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Research Paper

Ethnoveterinary Medicinal Plants and Indigenous Knowledge in Tarmaber District, North Shewa Zone, Ethiopia

Yirefu Tefera[1*], Ermias Lulekal[2], Bikila Warkineh[2]

[1]Department of Biology, Wolkite University, Wolkite, Ethiopia

[2]Department of Plant Biology and Biodiversity Management, Addis Ababa University, Addis Ababa, Ethiopia

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Abstract

Livestock ailments and inadequate access to modern veterinary care have increased dependence on ethnoveterinary medicinal plants in rural Ethiopia. However, associated indigenous knowledge remains poorly documented. This study was designed to explore livestock ailments, indigenous healing flora, and traditional animal healthcare practices maintained by local communities in the Tarmaber District, Ethiopia. Ethnobotanical information was gathered during the 2021–2022 period via focus group discussions, participatory field walks, and semi-structured interviews. A total of 392 informants, including purposively selected key traditional healers and randomly selected community members, were involved. Quantitative ethnobotanical indices were used to evaluate ethnoveterinary knowledge, medicinal plant use, and community preferences. Field surveys recorded 63 ethnoveterinary plant species across 60 genera and 41 botanical families employed in treating 26 distinct animal health disorders. Asteraceae was the most represented family utilized by local communities for livestock treatments. Herbs (42.9%) were the main growth forms, and the majority of the species (73%) were gathered from natural ecosystems, indicating strong reliance on natural ecosystems. The most frequently treated livestock ailments were anthrax (35%), blackleg (32%), abdominal pain (17.5%), and bloating (16%). Substantial informant consensus was indicated by high ICF scores, with musculoskeletal (0.86) and gastrointestinal complaints (0.82) showing the greatest agreement. Overall, the results highlight culturally valuable medicinal plants that warrant more phytochemical and pharmacological investigation, while underlining the urgent need to conserve indigenous knowledge and medicinal plant resources.

1. Introduction

Animal husbandry is fundamental to rural survival, global food security, and socio-economic progress, particularly across developing nations (Herrero et al., 2013). However, livestock productivity is often constrained by the high burden of infectious and parasitic diseases, which reduce the production

* Author email: rutitefera@gmail.com

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of meat, milk, draft power, hides, and other products, thereby threatening household income and food security among agrarian households (Kappes et al., 2023; Khade et al., 2021). These barriers are notably severe across sub-Saharan African nations, where pastoral and smallholder communities commonly face challenges related to scarce utilization of up-to-date animal health services, inadequate pharmaceutical supply chains, and the high cost of conventional pharmaceuticals (Jaime et al., 2022).

Ethiopia maintains one of Africa's most substantial and heterogeneous animal husbandry sectors, which forms a pillar of agricultural GDP and smallholder livelihoods (Legese et al., 2023). Despite its economic prominence, productivity remains suppressed by endemic pathogens and inadequate veterinary service coverage (Hassen et al., 2022; Welay et al., 2018). Consequently, rural communities depend highly on ethnoveterinary medicine (EVM)- an indigenous healthcare system based on generations of traditional knowledge, oral transmission, and plant-based preparations (Abebe, 2022; Feyisa et al., 2021). EVM provides an accessible, cost-effective, and culturally rich alternative to synthetic therapeutics (Mir et al., 2020).

Despite its widespread utility, ethnoveterinary knowledge is rapidly declining. Because it relies mostly on oral transmission among elderly healers and experienced herders, traditional knowledge faces severe erosion owing to rapid modernization, shifting socio-economic conditions, and insufficient systematic documentation (Wendimu et al., 2024). On the other hand, wild medicinal plant species are being depleted due to anthropogenic influences, which include habitat loss, recurring drought, land-use change, and unsustainable harvesting. Protecting the bio-cultural heritage requires systematic documentation together with quantitative ethnobotanical assessments like use reports (URs) and Informant Consensus Factor (ICF) in order to identify the important species and confirm the community consensus (Leonti, 2022; Tardío & Pardo-de-Santayana, 2008; Trotter & Logan, 2019). It is worth mentioning that, although high indices of consensus indicate common knowledge and use value, they do not imply clinical effectiveness.

Livestock plays an important role in the economy of the people of Tarmaber district. Moreover, ethnoveterinary practices are still useful for the residents of rural communities of the district. Despite the existence of ethnoveterinary surveys conducted in nearby districts such as Ankober and Mojana-Wedera, there are special features in terms of topography, agriculture, and floristics of Tarmaber that determine unique patterns of local use. The district-level reports mentioned diseases such as blackleg, anthrax, pasteurellosis, rabies, lumpy skin disease, sheep and goat pox, Newcastle disease, and various parasites (TDARDO, 2022). These livestock health experiences, along with the lack of opportunities for modern veterinary services in some rural communities, can contribute to the development of reliance on traditional practices of livestock treatment and the use of medicinal plants. Nevertheless, despite the presence of ethnoveterinary surveys conducted in adjacent areas, the systematization of the diversity of medicinal plant use and patterns of community agreement in relation to Tarmaber district has not been done yet. To cover the existing data deficiency, the current study intended to document traditional practices of animal health care and ethnoveterinary botanicals used by the population of Tarmaber district.

2. Materials and methods

2.1. Description of the study area

The study was carried out in Tarmaber District (North Shewa Zone, Amhara Region, Ethiopia; Fig. 1), positioned approximately 190 km northeast of Addis Ababa and 59 km east of

Debre Berhan. The district lies within the geographic bounds of 9◦45′-10◦00′N latitude and 39° 45′- 40° 00′E longitude, covering 609.26 km² at a mean altitude of 2,318 m a.s.l. (TDARDO, 2019). Topographical distribution reveals a predominantly mountainous environment (47.21%), alongside undulating terrain (33.37%), valley landforms (15.74%), and minor lowland plains (3.68%).

Based on the Ethiopian agroecological classification, the district comprises four agroecological zones: Qolla (warm semi-arid), occurring below 1,500 m a.s.l. and covering 20.17% of the district; Woina Dega (cool sub-humid), occurring between 1,500 and 2,300 m a.s.l. and covering 47.18%; and Dega (cool and humid), occurring above 2,300 m a.s.l. and covering 31.98% and Wurch (cool and moist; 406.49 ha, representing 0.67%) (Ministry of Agriculture (MoA)., 1998; TDARDO, 2019). Since the Wurch zone covers a negligible proportion of the total land mass (<1%) and lacks representative agricultural settlements and livestock-keeping communities, it was omitted from kebele sampling. Meteorological records indicate a mean annual precipitation of 1,100–1,400 mm and temperatures spanning 7.5°C to 25°C, reflecting distinct variation along altitudinal profiles (TDARDO, 2022). Under the potential Ethiopian vegetation classification (Friis et al., 2010), Dry Evergreen Afromontane Forest and Grassland Complex (DAF) constitutes the dominant vegetation cover in Tarmaber District.

Agriculture in the area is mainly a mixed crop–livestock system. Crop farming focuses mostly on teff (Eragrostis tef), wheat (Triticum aestivum), barley (Hordeum vulgare), faba bean (Vicia faba), sorghum (Sorghum bicolor), and mung bean (Vigna radiata). Alongside cropping, livestock rearing, including cattle, sheep, goats, equines, poultry, and apiculture, serves as a primary pillar of smallholder livelihoods and food security in the area (TDARDO, 2022).

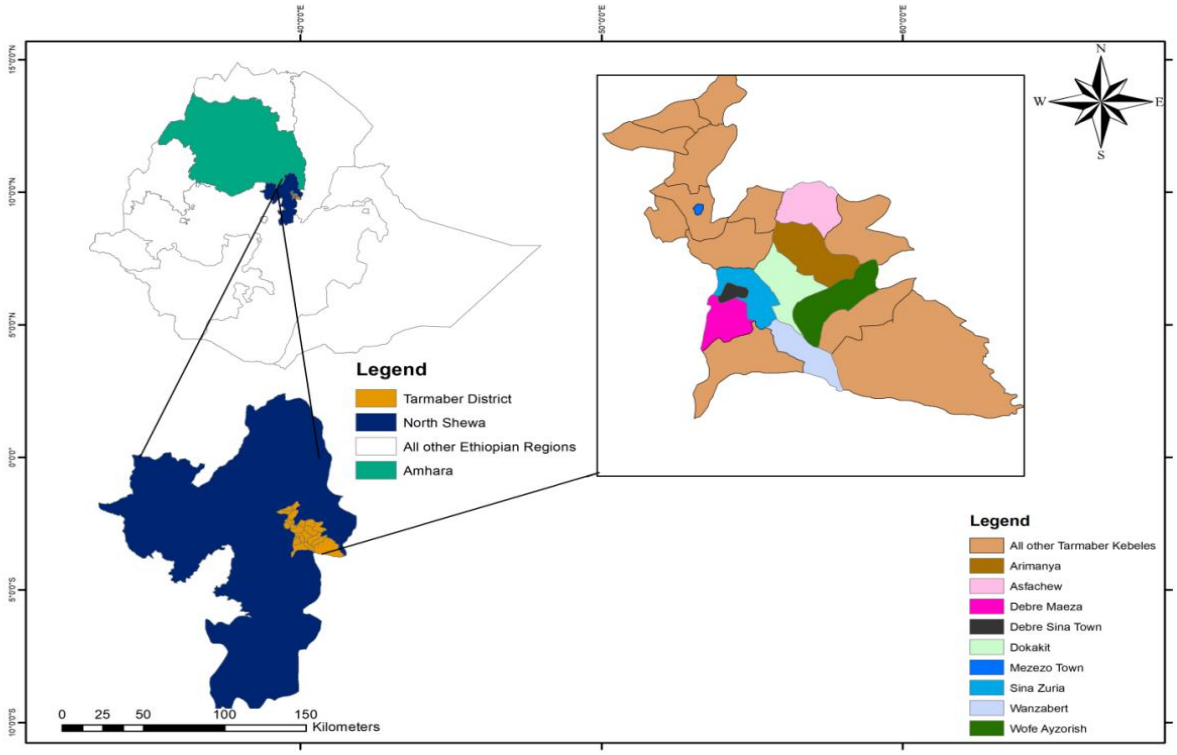


Figure 1: *Geographic location of the study area within the Amhara National Regional State, Ethiopia (developed using ArcGIS 10.5).* **Coordinate System**: *WGS 1984 UTM zone 37N.*

***Data Source**: Administrative and kebele boundary spatial shapefiles obtained directly from the Tarmaber District Administration / GIS Office.*

2.2. Site selection

A preliminary survey was made between May 28, 2021, and June 15, 2021. This survey provided preliminary insights into the agro-ecological attributes of the study area, including an assessment of vegetation status, and helped the researchers become familiar with the local community and environment. The observations made during the reconnaissance survey were used to identify representative vegetation areas, assess site accessibility, and determine suitable locations for sampling. The survey also enabled initial contact with local communities and assisted in identifying appropriate sites and informants for the ethnoveterinary study.

The kebeles used in the research were purposely selected depending on specific pre-defined geographical and ecological considerations such as differences in vegetation coverage, major agroecological zones, ethnoveterinary knowledge, and access to research areas. Before selecting the sites, consultations were made with local administrators, community elders, traditional healers, and other municipality personnel to obtain preliminary information about ethnoveterinary knowledge and medicinal plant distribution in the district. Nine kebeles representing various ecological and ethnoveterinary settings were purposively selected out of more than 35% kebeles of Tarmaber District using these criteria and obtained preliminary information. Although informants in the selected kebeles were randomly selected, kebeles were purposely selected because it is common practice in ethnobotanical research to select locations based on rich traditional knowledge and practices. The names and corresponding agroecological features of the selected kebeles are given in Table 1.

Table 1: *Distribution of informants across selected kebeles and agroecological zones in Tarmaber District*

No.	Kebele's name	Agroecological zones	Number of informants
1	Debresina town	Dega	43
2	Debre-meaza	Dega	43
3	Asfachew	Qolla	55
4	Armaniya	Qolla	52
5	Wof-Ayzurish	W/dega	43
6	Mezezo town	Dega	38
7	Sina Zuria	W/dega	43
8	Dokakit	W/dega	43
9	Wanza Beret	W/dega	32

2.3. Sample size determination and selection of informants

A multistage sampling design was employed. Nine kebeles were purposively selected to exemplify the district's central agroecological zones, livestock distribution, and indigenous healthcare practices. Subsequently, to ensure a statistically representative sample from selected kebeles, the required sample size for finite population sampling was estimated in accordance with Yamane (1967) using the expression:

$$n = N / [1 + N (e)^2]$$

Where: n = sample size; N = total household population across the nine kebeles (N =

23,024); e = margin of error/level of precision (e=5%); 1= constant.

Based on this calculation, a total of 392 household heads (281 males and 111 females) were selected and proportionally allocated across the nine kebeles in Tarmaber District (Table 1). The number of informants sampled per kebele (ranging from 32 to 55) varied according to the total household population of each kebele and the practical availability and willingness of livestock-owning households during fieldwork; where fewer eligible respondents were available in Wanza Beret and Mezezo town, extra informants were chosen from more populous kebeles (such as Asfachew and Armaniya) to accomplish the total required sample size of 392. From each selected household, one adult member capable of providing relevant information was interviewed.

From the total pool of 392 survey participants, a subset of 38 key informants comprising 31 males and 7 females was selected through purposive and snowball sampling strategies, chosen specifically for their deep familiarity with the study area and their knowledge and experience of medicinal plant use. Key informants were selected from elders, traditional healers, and other community members recognized locally as knowledgeable about medicinal plants, particularly those with long-term residence in the study area and direct experience with traditional medicinal plant practices. A knowledgeable informant was defined as a community member with demonstrable experience and practical knowledge of identifying, collecting, preparing, or using medicinal plants for primary healthcare. Specifically, initial key informants were purposively identified based on these criteria, while additional knowledgeable informants were identified through recommendations from previously interviewed participants (Martin, 1995).

2.4. Ethnobotanical data collection

Ethnoveterinary records were assembled over three sampling trips completed between June 2021 and December 2022. Before surveys, field assistants received orientation from the principal investigator on study objectives, ethics, and questionnaire administration. Individual interviews required 45–60 minutes to complete, compared to 60–90 minutes for focus group discussions (FGDs). Interviews were conducted in Amharic, with responses recorded directly on the questionnaires in writing by the researchers. Upon completion of each daily survey, the Amharic questionnaire notes were translated into English by the native-speaking authors, cross-checked against original field notes, and vernacular livestock ailments were verified with Tarmaber District Agriculture and Rural Development Office (TDARDO) professionals. Duplicate plant reports for the same ailment by a single informant counted as one use report (UR), and varying vernacular names were unified post-botanical authentication. Inconsistent responses were fixed through FGD triangulation, key informant cross-checking, and guided field walks.

2.4.1. Semi-structured interviews

Semi-structured interviews in the local Amharic language were conducted to obtain detailed ethnoveterinary information. Participants provided detailed information on medicinal plants, such as their local name, ailments treated, habitats, seasonal availability, and key documented parameters, including plant components utilized, processing techniques, and delivery routes for each remedy (Cotton, 1996).

2.4.2. Focus Group Discussion

Information from individual respondents was cross-validated through focus group discussions (FGDs) aimed at probing

community-wide ethnoveterinary practices. Following Martin (1995), discussions focused on identifying key livestock disorders, assessing medicinal plant conservation levels, and identifying local threats to botanical resources. A total of nine FGDs, one in each study kebele, were held, with 7–9 participants per group (72 participants in total). Participants were purposively selected to represent different age, sex, and socioeconomic groups, including traditional animal-health practitioners, elders, kebele administrators, and officials from natural resource management and agricultural offices. The FGDs were moderated by the researcher using a semi-structured discussion guide, while appropriate points were recorded for subsequent qualitative analysis and comparison with the interview data.

2.4.3. Field observations

Field observations were done through repeated field visits and guided walks with informants, local guides, traditional healers, and livestock and veterinary staff from the Tarmaber District Agriculture Office, who assisted in documenting local medicinal plant species, detailing their growth habitats, vernacular names, and associated ethnoveterinary practices. Voucher specimens for all 63 identified ethnoveterinary plants were collected, coded, and taxonomically verified during field sampling before being deposited at the Addis Ababa University Herbarium.

2.5. Voucher specimen identification

Voucher specimens were collected, pressed, dried, deep-frozen, and identified following standard methods (Randrianarivony et al., 2017). Identification was based on authenticated herbarium specimens and Flora of Ethiopia and Eritrea, with verification by experts at Addis Ababa University's National Herbarium. Details like families, species, vernacular names, along with their respective collection dates and sampling sites, were documented and archived at the National Herbarium (ETH), AAU.

2.6. Data analysis

Data analysis incorporated mixed quantitative and qualitative methodologies (Cotton, 1996; Martin, 1995). Quantitative datasets managed in MS Excel (v.2013) underwent descriptive statistical profiling (frequencies and percentages) to determine growth habits, taxonomic representation, plant parts used, preparation methods, and administration pathways. Informant Consensus Factor (ICF) and Preference Ranking were calculated to evaluate consensus and priority species. Qualitatively, observations, interviews, and group discussions were organized into thematic text summaries detailing traditional conservation practices and ecological knowledge, with outcomes displayed via summary tables, Venn diagrams, and figures.

2.6.1. Number of use reports (URs)

To determine the utilization frequency and relative cultural value of individual plant species, total use reports (URs) were tabulated as outlined by Tardío and Pardo-de-Santayana (2008). Each mention of a plant species used to treat a specific veterinary ailment was recorded as one Use Report (UR). Aggregating these citations generated total UR scores per species, enabling systematic prioritization of the most prominent ethnoveterinary plants in the district.

2.6.2. Preference ranking

The preference-ranking method was used to assess the relative importance of factors threatening medicinal plant diversity (Martin, 1995). For both exercises, the same 15 key informants were chosen for their wide local knowledge of medicinal plants and environmental conditions.

To determine the most favoured medicinal species for treating the primary livestock

disease in the district, key informants separately evaluated candidate plants by scoring the most effective species with the highest rank and the least preferred with a value of one (1). Similarly, to assess conservation pressures, the 15 key informants evaluated six major threatening factors on a numerical scale from 1 (least destructive) to 5 (most destructive). The values assigned by all informants were summed for each species, and the species were then ranked from highest to lowest to determine the overall community priority for both medicinal species and threat factors.

2.6.3. Informant consensus factor (ICF)

Informant Consensus Factor (ICF) was calculated to measure the degree of homogeneity among participants regarding the botanical remedies used for specific, widely reported disease categories in the district. The concept was originally known by Trotter and Logan (1986), and the current form of the index was proposed by TDARDO (2019).

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

where Nur denotes the total number of use reports recorded for a specific usage category, while Nt represents the total number of distinct plant species cited for that same category across all respondents. The resulting coefficient ranges from 0 to 1, with values approaching 1 reflecting complete consensus among informants. Medicinal traditions are viewed as well-defined when there is a high degree of consensus among healers (TDARDO, 2019). A high consensus designates that a few specific plant species are widely used by the majority of the informants for treating particular ailments, while low consensus reflects disagreement among informants on which plants to use for a given disease category.

Livestock disease classification was based on local respondents' reports and indigenous knowledge and consequently interpreted in the consideration of established veterinary literature to ensure consistency with recognized disease categories.

2.6.4. Venn diagram analysis of ethnoveterinary plants across districts

To compare species distribution, the dataset for Tarmaber was taken from the current field survey, while the source datasets for Ankober and Mojana-Wedera were compiled from previously published literature (Lulekal et al., 2014) and (Abebe, 2022), respectively. The comparison was based on the presence or absence of plant species utilized for treating livestock ailments in each district (Chen & Boutros, 2011). To avoid duplicate counting due to local naming variations and synonymous species, all taxonomic names were harmonized and standardized according to Plants of the World Online (POWO) prior to creating the Venn diagram.

2.7. Ethical consideration

Approval of the study protocol was secured from the Department of Plant Biology and Biodiversity Management, Addis Ababa University, under reference code DPBBM/CNS/029/14/2021. Prior to individual engagements, participants received full disclosure regarding the project's scope and procedures and subsequently gave their informed consent. Engagement in the research was completely discretionary, with participants reserving full autonomy to withdraw at any stage. Ethical and administrative approval to conduct the investigation was provided by the Tarmaber District local administration. All ethnoveterinary knowledge was documented with respect for local traditions and knowledge holders, and confidentiality was strictly maintained. Data were anonymized to protect personal identities.

3. Results

3.1. Types of livestock ailments in the study area

Informants reported 26 livestock ailments and health conditions, for which 63 ethnoveterinary plant species were used for treatment (Appendix 1). The most frequently reported ailments were anthrax, treated with 22 plant species (35%), followed by blackleg (20 species, 32%). Other commonly treated conditions included abdominal pain (11 species, 17.5%), bloating (10 species, 16%), abscess (9 species, 14.3%), febrile illnesses (8 species, 13%), and diarrhea (7 species, 11.1%).

3.2. Taxonomic diversity of medicinal plants

A total of 63 ethnoveterinary taxa belonging to 41 families and 60 genera were identified and documented across the study area (Appendix 1). Taxonomic representation revealed that 33 families contained only one species each, while eight families consisted of multiple species. Asteraceae showed the highest family representation (9 species, 14.3%), followed by Solanaceae (7 species, 11.1%) and Euphorbiaceae (3 species, 4.8%). Anacardiaceae, Cucurbitaceae, Lamiaceae, Malvaceae, Tiliaceae, and Vitaceae were each represented with two species (3.2%). Consequently, multi-species families comprised 19.5% of the identified botanical families. Analysis of plant provenance indicated that 46 species (73%) were sourced exclusively from the wild, 15 species (23.8%) were homegarden cultivated, and two species (3.2%) were harvested across both wild and cultivated settings (Fig. 2).



Figure 2: *Various habitats of medicinal plants in the study area*

3.3. Plant habit, parts, preparation methods and routes of administration

In terms of life-form distribution, herbaceous plants constituted the largest proportion (27 species, 42.9%), whereas shrubs, trees, and climbers comprised 39.7% (25 species), 9.5% (6 species), and 7.9% (5 species) of the documented medicinal flora, respectively. Informants reported diverse plant parts, used individually or in combination, in a total of 142 preparation entries. Leaves constituted the principal plant part harvested across the documented medicinal taxa (54 entries, 38.0%), followed by roots (36 entries, 25.4%) and seeds (17 entries, 12.0%). Other plant parts included fruits (7 entries, 4.9%), twigs (5 entries, 3.5%), latex (3 entries, 2.1%), whole plants (3 entries, 2.1%), bulbs (3 entries, 2.1%), and bark (2 entries, 1.4%). Multiple plant parts were reported in 12 entries (8.5%), including combinations of leaves and roots, leaves and bark, leaves and stems, leaves and fruits, and roots and twigs.

Fresh plant material was used in 74% of all remedy preparations, followed by dried materials

(19%) and dual fresh/dried combinations (7%). Pounding was the primary preparation method (62.7%, n = 89), followed by grinding (15.5%, n = 22) and squeezing (9.9%, n = 14). Less frequent methods included boiling (4.9%, n = 7), burning (2.1%, n = 3), chewing (2.1%, n = 3), and crushing (1.4%, n = 2), with raw feeding or holding accounting for the remainder (1.4%, n = 2). Most remedies (84%) were prepared from a single plant species, whereas 16% involved the combination of two or more species. Water was the primary solvent in 63% of the preparations, where plant materials were pounded and mixed to facilitate extraction. Quantification of remedies was not standardized; instead, traditional units such as JOG, TASA, KUBAYA, and MELEKIYA were commonly used.

Ethnoveterinary preparations in the study area were administered through multiple routes depending on the target livestock disease. The primary mode of administration was oral (mainly involving drenching, feeding, or chewing), followed by dermal routes, whereas nasal and ocular applications accounted for the lowest usage frequencies. Among the specific methods of administration, drenching was the most commonly reported way (65%), followed by smearing (15%) and dropping (7%).

3.4. Use reports of Ethnoveterinary medicinal plants

Based on the number of use reports, *Withania somnifera* accounted for the highest number of use reports (37), followed by *Cucumis ficifolius* (35), *Verbascum sinaiticum* (33), *Croton macrostachyus* (28), *Gymnanthemum amygdalinum* (24), *Lepidium sativum* (23), *Ruta chalepensis* (21), *Justicia schimperiana* (20), *Rumex nepalensis* (17), *Achyranthes aspera* (15) and *Aloe pulcherrima* (15) (Table 2). These species denoted the most commonly reported ethnoveterinary medicinal plants utilized by local communities for the treatment of livestock ailments.

Table 2: *Ethnoveterinary medicinal plants with highest use reports in Tarmaber District*

No.	Ethnoveterinary medicinal plants	Use report
1	*Withania somnifera* (L.) Dunal	37
2	*Cucumis ficifolius* A. Rich.	35
3	*Verbascum sinaiticum* Benth.	33
4	*Croton macrostachyus* Hochst. ex Delile	28
5	*Gymnanthemum amygdalinum* (Delile)	24
6	*Lepidium sativum* L.	23
7	*Ruta chalepensis* L.	21
8	*Justicia schimperiana* (Hochst. ex Nees) T. Anderson	20
9	*Rumex nepalensis* Spreng.	17
10	*Achyranthes aspera* L.	15
11	*Aloe pulcherrima* Gilbert & Sebsebe	15
12	*Cymbopogon martini* (Roxb.) Wats.	14

UR (Use Report) = the number of informants who independently reported the use of a particular plant species for treating a particular livestock ailment.

3.5. Informant Consensus Factor (ICF)

In total, 26 reported livestock ailments were grouped across eight major therapeutic categories (Table 3). Gastrointestinal conditions exhibited the highest species utilization and citation frequency, drawing on 36 medicinal plant species (30.77%) and 196 use reports (37.62%), with a high degree of participant agreement reflected by an ICF value of 0.82. Musculoskeletal disorders involved fewer species (20 species, 17.09%) but showed the

highest ICF (0.86) and 136 use citations (26.10%). Other ailment categories included dermatologic conditions (24 species, 20.51%; 84 citations, 16.12%; ICF 0.72), ophthalmological disorders (5 species, 4.27%; 21 citations, 4.03%; ICF 0.80), ecto- and endoparasitic disorders (9 species, 7.69%; 17 citations, 3.26%; ICF 0.50), reproductive disorders (5 species, 4.27%; 12 citations, 2.30%; ICF 0.64), general malaise (12 species, 10.26%; 35 citations, 6.72%; ICF 0.68), and other miscellaneous ailments (6 species, 5.13%; 20 citations, 3.84%; ICF 0.74). Informant Consensus Factor (ICF) values quantify agreement among informants regarding plants used within ailment groups, but they do not serve as proof of clinical efficacy or biological activity.

Table 3: *ICF values of traditional medicinal plants for treating livestock ailments in Tarmaber District*

Disease category (DC)	Species	% of all species	Use citation	% of all use citations	ICF
Dermatologic	24	20.51%	84	16.12%	0.72
Gastrointestinal ailments	36	30.77%	196	37.62%	**0.82**
General malaise	12	10.26%	35	6.72%	0.68
Ophthalmological	5	4.27%	21	4.03%	**0.80**
Ecto- and endoparasitic disorders	9	7.69%	17	3.26%	0.50
Musculoskeletal disorders	20	17.09%	136	26.10%	**0.86**
Reproductive	5	4.27%	12	2.30%	0.64
Others	6	5.13%	20	3.84%	0.74
Total	117	100%	521	100%	-

Note: The species total across categories (117) exceeds the actual species count (63) because several plant species are multipurpose and treat ailments in multiple categories

3.6. Preference ranking

Preference ranking by 15 key informants evaluated the relative effectiveness of ten plant species used to treat blackleg (Table 4). *Withania somnifera* received the highest score (56) and was ranked first, followed by *J. schimperiana* (52), *C. ficifolius* (48) and *G. amygdalinum* (41). The remaining species showed progressively lower preference scores, reflecting differences in perceived therapeutic effectiveness among informants.

Table 4: *Preference ranking values of ten medicinal plants used to treat blackleg in Tarmaber District*

Name of medicinal plants	Key informants (A-O)															Total	Rank
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O		
Withania somnifera	4	5	5	3	4	4	3	2	4	4	3	4	3	3	5	56	1st
Justicia schimperiana	5	2	2	4	4	5	3	3	4	4	3	4	4	4	1	52	2nd
Cucumis ficifolius	4	3	5	3	2	5	4	2	3	3	4	2	2	3	3	48	3rd
Gymnanthemum amygdalinum	3	4	2	2	4	3	1	3	2	4	3	4	1	3	2	41	4th
Cymbopogon martini	2	3	4	5	4	2	1	2	2	1	3	3	2	4	2	40	5th
Lepidium sativum	2	2	4	4	3	3	3	2	2	4	2	2	1	1	2	37	6th
Verbascum sinaiticum	5	3	3	2	2	3	2	3	2	3	1	3	1	2	1	36	7th
Rumex nepalensis	3	2	4	2	2	2	3	3	2	2	1	1	2	2	1	32	8th
Ruta chalepensis	3	4	2	2	2	1	2	2	2	3	1	3	2	1	1	31	9th
Achyranthes aspera	2	2	2	2	2	3	2	2	3	2	1	2	1	1	1	28	10th

3.7. Medicinal plant knowledge across districts of North Shewa Zone, Ethiopia

Comparative analysis of the livestock medicinal plants across the three districts yielded a total of 111 distinct species (Figure 3). Tarmaber District recorded the highest overall number of species (n=63), followed by Ankober (50 species; Lulekal et al., 2014), and Mojana-Wedera (33 species; Abebe, 2022). Only 7 medicinal plant species were commonly shared across all three districts. When comparing pairs of districts, Tarmaber shared 14 species exclusively with Mojana-Wedera and 6 species exclusively with Ankober, while Ankober and Mojana-Wedera shared only 1 species exclusively. Tarmaber and Ankober exhibited equal numbers of unique, unshared species (36 species each), whereas Mojana-Wedera contained 11 unique species.

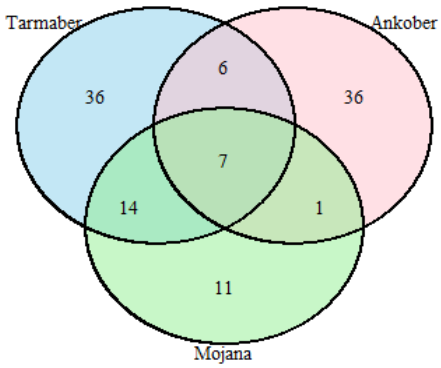


Figure 3: *Venn diagram of medicinal plants among the studied adjacent districts in North Shewa Zone, Ethiopia*

3.8. Less-reported ethnoveterinary practices and implications for pharmacological research

Although most plant - disease treatments recorded in the present study are in line with previous Ethiopian ethnoveterinary reports, several uses appear to be less repeatedly documented in the available literature. In particular, the use of Pentas schimperiana, Acmella caulirhiza, and Xanthium spinosum for livestock eye problem, Plumbago zeylanica and Aloe pulcherrima for snakebite, and Foeniculum vulgare for urinary retention has received limited attention in previous studies, which have mainly

emphasized remedies for digestive problems, wounds, blackleg, and anthrax. Similarly, while the application of J. schimperiana, A. aspera, and C. martini for blackleg is well established, the application of G. amygdalinum and V. sinaiticum for the same ailment appears to be less reported. These findings should therefore be interpreted as reflecting localized or less-recognized ethnoveterinary knowledge rather than exclusively novel discoveries, underlining the need for further pharmacological and experimental validation.

3.9. Seasonality of livestock ailments

Informants reported that such livestock ailments occurred throughout the year; however, the highest incidence of disease occurrence was observed between September and November. This period was regularly recognized by respondents as the peak period for livestock health issues.

3.10. Threats to ethnoveterinary medicinal plants and conservation status

Focus group discussions identified agricultural expansion as the main threat to ethnoveterinary medicinal plants in the study area, followed by cutting for firewood, charcoal production, construction, and overgrazing (Table 5). The spread of invasive alien plant species was also identified as contributing to habitat deprivation and the minimized availability of medicinal plant species. Among the recognized species, Echinops kebericho was identified by local informants as the most vulnerable due to unsustainable root harvesting and ongoing habitat loss. Informants also noted that a few frequently used medicinal species are forced into repeated harvesting, increasing the risk of resource depletion. Limited cultivation practices and the absence of effective local conservation measures were further known as factors threatening the long-term availability of ethnoveterinary medicinal plants. Inadequate in situ and ex situ conservation, minimal cultivation efforts, and a lack of organized community management jointly heighten the ecological vulnerability of these vital ethnoveterinary resources.

Table 5: *Informant preference ranking of perceived threats to medicinal plant diversity (n = 15)*

Threats	Informants labeled A to O															Total	Rank
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O		
Agricultural expansion	5	4	5	3	5	3	5	4	3	3	5	4	3	4	5	61	**1st**
Overgrazing	2	1	3	3	5	1	3	2	4	3	3	5	3	2	3	40	**3rd**
Cuttings	5	1	5	2	4	3	1	2	5	3	3	4	3	3	4	48	**2nd**
Monospecific plantation establishment	2	3	1	1	2	1	2	1	1	1	2	2	1	1	2	23	4th
Invasive species	1	2	3	2	1	1	1	1	1	1	2	2	2	1	1	23	4th
Trampling	1	2	1	2	1	1	1	1	1	1	2	1	2	1	1	19	5th

4. Discussion

The current study demonstrates that Tarmaber district possesses many ethnoveterinary medicinal plant species, thus indicating the existence of vast indigenous knowledge. The primary diseases of domesticated animals reported in this research resemble previous ethnobotanical studies on ethnoveterinary medicine conducted in Ethiopia (Tahir et al., 2021; Wendimu et al., 2024; Yigezu et al., 2014); hence, these diseases appear to be common and culturally significant. The relatively large number of medicinal plants used in the treatment of anthrax and blackleg can be associated with the extensive ethnoveterinary knowledge about these diseases (Giday & Teklehaymanot, 2013), but not necessarily their importance.

Both the species richness and family diversity documented in this study fall within the range reported across Ethiopia and elsewhere. While our species and family counts are comparable to those reported in Dugda District (Oda et al., 2024), they are lower than the diversity reported in southern Ethiopia (Hankiso et al., 2023), yet higher than findings from Ensaro (Asfaw et al., 2022), Ankober (Lulekal et al., 2014), and Wolaita (Wendimu et al., 2024) Districts. Such variation likely reflects differences in local agroecology, floristic composition, and cultural practices, as well as broader biodiversity gradients reported in other countries such as Uganda (Gradé et al., 2009). Overall, these findings confirm the continued reliance on ethnoveterinary medicine as an important component of livestock healthcare.

The dominance of the Asteraceae family, Solanaceae, and Euphorbiaceae agrees with several Ethiopian ethnoveterinary studies (Asfaw et al., 2022; Feyisa et al., 2021; Lulekal et al., 2014; Wendimu et al., 2024; Yigezu et al., 2014), whereas surveys in other agroecological zones found Fabaceae and Lamiaceae as most prominent (Tahir et al., 2021). The high representation of Asteraceae and Solanaceae in Tarmaber District may be associated with their local abundance, broad ecological distribution, and familiarity among livestock owners. Previous studies suggest that their frequent use may also relate to a high concentration of secondary metabolites (Barreto Silva et al., 2025; Bessada et al., 2015). This hypothesis remains plausible rather than proven here, as our study did not empirically analyze the chemical profiles or bioactivity of the documented species.

Our findings confirm trends documented in earlier studies, where herbaceous plants and shrubs constituted the leading growth forms utilized for traditional remedies (Feyisa et al., 2021; Oda et al., 2024; Wendimu et al., 2024). The preference for herbs may be associated with their widespread availability, ease of harvesting, and rapid seasonal growth. However, in contrast to other Ethiopian areas, where shrubs predominate (Asfaw et al., 2022; Lulekal et al., 2014), our results indicate that vegetation structure and agroecological variability play a critical role in shaping plant use patterns.

The predominant reliance on wild habitats for harvesting medicinal plant species (73%) aligns with earlier findings reported across various regions of Ethiopia (Hankiso et al., 2023; Lulekal et al., 2014; Oda et al., 2024). This indicates a prevailing local belief that wild plants have more therapeutic potency (Khunoana et al., 2019). However, heavy reliance on wild harvesting, when exacerbated by ongoing agricultural expansion and overgrazing, places severe pressure on natural vegetation (Tadesse et al., 2024; Tefera et al., 2025). Although leaves constituted the primary plant part employed in remedy preparation, the harvesting of roots poses a much greater conservation risk because uprooting destroys the entire mother plant. This threat is especially serious for slow-growing, heavily targeted species such as Echinops kebericho, underlining the urgent need for

homegarden cultivation and community-based conservation system.

Leaf material represented the most widely utilized anatomical part for remedy preparation, aligning with trends frequently reported in prior ethnobotanical studies across Ethiopia (Feyisa et al., 2021; Oda et al., 2024; Yigezu et al., 2014). Their frequent use may be attributed to their accessibility and availability, as well as the presence of diverse secondary metabolites reported in the leaves of some medicinal plant species. However, the concentration and composition of bioactive compounds fluctuate among species, plant parts, developmental stages, and extraction methods; therefore, the phytochemical basis of leaf preference shall be regarded as plausible rather than empirically demonstrated in this study.

Pounding was identified as the dominant mode of remedy preparation, typically carried out using locally available tools such as a mortar and pestle, which aligns with previous reports in Ethiopia (Oda et al., 2024). Oral administration was the primary route of remedy application, reflecting its practicality and effectiveness in treating internal livestock illness (Wendimu et al., 2024). However, the absence of standardized dosage systems highlights a critical limitation, as reliance on traditional units such as JOG, TASA, and KUBAYA may introduce variability in treatment outcomes. Water was the most commonly used solvent, likely due to its availability, safety, and compatibility with traditional preparation techniques (Hassen et al., 2022).

The informant consensus factor (ICF) values obtained in this study show moderate to high agreement among informants, suggesting a shared body of ethnoveterinary knowledge (Sharma et al., 2012). The relatively high ICF values recorded for gastrointestinal (0.82), musculoskeletal (0.86), and ophthalmological (0.80) reflect a strong community consensus regarding the specific plant species used to treat these livestock ailments. Such high agreement often points to persistent cultural transmission and long-standing reliance on specific remedies. However, high consensus reflects the degree of social agreement rather than empirical proof of therapeutic efficacy, safety, or pharmacological activity.

The relatively low species overlap among Tarmaber, Ankober, and Mojana-Wedera Districts points to local differences in ethnoveterinary practices, while the shared species reflect a common core of district plant knowledge (Yifru et al., 2025). When viewed cautiously, the common plants probably result from geographic proximity, local market exchange, and shared cultural traditions across North Shewa, whereas the differences may arise from microclimatic variation across altitudes, local disease pressures, and the tendency of healers to keep remedies within family lines (Kohsaka & Rogel, 2019).

Commonly mentioned species like *G. amygdalinum, A. sativum, and C. ficifolius* are also commonly used in other areas of Ethiopia (Abebe, 2022; Feyisa et al., 2021). Previous pharmacological studies have found that these plants contain antimicrobial and anti-inflammatory phytochemicals, which will assist in explaining the reasons behind their common use (Gul et al., 2025; Maroyi, 2017; Saleem et al., 2020). Nevertheless, traditional mention does not equate to being clinically proven to be effective in animals, and therefore these species need to be considered as priority samples for phytochemical investigation.

Seasonality was identified as an essential factor influencing livestock health in Tarmaber District, with most disease occurrences reported between September and November. This finding suggests that climatic and environmental conditions may

affect the occurrence and transmission of livestock ailments by affecting pathogen survival, vector numbers, and feed availability (Birhanu & Destaw, 2026). Similar seasonal patterns have been reported in other agro-pastoral areas of Ethiopia, where climate variability significantly affects livestock health and productivity (Birhanu & Destaw, 2026; Oda et al., 2024). Moreover, climate change has been known as a major challenge to livestock production because changes in rainfall patterns and temperature increase the incidence and severity of livestock ailments and decrease fodder availability (Gizaw et al., 2020; Rojas-Downing et al., 2017). Thus, the observed seasonal increase in disease occurrence between September and November indicates the continued importance of ethnoveterinary medicinal plants as an alternative healthcare for livestock during periods of high disease occurrence.

Conclusions and Recommendations

This study revealed considerable ethnoveterinary knowledge in Tarmaber District, evidenced by 63 medicinal plant species used to manage 26 distinct livestock ailments. Infectious ailments, particularly anthrax and blackleg, were among the most frequently managed ailments, exhibiting a marked seasonal peak during the transition period from September to November. The study also documented considerable reliance on wild-harvested medicinal plants, rendering these valued botanical resources exposed to agricultural expansion, deforestation, habitat degradation, and overgrazing. For the sustainable maintenance of plant materials and related ethno-knowledge, the measures suggested include the following: 1) The emphasis should be laid on systematic recording and digital archiving of indigenous ethnoveterinary knowledge so that it does not get lost because of demographic changes; 2) Community-based conservation, homegarden planting, and sustainable collection practices; and 3) Pharmacological, toxicological, and phytochemical evaluation of highly consensual plant taxa to test their biological activity and medicinal safety.

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Competing interests

The authors declare no conflicts of interest regarding the publication of this manuscript.

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Appendix 1: List of medicinal plants employed for treating livestock ailments in Tarmaber District, Amhara Region, Ethiopia

Appendix 1: List of medicinal plants employed for treating livestock ailments in Tarmaber District, Amhara Region, Ethiopia

Family name	Scientific names	Local name (Amharic)	H	AT	PPU	CPU	MPA	RA	UC	V. No
Acanthaceae	*Justicia schimperiana* (Hochst. ex Nees) T. Anderson	Sensel	S	Anthrax	Tw	F	Pounding, mixing with water and drenching	Oral (drenching)	3	YT046
				Blackleg	Tw	F	Pounding, mixing with water and drenching	Oral (drenching)	15	
				Diarrhea	L	F	Pounding, mixing with water, and drenching	Oral (drenching)	2	
				Bloating	L	F	Pounding, mixing with water and drenching	Oral (drenching)	3	
Alliaceae	*Allium sativum* L.	Nech Shinkurt	H	Blackleg	Bu	F	Pounding (with water)	Oral (drenching)	6	YT079
				Abscess	Bu	F	Pounding	Dermal (smearing)	5	
Amaranthaceae	*Achyranthes aspera* L.	Telenj	H	Anthrax	Bu	F	Pounding (with water)	Oral (drenching)	9	YT077
				Anthrax	L	F	Pounding (with water)	Oral (drenching)	12	
				Bloating	L	F	Pounding (with water)	Oral (drenching)	3	
				Abdominal problem	R	F	Pounding (with water)	Oral (drenching)	4	
Anacardiaceae	*Searsia pyroides* var. *pyroides*	Kimo	T	Febrile	R	F	Pounding	Dermal (smearing)	1	YT010

	Searsia quartiniana	Chakima		Abscess	L	F	Pounding	Dermal (smearing)	1	YT0159
Apiaceae	*Foeniculum vulgare* Mill.	Ensilal	H	Bloating	L	D	Grinding (with water)	Oral (drenching)	3	YT0114
				Urinary retention	L/St	F	Pounding (with water)	Oral (drenching)	5	
Apocynaceae	*Carissa spinarum* L.	Agam	S	Wound	R	F	Pounding (with water)	Oral (drenching)	1	YT014
				Diarrhea	R	F	Pounding (with water)	Oral (drenching)	2	YT0142
Asclepiadaceae	*Periploca linearifolia* Quart.-Dill. & A. Rich.	Moider	Cl	Blackleg	R	F	Pounding (small water)	Na/Au (dropping)	2	
				Abdominal problem	R	F	Pounding (with water)	Oral (drenching)	2	
				Chicken disease	R	F	Grinding	Oral (feeding)	2	
Asparagaceae	*Asparagus africanus* Lam.	Serite	S	Abscess	L	F	Pounding	Dermal (smearing)	2	YT06
				Blackleg	R/Tw	F	Pounding (with water)	Oral (drenching)	2	
Asphodelaceae	*Aloe pulcherrima* Gilbert & Sebsebe	Sete-ret	S	Snake bite	Lat	F	Squeezing	Oral (dropping)	5	YT013
				Abdominal problem	R	F	Pounding (with water)	Oral (drenching)	2	
				Lice infestation	Lat	F	Squeezing	Dermal (smearing)	3	
				Febrile illness	Lat	F	Squeezing	Oral (dropping)	1	
				Brucellosis	R	F	Pounding (with water)	Oral (drenching)	2	

Asteraceae	*Acmella caulirhiza* Del.	Yemider berbere	H	Diarrhoea	R	F	Pounding (with water)	Oral (drenching)	3	
				Eye disease	Fr	D	Squeezing	Dermal (smearing)	5	YT078
				Abscess	Fr	F	Pounding (with water)	Oral (drenching)	2	
	Echinops kebericho	Kebericho	H	Evil eye	R	D	Burning	Dermal (fumigating)	4	YT0110
				Foot and mouth disease	R	D	Burning	Dermal (fumigating)	1	
				Equine disease	R	D	Burning	Dermal (fumigating)	2	
	Guizotia abyssinica (L.f.) Cass.	Nug	H	Anthrax	Se	D	Grinding (with water)	Oral (drenching)	2	YT0117
				Febrile illness	Se	D	Grinding (with water)	Oral (drenching)	3	
	Gymnanthemum amygdalinum (Delile)	Girawa	S	Febrile illness	LR	F	Pounding (with water)	Oral (drenching)	6	YT020
				Diarrhoea	L	F	Pounding (with water)	Oral (drenching)	3	
				Bloating	L	D	Grinding (with water)	Oral (drenching)	4	
				Blackleg	LR	F	Pounding (with water)	Oral (drenching)	14	
				Febrile illness	L	F	Pounding (with water)	Oral (drenching)	2	
	Helianthus annuus L.	Suf	H	Anthrax	Se	D	Grinding (with water)	Oral (drenching)	1	YT0120
				Febrile illness	Se	D	Grinding (with water)	Oral (drenching)	3	
	Parthenium hysterophorus L	Kinche kitel	H	Chicken disease	L	F	Squeezing	Oral (feeding)	1	YT0141

	Solanecio gigas (Vatke) C. Jeffrey	Shikoko gomen	S	Diarrhea	L/St	F	Squeezing	Oral (drenching)	5	YT059
				Blackleg	L	F	Pounding (with water)	Oral (drenching)	3	
	Xanthium spinosum L.	Yeset milas	H	Eye disease	L	D	Grinding	Optical (smearing)	3	YT0171
	Artemisia absinthium L.	Nech-Arity	H	Anthrax	L	F	Pounding (with water)	Oral (drenching)	2	
Brassicaceae	*Lepidium sativum* L.	Feto	H	Abscess	Se	D	Grinding	Dermal (smearing)	6	YT0125
				Anthrax	Se	D	Grinding (with water)	Oral (drenching)	7	
				Blackleg	Se	D	Grinding (with water)	Oral (drenching)	4	
				Lumpy Skin Disease	Se	D	Pounding	Dermal (smearing)	3	
Caricaceae	*Carica papaya* L.	Papaye	T	Chicken disease	L	F	Squeezing	Oral (feeding)	3	YT090
Cucurbitaceae	*Cucumis ficifolius* A. Rich.	Yemider embay	H	Blackleg	R	F	Chewing	Dermal (spitting)	6	YT0101
				Blackleg	R	F	Pounding (with water)	Oral (drenching)	6	
				Abdominal problem	R	F	Pounding (with water)	Oral (drenching)	18	
				Anthrax	Fr	F	Pounding (with water)	Oral (drenching)	1	
				Anthrax	R	F	Pounding (with water)	Oral (drenching)	2	
				Wound	Se	D	Grinding	Dermal (smearing)	2	
	Momordica foetida Schumach.	Yamora misa	Cl	Blackleg	W	F	Pounding (with water)	Oral (drenching)	2	YT0131

				Wound	L	F	Pounding	Dermal (smearing)	4	
Ebenaceae	*Euclea divinorum* Hiern.	Dedeho	S	Abdominal problem	R	D/F	Pounding (with water)	Oral (drenching)	1	YT029
				Eye disease	L	D	Grinding	Optical (dropping)	3	
Euphorbiaceae	*Croton macrostachyus* Hochst. ex Delile	Bisana	T	Blackleg	Ba	D/F	Pounding (with water)	Oral (drenching)	6	YT08
				Foot and Mouth Diseases	L	F	Boiling	Dermal (washing)	5	
				Foot and mouth diseases	L/Ba	F	Pounding	Dermal (smearing)	8	
				Anthrax	Tw	F	Pounding (with water)	Oral (drenching)	2	
				Tick infestation	L	F	Boiling	Dermal (washing)	1	
				Febrile illness	L	F	Pounding (with water)	Oral (drenching)	1	
	Ricinus communis L.	Gulo	S	Rectal prolapse	L	F	Holding the rectal prolapse	Dermal (hold)	2	YT051
	Rubus volkensii Engl	Enjori	S	Eye disease	L	D	Burning	Optical (smearing)	3	YT053
	Tragia doryodes M Gilber	Alebilabit	Cl	Abscess	L	F	Pounding (with water)	Oral (drenching)	4	YT0167
				Anthrax	R	F	Pounding (with water)	Oral (drenching)	2	
Fabaceae	*Calpurnia aurea* (Ait.) Benth.	Digita	S	Diarrhoea	L	F	Pounding (with water)	Oral (drenching)	3	YT030

Lamiaceae	*Ocimum gratissimum* (L.) *subsp.gratissimum*	Ena	H	Leech infestation	L	D/F	Pounding (with water)	Oral (drenching)	1	YT0137
	Salvia nilotica Juss. ex Jacq.	Hul-geb	H	Anthrax	L	F	Pounding (with water)	Oral (drenching)	2	YT0156
Loganiaceae	*Buddleja polystachya* Fresen.	Anfar	T	Retained placenta	L	F	Raw feeding	Oral (feeding)	3	YT018
Malvaceae	*Malva verticillata* L.	Lit/Lut	H	Leech infestation	L	F	Pounding (with water)	Oral (drenching)	1	YT0128
	Myrica salicifolia A.Rich.	Shinet	T	Abdominal pain	L	F	Grinding (with water)	Oral (drenching)	2	YT015
				Diarrhea	L	D/F	Grinding (with water)	Oral (drenching)	2	
				Anthrax	Ba	D	Grinding (with water)	Oral (drenching)	1	
Myrtaceae	*Eucalyptus globulus* Labill.	Nech Bar zaf	T	Anthrax	L	F	Boiling	Dermal (steam)	2	YT037
Oleaceae	*Jasminum abyssinicum* Hochets. Ex DC.	Tembelel	Cl	Anthrax	L	F	Squeezing	Dermal (smearing)	2	YT011
				Abscess	L	F	Pounding	Dermal (smearing)	1	
Papaveraceae	*Argemone ochroleuca* Sweet	Nechelo	S	Wound	L	F	Crushing	Dermal (pasting)	1	YT067
Pedaliaceae	*Sesamum orientale* L.	Selit	H	Febrile illness	Se	D	Grinding (with water)	Oral (drenching)	3	YT0161
				Bloating	Se	D	Grinding (with water)	Oral (drenching)	3	
				Anthrax	Se	D	Grinding (with water)	Oral (drenching)	1	
Penaeaceae	*Olinia rochetiana* A.Juss.	Tife	S	Abdominal pain	L	D/F	Grinding (with water)	Oral (drenching)	1	YT033
Phytolaccaceae	*Phytolacca dodecandra* L'Hér.	Endode	S	Rabies	Se	F	Pounding (with water)	Oral (drenching)	1	YT028

Plumbaginaceae	*Plumbago zeylanica* L.	Amera	H	Abdominal pain	L	F	Pounding (with water)	Oral (drenching)	4	YT0146
				Snake bite	R	D/F	Pounding (with water)	Oral (drenching)	7	
Poaceae	*Cymbopogon martini* (Roxb.) Wats.	Tej-sar	H	Anthrax	L	F	Pounding (with water)	Oral (drenching)	2	YT0103
				Blackleg	L	F	Pounding	Nasal (dropping)	9	
				Leech infestation	L	F	Pounding (with water)	Oral (drenching)	1	
				Bloating	L	F	Pounding (with water)	Oral (drenching)	2	
Polygalaceae	*Polygala steudneri* Chodat	Etse-libona	H	Blackleg	W	D/F	Pounding (with water)	Oral (drenching)	3	YT0147
Polygonaceae	*Rumex nepalensis* Spreng.	Tult	H	Bloating	R	F	Pounding (with water)	Oral (drenching)	4	YT0153
Ranunculaceae	*Thalictrum rhynchocarpum* Quart.-Dill. & A.Rich.	Sire-Bizu	H	Blackleg	R	F	Pounding (with water)	Oral (drenching)	3	YT0165
Rhamnaceae	*Rhamnus prinoides* L'Herit.	Gesho	S	Blackleg	Tw	F	Pounding (with water)	Oral (drenching)	1	YT049
				Rabies	L	F	Pounding (with water)	Oral (drenching)	1	
Rosaceae	*Rubus volkensii* Engl	Enjori	S	Blackleg	R	F	Pounding (with water)	Oral (drenching)	8	YT0153
				Anthrax	R	F	Pounding (with water)	Oral (drenching)	4	
Rubiaceae	*Pentas schimperiana* (A. Rich.) Vatke	Wenagift	S	Eye disease	L	F	Squeezing	Optical (dropping)	8	YT074
Rutaceae	*Ruta chalepensis* L.	Tenadam	H	Anthrax	L/Fr	F	Pounding (with water)	Oral (drenching)	5	YT0154
				Blackleg	L/Fr	F	Pounding (with water)	Oral (drenching)	12	

				Bloating	L/Fr	F	Pounding (with water)	Oral (drenching)	4	
Santalaceae	*Osyris quadripartita* Salzm. ex Decne.	Keret	S	Abscess	Tw	F	Chewing	Dermal (spitting)	7	YT03
Scrophulariaceae	*Verbascum sinaiticum* Benth.	Ketetina	S	Abdominal problem	R	F	Pounding (with water)	Oral (drenching)	16	YT068
				Blackleg	R	F	Pounding (with water)	Oral (drenching)	6	
				Anthrax	L	F	Pounding (with water)	Oral (drenching)	4	
				Brucellosis	L/R	D	Crushing	Dermal (hold on the neck)	1	
				Diarrhoea	L	F	Pounding (with water)	Oral (drenching)	2	
				Fattening	L	D	Grinding (with water)	Oral (drenching)	2	
				Equine disease	R	F	Pounding (with water)	Oral (drenching)	1	
Solanaceae	*Capsicum annuum* L.	Kariya	H	Anthrax	Fr	F	Pounding (with water)	Oral (drenching)	2	YT089
				Abdominal problem	Fr	F	Pounding (with water)	Oral (drenching)	3	
	Discopodium penninervium Hochst.	Ameraro	S	Wound	L	F	Pounding	Dermal (smearing)	1	YT069
				Abdominal problem	L	F	Pounding (with water)	Oral (drenching)	7	
				Blackleg	L	F	Pounding (with water)	Oral (drenching)	4	
				Bloating	L	F	Pounding (with water)	Oral (drenching)	3	

Lycopersicon esculentum Mill.	Timatim	H	Wound	L	F	Pounding (with water)	Oral (drenching)	1	YT0127
Nicotiana tabacum L.	Timbaho	S	Leech infestation	Fr	D/F	Pounding (with water)	Oral (drenching)	2	YT0134
			Leech infestation	L	D/F	Pounding	Nasal (dropping)	2	
Solanum incanum L.	Embay	S	Tick infestation	Se	F	Squeezing	Dermal (smearing)	3	YT075
			Equine disease	Fr	F	Squeezing	Oral (dropping)	1	
Solanum marginatum L.f.	Geber Embay	S	Foot and mouth diseases	Se	F	Pounding	Dermal (smearing)	5	YT07
			Tail amputation	Fr	F	Squeezing	Dermal (smearing)	2	
			Lumpy Skin Disease	Se	D	Burning	Dermal (smearing)	3	
Withania somnifera (L.) Dunal	Gizawa	S	Blackleg	Se	F	Pounding (with water)	Oral (drenching)	2	YT060
			Blackleg	R	F	Pounding (with water)	Oral (drenching)	22	
			Equine disease	R	D	Burning	Dermal (fumigating)	1	
			Anthrax	R	F	Pounding (with water)	Oral (drenching)	8	
			Foot and mouth diseases	R	D	Burning	Dermal (fumigating)	3	
			Febrile illness	R	F	Pounding (with water)	Oral (drenching)	3	

										YT064
Tiliaceae	*Scepocarpus hypselodendron* (Hochst. Ex A.Rich.) T.Wells & A.K.Monro.	Lankuso	S	Leech infestation	L/St	F	Squeezing	Nasal (dropping)	4	
				Diarrhea	L/St	F	Squeezing	Nasal (dropping)	4	
	Grewia ferruginea Hochst. ex A. Rich.	Lenkuata	S	Wound	L	D/F	Grinding	Dermal (smearing)	1	YT0116
Urticaceae	*Urtica urens* L.	Sama	H	Bleeding	L	F	Crushing	Dermal (hold)	3	YT0169
Verbenaceae	*Verbena officinalis* L.	Atuch	H	Anthrax	R	F	Pounding (with water)	Oral (drenching)	3	YT0170
Vitaceae	*Cyphostemma adenocaule*	Milas golgul	Cl	Bloating	R	F	Pounding (with water)	Oral (drenching)	3	YT0107
				Abscess	L	F	Pounding (with water)	Oral (drenching)	5	
				Anthrax	R	F	Pounding (with water)	Oral (drenching)	1	
	Cyphostemma junceum (Webb) Descoings ex Wild & Drummond	Etse-zewe	H	Snake bite	W	F	Pounding (with water)	Oral (drenching)	3	YT0108

Keys: Habit, H (Tree, T; Shrub, S; Herb, H; Climber, Cl). Aliment treated, AT. Plant part used, PPU (Leaves, L; Root, R; Fruit, Fr, Seed, Se; Flower, Fl; Latex, Lat; Bark, Ba; Bulb, Bu; Rhizome, Rh; The whole plant part, W; Leaves and Root, LR, TW, Twigs; Leaves and fruit, L/Fr; Leaves and stem, L/St; Leaves and bark, LBa). Conditions of part used, CPU (Dry, D; Fresh, F; Dry and Fresh, DF). Methods of Preparation and Application, MPA; Route of Administration, RA; Use citation, UC.; Voucher number, V. No