30	9	0.101	10.1	(Alemneh 2021)
Wollo	23	7	0.087	8.7	(Wodegebriel etal.2018)

Discussion

Taxonomic Diversity of Ethnoveterinary Phytomedicines

In Yeki District, as in many parts of Ethiopia, livestock plays a central role in rural livelihoods not only as a source of income and food but also in transportation, cultural rituals, and as social capital in marriage and religious contexts. However, livestock health is frequently compromised by diseases such as Newcastle disease, coccidiosis, foot-and-mouth disease, trypanosomiasis, diarrhea, rabies, blackleg, and bloating. These diseases significantly reduce animal productivity and household resilience. Traditional herbal remedies remain a key resource for managing such conditions, especially in areas with limited access to modern veterinary services (Birhan *et al.* 2018; Gensa *et al.* 2023; Hankiso *et al.* 2024; Oda *et al.* 2024). Similar ethnoveterinary studies in other Ethiopian regions report overlapping health challenges, including anthrax, rabies, and blackleg, as observed by Kidane *et al.* (2014), Lulekal *et al.* (2014), Asfaw *et al.* (2022), Hankiso *et al.* (2024), and Awoke *et al.* (2024). While disease prevalence and type vary by region, largely due to climatic differences, studies consistently highlight shared causative agents and similar animal health management practices across the country. This study documented 50 ethnoveterinary plant species across 34 families and 47 genera, used to treat 21 livestock ailments. These species were collected from highland, midland, and lowland agroecological zones, reflecting broad ecological adaptation and cultural acceptance. The results affirm the continued relevance of ethnoveterinary phytomedicines (EVPMs) in addressing livestock health, particularly in resource-constrained settings. Several of the documented species overlap with those reported in other regions of Ethiopia: 19 in Guraferda (Awoke *et al.* 2024), 42 in Soro (Hankiso *et al.* 2024), 25 in Omo Gibe (Wendimu *et al.* 2024), 21 in Dugda (Oda *et al.* 2024), and 17 in Ambo (Berhanu *et al.* 2020). Additional comparisons include 14 in Siltie Zone (Gensa *et al.* 2023), 11 in Ensaro (Asfaw *et al.* 2022), 12 in Ankober (Lulekal *et al.* 2014), 10 in Enarj Enawga (Birhan *et al.* 2018), and 7 in South Wollo (Wodegebriel *et al.* 2018). This widespread use illustrates a strong ethnoveterinary tradition across Ethiopia, supported by locally adapted knowledge systems.

A comparative analysis using Jaccard's Similarity Index (JSI) revealed varying degrees of similarity between this study and previous ethnoveterinary surveys. The highest similarity (19%) was observed with Guraferda (Awoke *et al.* 2024), followed by Soro (18.7%), Omo Gibe (16.3%), and Dugda (15.5%). The lowest similarity was recorded in Ankober (10.6%), Ensaro (10.4%), and South Wollo (8.7%). This geographic trend decreasing similarity from the southwest to the north likely reflects ecological, cultural, and linguistic variations as well as limited interregional knowledge exchange due to geographic isolation. The closer resemblance between Yeki and Guraferda districts may be explained by their proximity, shared ecological zones, and cultural ties. Regions with similar climates and vegetation often support the same plant species, leading to parallel uses in livestock treatment. Additionally, shared language and cultural heritage promote the transmission of ethnobotanical knowledge, reinforcing consistent medicinal practices within linguistic groups. Despite this rich traditional heritage, ethnoveterinary knowledge is increasingly at risk. Environmental degradation, deforestation, land-use changes, and climate variability threaten the habitats of medicinal plants and erode knowledge systems. Prior studies (Lulekal *et al.* 2014; Birhan *et al.* 2018; Asfaw *et al.* 2022; Awoke *et al.* 2024) have identified habitat loss due to agriculture and urban expansion as key factors in the decline of plant-based veterinary practices. These findings highlight the need for integrated conservation strategies that include biodiversity preservation, community engagement, and phytochemical analysis of key species. Documenting and safeguarding local knowledge systems is essential not only for cultural continuity but also for the development of affordable and ecologically sustainable livestock healthcare solutions. In this study, the most represented plant families were Asteraceae, Euphorbiaceae, and Solanaceae (each with four species), followed by Cucurbitaceae (three species), and Brassicaceae, Boraginaceae, Poaceae, and Zingiberaceae (each with two species). These families are widely recognized in traditional veterinary medicine for their therapeutic properties. Their prominence in this study aligns with earlier findings in Ethiopia and other African contexts (Feyisa *et al.* 2021; Asfaw *et al.* 2022; Dilbato *et al.* 2023; Awoke *et al.* 2024; Alemneh 2021; Hussein 2023; Matovu *et al.* 2020; Luo *et al.* 2022). In contrast, Fabaceae, Apocynaceae, Malvaceae, and Vitaceae were more dominant in Dugda District (Oda *et al.* 2024), suggesting regional variability in plant availability and usage. This likely reflects both ecological distribution and the demonstrated effectiveness of these species in treating local animal health conditions. The reliance on EVPMs in rural areas is driven by their affordability, accessibility, and integration with local cultural beliefs (Berhanu *et al.* 2020; Feyisa *et al.* 2021).

Habitat and Life Forms of Ethnoveterinary Phytomedicines

In the Yeki district, ethnoveterinary phytomedicines (EVPMs) are sourced primarily from the wild, with additional contributions from home gardens and local markets. The preference for wild plants is often rooted in the belief that they are more potent than cultivated ones (Oda *et al.* 2024). However, heavy reliance on wild resources without cultivation efforts raises sustainability concerns, as continuous harvesting can threaten plant populations (Hankiso *et al.* 2024; Awoke *et al.* 2024). This trend is common across Ethiopia, where the domestication of medicinal plants for livestock treatment remains limited (Asefa *et al.* 2021; Gobana 2022; Dilbato *et al.* 2023). The study identified a range of life forms among medicinal plants, with herbs being the most commonly used, followed by trees and shrubs. Herbs are favored due to their rapid growth, accessibility near homesteads, and ease of collection during the bimodal rainy seasons. Similar patterns have been reported in both Ethiopian (Feyisa *et al.* 2021; Berhanu *et al.* 2020) and international studies (Muhammad *et al.* 2021; Pakhtunkhwa *et al.* 2022). Shrubs and trees also contribute significantly to ethnoveterinary practices, though their prominence varies depending on local agroecological conditions, cultural knowledge transmission, and resource availability (Kahsay *et al.* 2020; Asfaw *et al.* 2022; Assefa *et al.* 2018).

Plant Parts Used and Remedy Preparation

Leaves were the most frequently used plant parts in remedy preparations, followed by roots. Leaves are preferred due to their abundance, ease of harvesting, and high concentration of bioactive compounds (Deressa 2021; Bogale & Abda 2022). Their use is also considered more sustainable, as leaf harvesting typically does not harm the plant. In contrast, the removal of roots and whole plants poses serious conservation threats and risks species depletion (Birhan *et al.* 2018; Hankiso *et al.* 2024; Iwaka *et al.* 2023). Therefore, promoting the use of renewable plant parts, particularly leaves, is crucial for sustainable ethnoveterinary practice (Lulekal *et al.* 2014; Asfaw *et al.* 2022; Awoke *et al.* 2024). Remedies are primarily prepared using freshly collected plant materials. This practice helps preserve essential oils and secondary metabolites that are sensitive to drying and are critical in treating livestock diseases. The availability of fresh plants year-round, supported by the region's bimodal rainfall, facilitates this approach. The preference for fresh materials is widely observed across Ethiopia (Lulekal *et al.* 2014; Asfaw *et al.* 2022; Oda *et al.* 2024) and internationally (Rizwan & Banday 2020; Barbosa *et al.* 2023; Shah *et al.* 2024).

Modes of Remedy Preparation and Application

This study found that pounding is the most common method used in preparing ethnoveterinary remedies, followed by grinding. The choice of preparation technique is influenced by factors such as the type of plant, plant part used, target disease, and livestock species (Awoke *et al.* 2024; Oda *et al.* 2024). Most remedies are derived from single plant species, reflecting the healers' experience and confidence in the efficacy of mono-preparations a common practice across many Ethiopian communities (Lulekal *et al.* 2014; Berhanu *et al.* 2020; Asfaw *et al.* 2022). In contrast, studies from other regions (Eshetu *et al.* 2015; Bishist *et al.* 2022) report frequent use of multi-plant formulations, especially in areas like Dallol Manna (Gobana *et al.* 2023), Aleta-Chuko (Bogale & Neja 2021), Siltie Zone (Gensa *et al.* 2023), and Ada'ar District (Giday & Teklehaymanot 2013). Multi-herbal combinations are often favored for their synergistic effects, reduced toxicity, and improved palatability. The choice of remedy is also shaped by environmental knowledge, such as vegetation types, seasonal availability, and access to resources (Wodegebriel *et al.* 2018; Alemneh 2021; Yigezu *et al.* 2014). Water is the primary solvent used in remedy preparation, consistent with findings from various Ethiopian studies (Kidane *et al.* 2014; Birhan *et al.* 2018; Gemechu 2021; Oda *et al.* 2024). In some areas, boiling is preferred to extract active compounds and reduce toxicity (Maphosa & Masika 2010; Miara *et al.* 2019). Non-plant additives such as salt, milk, butter, and *Bulla* (a traditional Enset product) are commonly incorporated to enhance solubility, flavor, and medicinal effects. These practices are widespread across Ethiopian ethnolinguistic groups and have parallels in global ethnoveterinary contexts (Feyisa *et al.* 2021; Bishist *et al.* 2022; Oda *et al.* 2024). In addition to plant-based remedies, non-plant materials including charcoal, ash, limestone, salt, human urine, edible oil, honey, yeast, whey, and heated iron are employed to treat livestock ailments. The use of such substances may offer alternative solutions and help reduce pressure on endangered wild medicinal flora (Oda *et al.* 2024).

Routes and Dosage of Remedy Administration

Traditional healers typically begin treatment by visually inspecting the animal and identifying symptoms in the mouth, throat, eyes, ears, nose, feet, or skin. Diagnosis relies heavily on these observations and on owner-provided information about the animal's condition, consistent with other regional reports (Lulekal *et al.* 2014; Yenesew *et al.* 2015; Alemneh 2021; Awoke *et al.* 2024). The oral route, especially drenching, is the predominant method of administration, likely due to the high prevalence of internal ailments and the rapid response required. This trend is widely reported across Ethiopia and globally (Birhan *et al.* 2018; Oda *et al.* 2024). However, in some districts, such as Seharti-Samre, topical (dermal) applications are more commonly used (Yirga *et al.* 2012). Dosages vary based on the species, age, and size of the animal. For smaller animals like goats and sheep, remedies are measured using household items (e.g., coffee cups, tea cups), while larger animals like cattle and donkeys receive higher doses, typically administered using containers such as one-liter plastic jugs. Treatments may be given as a single dose or repeated until the desired effect is achieved. However, these dosage practices remain unstandardized, leading to variability and potential inconsistencies an issue also observed in other studies across the country (Lulekal *et al.* 2014; Hankiso *et al.* 2024).

Ailment category and fidelity level of ethnoveterinary phytomedicines

The Informant Consensus Factor (ICF) was used to measure the level of agreement among informants on the use of medicinal plants for treating livestock ailments in the Yeki district. A total of 21 livestock diseases were recorded and categorized into nine major ailment types. Among these, external parasitic infections had the highest ICF value (0.94), followed by respiratory (0.92), dermatological (0.91), and gastrointestinal ailments (0.89). These high ICF values indicate not only the prevalence of these disease types but also the widespread reliance on and perceived efficacy of certain ethnoveterinary remedies. Similar findings were reported by Lulekal *et al.* (2014) and Hankiso *et al.* (2024), who documented high ICF values for dermatological and viral diseases such as lumpy skin disease, reflecting consistent and culturally validated use of specific medicinal plants. Plants associated with high ICF values are often rich in bioactive secondary metabolites and may offer significant therapeutic potential, as also noted by Birhan *et al.* (2018) and Oda *et al.* (2024). These observations highlight the value of indigenous ethnoveterinary knowledge and emphasize the need for further phytochemical and pharmacological studies on frequently cited plant species. In the current study, several plant species showed high Fidelity Levels (FL), indicating strong agreement among informants on their specific therapeutic uses: *Justicia schimperiana* (FL = 0.94) for intestinal parasites, *Nicotiana tabacum* (FL = 0.90) for leech infestation, *Melia azedarach* (FL = 0.87) for ectoparasites, *Aframomum caudatum* (FL = 0.85) for bloating, and *Vernonia amygdalina* (FL = 0.90) for diarrhea. These findings are consistent with previous research by Gensa *et al.* (2023), Wendimu *et al.* (2024), and Awoke *et al.* (2024), all of which emphasized the pharmacological relevance of these species. Similarly, in the Soro district, Hankiso *et al.* (2024) reported high FL values for *A. schimperiana* (96%) in treating aspiration pneumonia and *Brugmansia suaveolens* (92%) for diarrhea. Thus, the FL serves as a crucial tool for identifying plant species with strong ethnomedical significance and therapeutic potential.

Ranking and Multipurpose Use of Ethnoveterinary Plants

Informants were asked to rank ethnoveterinary phytomedicines (EVPMs) based on their perceived effectiveness against specific ailments. In treating intestinal parasites, *Justicia schimperiana* was ranked highest, followed by *Vernonia amygdalina*. For bloating, *V. amygdalina* was again the top choice, with *Allium sativum* and *Datura stramonium* ranked next (Awoke *et al.* 2024). A direct matrix ranking revealed that some medicinal plants are valued more for their non-medicinal uses such as firewood, charcoal, or construction than for their therapeutic benefits. Species like *Milicia ferruginea* (1st), *Croton macrostachyus* (2nd), and *Eucalyptus globulus* (3rd) are heavily harvested, contributing to their local endangerment. In contrast, *Melia azedarach* is considered less threatened (Dilbato *et al.* 2023), although it remains under pressure in certain areas, such as Guraferda, where *Euphorbia cymosa* is among the most endangered species (Awoke *et al.* 2024). Similarly, a study by Hankiso *et al.* (2024) in Soro district ranked *Prunus africana* and *Combretum molle* as the most preferred species for livestock treatments. However, both are facing conservation threats due to overharvesting, largely driven by fuelwood demand and the absence of electricity in many rural areas. These multipurpose uses place several medicinal species at risk, highlighting the need for community-based conservation strategies. Given their therapeutic significance and ecological vulnerability, the conservation of ethnoveterinary plants must be prioritized, especially for species with high use values and limited local availability.

Demographic Features and Knowledge of Ethnoveterinary Phytomedicines among Informant Groups

In the Yeki district of Southwestern Ethiopia, demographic factors such as gender, age, education level, and informant type (general vs. key) significantly influence the knowledge and use of ethnoveterinary phytomedicines (EVPMs). Understanding these variables helps clarify differences in traditional knowledge and supports efforts to preserve and promote culturally rooted practices. Gender plays a notable role in the transmission and application of ethnoveterinary knowledge. A statistically significant difference ($P < 0.05$) was observed between male and female informants, with men generally possessing more practical knowledge of phytomedicines. This trend is likely due to men's greater involvement in livestock care and their frequent exposure to natural habitats where medicinal plants are found. These findings align with studies from other Ethiopian regions (Bose 2021; Usman *et al.* 2022; Silambarasan *et al.* 2023; Awoke *et al.* 2024; Oda *et al.* 2024; Hankiso *et al.* 2024). However, some reports (e.g., Gnahore *et al.* 2022) suggest that women may have equal or even superior knowledge, while others (Kidane *et al.* 2018; Tahir *et al.* 2021) found no significant gender differences. Such inconsistencies may reflect variations in livelihood roles, where women not actively engaged in agriculture may focus more on traditional remedies than livestock productivity. These gender-based dynamics underscore the importance of inclusive approaches that recognize both men's and women's contributions to ethnoveterinary knowledge. Educational background also influences EVPM knowledge. A statistically significant difference ($P < 0.05$) was found between informants with different education levels. Those with limited formal education often possess extensive hands-on knowledge of local medicinal plants, while more formally educated individuals may value traditional practices but engage with them less actively. This trend is supported by previous findings (Bose 2021; Tahir *et al.* 2021; Gnahore *et al.* 2022; Awoke *et al.* 2024; Oda *et al.* 2024). The limited inclusion of traditional medicine in formal education may contribute to knowledge loss among highly educated individuals. However, some studies, such as Hankiso *et al.* (2022), have reported higher knowledge levels among literate informants. This variation points to a disconnect between indigenous knowledge and modern education systems, highlighting the need for integrative educational initiatives that bridge these two domains. The distinction between general and key informants also revealed significant differences in EVPM knowledge ($P < 0.05$). Key informants, often elders or recognized traditional experts, demonstrated deeper and more comprehensive knowledge than general informants. Their insights often include rare practices and cultural interpretations that might not be widely known. However, relying solely on key informants risks overlooking the broader community knowledge base, which contributes diverse perspectives essential for a holistic understanding of ethnoveterinary practices. This finding is consistent with previous research (Kidane *et al.* 2018; Bose 2021; Tahir *et al.* 2023; Hankiso *et al.* 2024; Oda *et al.* 2024; Awoke *et al.* 2024), emphasizing the value of combining both general and expert knowledge in ethnobotanical research.

Comparison of Present Findings with Previous Ethnoveterinary Phytomedicine (EVPM) Studies in Ethiopia

This study documents the use of ethnoveterinary phytomedicines (EVPMs) by indigenous and local communities in Yeki district, Southwestern Ethiopia, revealing both shared and regionally unique practices within the broader Ethiopian ethnobotanical context. Key species identified include *Croton macrostachyus*, *Aframomum caudatum*, *Aframomum corrorima*, *Datura stramonium*, *Ensete ventricosum*, *Eucalyptus globulus*, *Justicia schimperiana*, *Melia azedarach*, *Momordica foetida*, and *Nicotiana tabacum*. Many of these are consistent with findings from other regions, such as Soro district (Hankiso *et al.* 2024) and Guraferda district (Awoke *et al.* 2024). However, our study also records EVPMs not previously reported, indicating the presence of locally adapted knowledge shaped by the district's distinct ecological and cultural environment. Preparation and application methods differ notably across Ethiopia. In Yeki, topical applications and dressings are commonly used, contrasting with the decoctions and infusions predominant in Dugda district (Oda *et al.* 2024). These variations likely reflect differences in livestock types, disease prevalence, and cultural preferences. In addition, spiritual elements are integrated into veterinary treatments in Yeki, often involving ancestral rituals and beliefs. This contrasts with more utilitarian approaches observed in areas such as Quarit and Yilmana Densa (Alemneh 2011), where emphasis is placed solely on therapeutic outcomes. The inclusion of spiritual practices in Yeki underscores a holistic worldview that values both physical healing and spiritual well-being. Socioeconomic conditions also influence reliance on traditional veterinary medicine. In Yeki, livestock is closely linked to economic stability, echoing patterns in Ankober district (Lulekal *et al.* 2014). However, modernization and economic pressure are contributing to a decline in knowledge transmission, particularly among younger generations a trend also noted in Siltie Zone (Gensa *et al.* 2023). This erosion of traditional knowledge underscores the need for targeted community-based preservation efforts. The conservation of medicinal plant species remains a critical issue. Many of the plants identified in this study face threats from habitat degradation and unsustainable harvesting, consistent with findings from Ambo district (Berhanu *et al.* 2020). Notably, Yeki communities have initiated grassroots conservation practices, including community-managed forests, to safeguard these resources an approach that differs from the more centralized conservation efforts in other regions. Our study also introduces new ethnoveterinary uses, such as *Milicia excelsa* for treating bloody diarrhea, which has not been reported in earlier Ethiopian EVPM literature. This suggests adaptive knowledge systems that respond dynamically to local environmental and veterinary challenges. Furthermore, the cultural significance of certain species, such as the belief in the protective power of *Momordica foetida* against malevolent forces, illustrates how spiritual values and practical applications often coexist a perspective frequently underrepresented in scientific studies.

Environmental, Food Security, and Public Health Implications of Ethnoveterinary Phytomedicines (EVPMs)

This study highlights the vital role of ethnoveterinary phytomedicines (EVPMs) in Yeki district, Southwestern Ethiopia, emphasizing their interconnected impacts on environmental sustainability, food security, public health, and cultural heritage.

Environmental Implications

The use of EVPMs demonstrates a strong link between local communities and their natural environment. Many of the medicinal plants identified are native species that contribute significantly to local biodiversity. Their continued use underscores the importance of conserving these species, especially amid threats such as deforestation, agricultural expansion, and climate change. Traditional knowledge promotes sustainable harvesting practices, helping to prevent overexploitation and supporting ecosystem resilience. Several EVPM species also contribute to ecological functions such as soil stabilization, habitat restoration, and attracting pollinator's vital services that enhance both wild and cultivated plant productivity. Moreover, integrating indigenous knowledge into modern conservation strategies can support biodiversity while sustaining community livelihoods.

Food Security Considerations

Livestock plays a central role in household nutrition and economic stability in Yeki district. EVPMs offer an affordable and locally available alternative to conventional veterinary medicine, enabling farmers to manage livestock health without reliance on costly or inaccessible pharmaceuticals. Maintaining healthy herds enhances meat and milk production, directly supporting food security and rural livelihoods. Certain phytomedicinal species also serve as valuable livestock feed. Plants like *E. schimperi*, *M. foetida*, *C. citratus*, and *C. dactylon* improve forage quality, while others such as *V. amygdalina* and *A. caudatum* offer both nutritional and antimicrobial benefits. Plant species like *J. schimperiana*, serving as both forage and medicine, exemplifies the multifunctional value of these plants in reinforcing food systems.

Public Health Implications

The use of EVPMs has important public health benefits. Many of the plants used possess bioactive compounds that may reduce reliance on antibiotics, helping to address the global issue of antimicrobial resistance in animal health. Ensuring livestock health also contributes to safer animal products, reducing the risk of zoonotic disease transmission. Promoting the safe and effective use of traditional remedies can strengthen community health systems, particularly in regions with limited access to formal veterinary care. Conversely, the loss of these medicinal resources may increase dependence on synthetic drugs, which may not be affordable or culturally accepted. Protecting EVPM knowledge can offer accessible, culturally relevant, and ecologically sustainable healthcare options for both animals and humans.

Cultural Significance and Knowledge Preservation

Ethnoveterinary practices in Yeki are not only functional but deeply rooted in cultural tradition. They represent generations of accumulated indigenous knowledge. However, modernization and generational shifts threaten the continuity of this heritage. Preserving and documenting these practices is essential for safeguarding both cultural identity and biodiversity. Involving younger generations and incorporating traditional knowledge into local education can enhance community pride, promote sustainable practices, and support biodiversity conservation.

Threats and Conservation Practices of Ethnoveterinary Phytomedicines

In Yeki district, ethnoveterinary phytomedicines (EVPMs) face increasing threats from both natural and human-induced factors, reflecting broader challenges seen in other parts of Ethiopia. According to eight key informants, the primary threats include agricultural expansion, infrastructure development, timber and charcoal production, firewood collection, overgrazing, and invasive alien species (IAS). Among these, deforestation driven by agricultural expansion poses the most severe risk to phytomedicinal resources. This finding is consistent with earlier studies (Tamene 2020; Girmay *et al.* 2021; Alemu *et al.* 2024; Oda *et al.* 2024; Awoke *et al.* 2024). Overgrazing, particularly in protected areas, further exacerbates plant loss, often due to limited awareness of its ecological impact. Invasive species such as *Parthenium hysterophorus* and *Lantana camara* are also major threats, suppressing the growth of native medicinal plants and disrupting local ecosystems (Shiferaw *et al.* 2018; Kahsay *et al.* 2020; Karki *et al.* 2023; Awoke *et al.* 2024). Similarly, *Prosopis juliflora* has been identified as a significant invasive species affecting phytomedicinal diversity in other parts of the country (Beche *et al.* 2016; Megersa & Woldetsadik 2022). Multipurpose medicinal plants, which serve both therapeutic and non-medicinal functions, are especially vulnerable to these pressures (Agize *et al.* 2022; Alemu *et al.* 2024; Awoke *et al.* 2024). The degradation of natural habitats not only threatens plant survival but also contributes to the erosion of traditional knowledge, particularly as younger generations become increasingly disconnected from these practices. Despite these challenges, local healers and community members have begun conservation efforts by cultivating formerly wild species such as *A. vera*, *I. ethiopica*, *C. macrostachyus*, *R. communis*, *M. azedarach*, *Z. officinale*, *M. ferrugin*, *J. schimperiana*, *E. globulus*, *A. abyssinica*, and *E. ventricosum* in home gardens and communal spaces. These conservation initiatives primarily involve *in situ* methods within natural habitats and the promotion of *ex situ* practices, such as the domestication of phytomedicinal plants in home gardens, nursery sites, roadside plantings, and integrated agroforestry systems. Examples include planting species like *A. abyssinica*, *S. incanum*, *N. tabacum*, *R. prinoides*, and *R. chalepensis* in home gardens; cultivating *S. campanulata* and *R. communis* under coffee shade; and using *J. schimperiana*, *P. dodecandra*, and *M. azedarach* as live fences. Roadside plantings of *E. cymosa* and *E. globulus* and integrating medicinal plants into mixed cropping systems are also common practices. However, the study also highlights a significant gap in organized, community-based conservation programs, echoing concerns raised by Ssenku *et al.* (2022), Kindie (2023), and Awoke *et al.* (2024). To ensure the sustainable use and protection of EVPMs, it is vital to strengthen local conservation efforts through both *in situ* and *ex situ* strategies. Equally important is raising public awareness of the ecological, cultural, and medicinal value of these plants. Educational campaigns, community outreach, and the use of local media can play a crucial role in fostering environmental stewardship and preserving remaining forest patches vital to the region's ethnobotanical heritage.

Limitation of the study

This study presents several limitations that should be considered. Conducted solely in Yeki district, the findings may not be generalizable to regions with different ecological and cultural contexts. While a diverse range of informants was consulted, the sample may not fully capture the community's knowledge, which can vary across ethnic and social groups. The reliance on interviews and focus group discussions may have introduced biases, as some informants might have withheld information or emphasized certain plants based on personal or cultural preferences. The study's limited timeframe also restricted the observation of seasonal variations in plant availability and use. Additionally, the impact of invasive alien species (IAS) on traditional practices was not thoroughly explored. The lack of pharmacological validation of the recorded plants limits confirmation of their effectiveness. The role of local markets in influencing plant availability and the economic significance of ethnoveterinary medicine were also not addressed. Cultural norms related to secrecy may have constrained information sharing. Lastly, the study did not fully assess the influence of anthropogenic pressures such as land use change and climate variability on the sustainability of EVPMs. These gaps warrant further investigation.

Conclusion

This study documented a rich diversity of ethnoveterinary phytomedicines (EVPMs) in Yeki district, used by local communities to treat various livestock ailments through indigenous knowledge and practices. A total of 50 medicinal plant species were identified, addressing 21 different livestock health issues. Data were collected and verified across multiple sites, emphasizing these plants' vital role in animal health and their multifunctional uses. Most species were used to treat a single condition, while some were effective against multiple ailments. Various plant parts were used either alone or combined with other medicinal plants, sometimes with additives. Notably, water, milk, and honey were frequently cited as antidotes to counteract toxic effects from certain plants consumed by livestock, highlighting their importance in traditional veterinary care. The majority of phytomedicines were harvested from natural wild habitats spanning diverse agroecological zones, with some sourced from agricultural lands and local markets. Species such as *Aloe vera* and *Albizia abyssinica* were noted alongside culinary and medicinal spices like *Zingiber officinale*, *Allium sativum*, *Coriandrum sativum*, and *Ruta chalepensis*. Common food plants including *Ensete ventricosum* and *Lepidium sativum*, as well as fruits and vegetables like *Carica papaya*, *Lycopersicon esculentum*, and *Brassica carinata*, were also documented, along with stimulants such as *Coffea arabica* and *Nicotiana tabacum*. Significant variation in ethnoveterinary knowledge was observed among informants ($P < 0.05$). Quantitative ethnobotanical methods helped identify priority species for conservation, remedy use, and future antimicrobial research. Plant species like *Millettia ferruginea*, *Croton macrostachyus*, *Eucalyptus globulus*, *Eragrostis schimperi* and *Euphorbia cymosa* is key candidates for protection due to their cultural and medicinal importance in the study area. These plants face increasing threats from human activities and environmental pressures, underscoring the urgent need for conservation. The study recommends collaboration between researchers and traditional practitioners including agriculturalists, ethnobotanists, and ecologists—to support sustainable management of these multipurpose phytomedicines and safeguard associated indigenous knowledge. Many identified species hold significant potential for phytochemical and pharmacological investigations, which could further validate and enhance the value of local ethnoveterinary traditions.

Declarations

List of abbreviations: ETH - Ethiopian National Herbarium; FL - Fidelity Level; ICF - Informant Consensus Factor; PR - Preference Ranking; EVPMs - Ethnoveterinary phytomedicines; JSI - Jaccard similarity index; IAS - Invasive alien species

Ethics approval and consent to participate: Before initiating data collection, we obtained permission letters from the Yeki district Administration Offices. Informants were verbally asked for their consent prior to conducting interviews and group discussions, and their data was recorded only with their approval. Additionally, consent was secured from the informants for the publication of the individual data gathered from them. Our research adhered to the ethical guidelines established by the Declaration of Mizan Tepi University, which governs studies involving human and animal subjects. The Institutional Review Board of Mizan Tepi University provided approval for the study. We ensured that all participants gave informed consent and followed protocols aimed at safeguarding their rights and welfare throughout the research process. Furthermore, our research protocol underwent review and received approval from an institutional review board to guarantee adherence to ethical standards. Participants were made aware of the study's objectives, anticipated outcomes, benefits, and any potential risks associated with their involvement. Written consent was obtained from each participant prior to the commencement of the interviews. Ethical measures put in place to ensure equitable representation and benefit-sharing with informants and their communities.

Consent for publication: Not applicable

Availability of data and materials: All the information gathered for this research was examined, interpreted, and incorporated into this paper

Competing interests: Not applicable

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Author contributions: D.M. drafted the manuscript and methodology. M.A. focused on language editing, verifying botanical names of plants, and conducting an overall review. S.G. managed data collection, also verified the data analysis. A.A. drafted the manuscript and methodology, created the climatogram for the study area, prepared the map of the study area. Each author has reviewed and approved the final manuscript.

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