

Ethnobotanical Knowledge of Pastoral Community for Treating Livestock Diseases in Shinle Zone, Somali Regional State, Eastern Ethiopia

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Abstract

Background: Modern livestock health care is still at its lowest stage in Ethiopia and most modern veterinary services like drugs and veterinary professionals are not accessible and affordable to the majority of pastoral farmers. As a result, they are heavily relying on their traditional knowledge and practices on locally available materials mainly plants in the management of animal diseases. However, this traditional knowledge has not yet been well documented and analyzed. Therefore, this study was conducted to identify medicinal plants and examine factors that threaten ethno-veterinary.

Methods: This study was conducted in Ethiopian Somaliland regional state, Shinle zone. Survey was conducted to gather information from 180 households on indigenous knowledge using a semi-structured questionnaire and filed guided observations. The data was collected and analyzed using SPSS. The variability of documented knowledge and the homogeneity of the information given by the respondents were estimated by informant consensus factor.

Results: Thirty-one plant species belonging to eighteen families used against fourteen types of livestock health problems. Majority of plant identified fall under Fabaceae (22.5%) and Euphorbiaceae (16.1%) family that are largely shrubs. The most commonly used plant parts were roots (35.5%) followed by leaves (25.8%). Remedy preparation was mainly through chop and soak in concoction of water and salt. Oral, topical and nasal route were the common mode of administration with no standardized dosing and treatment duration. The principal threats of medicinal plants were invasive plants, drought, over grazing, agricultural activity and firewood collection. Indigenous knowledge on ethno-veterinary medicinal plants was accepted orally from healer's forefathers and transmitted similarly.

Conclusion: Awareness should be raised and ethno-veterinary medicine should be integrated in to livestock extension delivery systems for the need to exploit the possibility of discovering more medicinally viable plants. Further studies needed under controlled conditions on the efficacy of such plants.

Keywords: Ethno-veterinary; Livestock; Medicinal plants; Pastoralists; Plant species

Introduction

Medicinal plants traditionally used in the treatment of animal diseases play a crucial role in local health modalities [1]. The use of ethno-veterinary medicine (EVM) may present a cheaper and sustainable alternative to synthetic medicines in the present and future [2]. These herbal preparations, drawing upon centuries of traditional belief and use, are in practice over time by pastoralists and farmers for the treatment of different diseases of livestock [3]. About 65-80% of the world's population in developing countries depends on plants for their primary healthcare due to poverty and lack of access to modern medicine [4]. Likewise 80% of the total population of Ethiopia is depending on traditional medicine to treat different types of human illness and animals [5]. According to the United Nations Food and Agricultural Organization, lack of drugs to treat diseases and infections results in losses of 30-35% in the breeding sector of many developing countries, where poor animal health remains the major constraint to increased production [6].

Modern livestock health care in pastoral community of Ethiopia is still at its lowest stage due to limited veterinary services and supply of drugs. Besides, most modern drugs are expensive and, as a result, not affordable by the majority of Ethiopian farmers and pastoralists. As a result, pastoral and agro-pastoral communities heavily rely on their traditional knowledge and practices on locally available materials mainly plants in the management of animal diseases. However; this traditional

knowledge has not yet been well documented and so far very little of the ethno-veterinary knowledge in Ethiopia is properly documented and analyzed [7]. Moreover, the knowledge of ethno-veterinary transmitted from generation to generation mainly orally; consequently, it remains fragile and threatened, and presents an urgent need for being record and document for prospect utilization. Therefore, this study was conducted to identify medicinal plants and examine factors that threaten ethno-veterinary in the study area.

Materials and Methods

Description of the study area

This study was conducted in Ethiopian Somaliland regional state, Shinle zone. It is located at about 517 Km east of Addis Ababa and 15 Km

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from Dire-Dawa. The area's altitude ranges between 950-1300 meters above sea level. Annual average rainfall and the average temperature of the area are 500-700 mm and 27.5°C, respectively [8]. About 85-95% of Shinile district population depends on livestock and livestock products for their livelihood and the rest, 5-15% are engaged in the crop-livestock production and cross border trade. The pastoralists keep the full range of livestock in total livestock unit (TLU): 90000 sheep, 55000 cattle, 100000 goats and 60000 camels [9].

Study subjects and sampling method

Shinile zone is located in Somali Regional State, which consists six districts such as Afdem, Ayasha, Dembel, Erer, Mieso and Shinile. Among the pastoral area of Shinile zone, Erer, Shinile and Dembel districts were purposively selected on the bases of their livestock production potential and ethno-veterinary knowledge. One hundred eighty households (Sixty from each district) which were traditional healers who practiced providing services related to veterinary medicinal plants for at least a year purposively selected and interviewed [10].

Data collection

Survey conducted to gather information from pastoral communities on traditional usage of plants in livestock health care system using a semi-structured interview, observations and field guided walks with traditional healers to share their indigenous knowledge. Data collected from respondents include local name of medicinal plant, diseases treated, animal species treated, distance from the house to place where plant species gathered, seasonality of plant species, degree of management (wild/cultivated), abundance, parts used, condition of plant part used (fresh/dried), other ingredients or additives, methods of medicine preparation, preservation, dosage prescriptions, routes of remedy administration, noticeable adverse effects of remedies, use of antidote for adverse effects, source and method of indigenous knowledge transfer, existing threats and traditional conservation practices, marketability of medicinal plant species and income earned per animal treated for any disease.

Plant identification

Specimens of plants with leaves and roots, and including floral parts, as it was appropriate for taxonomic identification were collected. The specimens coded by their vernacular names and transported by plastic bag to Haramaya University Botany laboratory where it identified and authenticated.

Statistical analysis

The data collected was analyzed using statistical package for social sciences (SPSS) version 16. The variability of documented knowledge

of ethno-veterinary medicine and the homogeneity of the information given by the respondents were estimated by informant consensus factor (ICF) [11,12].

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

Where: nur=Number of usage-reported by informant, nt=Number of plant species used.

Results and Discussion

Respondents' demographic characteristics

The majority of respondents were males (Table 1) and this marked difference reflects the limited involvement of women in livestock production and herd health in pastoral areas. Similarly, Giday et al. observed that men had more knowledge of plant usage because they are naturally selected during childhood to be trainees of ethno-veterinary practices [13]. In addition, in some regions, labor division makes women responsible for housekeeping only, while men take care of the animals [14]. The age characteristics indicated that most of respondents were elder (Table 1) and the concern expressed by some elder informants that young people were not interested in ethno-veterinary medicine (EVM). The young generation had little knowledge about the traditional medicines while the elder people know much more about the traditional knowledge to treat livestock ailments. This finding is in line with the study of Yirga and Zerabruk who reported that majority of the respondents involved in traditional livestock treatment were old age people [15].

Medicinal plants and its application

Thirty-one plant species were used against 14 types of livestock diseases that have uncomplicated symptoms (Table 2). This study suggested that the highest number of plant species found in Fabaceae family followed by Euphorbiaceae. In agreement to current finding, the dominant use of Cucurbitaceae, Euphorbiaceae, Fabaceae and Solanaceae families have been noticed by Ashagre et al. to be used for treatment of cattle diseases in other part of the country [16]. Such widespread use of these plants by different groups of societies in different countries could be to a certain extent attributed to their efficacy. In other words, the ethno medicinal reports of those species from wider geographical regions and different cultural groups could validate the medicinal properties of these species.

Diarrhea was the one against which a high number of medicinal plants species were prescribed (Table 3). These disease conditions reported in current study comparable to those reported by Gabriel A whose study indicated many similar diseases such as worms

Variables	Shinile		Erer		Dembel		Total	
	N	%	N	%	N	%	N	%
Age								
<40	13	7.2	11	6.1	15	8.3	39	21.7
40-50	29	16.1	27	15	25	13.9	81	45
>55	18	10	22	12.2	20	11.1	60	33.3
Gender								
Male	51	28.3	48	26.7	54	30	153	85
Female	9	5	12	6.7	6	3.3	27	15
Educational status								
Primary school	19	10.5	22	12.2	16	8.9	57	31.7
Illiterate	41	22.8	38	21.1	44	24.4	123	68.3

Table 1: Demographic characteristics of respondents in the study Area (N=180).

Families	Number of species	%
Berberidaceae	1	3.2
Rubiaceae	1	3.2
Meliaceae	2	6.4
Fabaceae	7	22.6
Euphorbiaceae	5	16.1
Liliaceae	1	3.2
Oleaceae	1	3.2
Aloaceae	2	6.4
Myrtaceae	1	3.2
Polygonaceae	1	3.2
Solanaceae	2	9.7
Asteraceae	1	3.2
Lythraceae	1	3.2
Lamiaceae	1	3.2
Balantaceae	1	3.2
Cyperaceae	1	3.2
Zingiberaceae	1	3.2
Rutaceae	1	3.2

Table 2: Plant families identified in the study area.

Types of diseases	Local name	Plant species (N)	%	Informant cited (N)	%	ICF
CCPP/ Cough	Qufac iyo lab wareen	3	9.7	29	24.2	0.93
Diarrhea	Shuban	7	22.6	17	14.2	0.62
Wound healing	Boog	3	9.6	27	45.0	0.93
Ectoparasites (ticks)		1	3.2	37	30.8	1.00
Bloating		2	6.4	22	18.3	0.95
Evil eye	Shaydaan	1	3.2	9	7.5	1.00
Body swell	Jidh barar	3	9.7	15	12.5	0.86
Kidney problems (like Bloody Urine)	Infekshinka kaadi mareenka	2	6.4	19	15.8	0.94
Eye problems	Gaaska caloosha	1	3.2	21	17.5	1.00
Hayna bite		1	3.2	15	12.5	1.00
Skin diseases like lesions/ dermatophilosis	Xanuunka maqaarka	1	3.2	43	35.8	1.00
Snake bite		2	6.4	7	5.8	0.83
Internal parasite/like tape worm		2	6.4	39	32.5	0.97
Rabies (mad dog bite)		2	6.4	43	35.8	0.97

Table 3: Livestock diseases treated by medicinal plants in the study area. N.B: CCPP = Contagious caprine pleuropneumonia.

(external parasites), diarrhea, eye infection, cough, bloat, wounds and ectoparasites [17]. Similarly, Nalule reported diseases or conditions like bloat, trypanosomiasis, skin diseases, CBPP, FMD [18]. Elsewhere, trypanosomiasis, diarrhea, bloat, helminthiasis, snake bites and wounds were the common diseases reported by Adeola et al. [19]. Among the factors which made the people of the study area to rely on indigenous knowledge to treat livestock disease is inaccessibility to veterinary clinics and veterinarian to community living in marginal areas and the conventional drugs are also unaffordable to the less economically endowed people. This finding also supported Abebe et al. [20] who reported that people recognizing the value of indigenous knowledge to solve their animal health problems in an accessible way and economic affordability. The inconsistency and sometimes-complete absence of conventional veterinary services by the government and private sector has led the pastoralists to stick and relay on the traditional treatment systems followed by their ancestors [21].

Sources and growth habit of medicinal plants

Analysis of the growth forms of ethno-veterinary medicinal plants in the study area revealed that shrubs constituted the largest number or

proportion with 12 species whereas herbs and trees account 11 species and 8 species, respectively (Table 6). Dominance of shrubs was also reported by earlier ethno-botanical inventories [22-25]. In contrast, other investigators [7,26-29] reported dominance of herbaceous species for ethno-medicinal preparation in elsewhere. Also, Yibrah reported that trees and herbaceous medicinal plants were the widely used for the treatment of various ailments that constituting 51.72%, and 24.14%, respectively, followed by 13.79% shrub and 10.34% climbers [30]. However, the variation in dominance of growth forms of medicinal plants used among different traditional healers in the country attributed to the wide agro-ecological diversity and specific indigenous knowledge of different communities. All respondents of traditional healers in the study area were harvesting medicinal plants from the wild environment. Comparable trends in harvesting medicinal plants from the wild were also reported [23,27,31-33]. Sinha et al. also reported, as medicinal plants have been growing in natural habitats (wild) and exploited to cure ailments by collecting them from natural habitats [34]. Likewise, in other parts of the country, ethno veterinary medicinal plants mainly collected from the wild stands as reported by Yirga et al. [35]. The finding of current study also agrees

with the finding of Habibul [36] in which wild plants mostly collected for livestock treatment. Similarly, Yibrah reported that most of the plant species collected from wild habitats (72.41%), and few of them obtained from around home garden (27.59%) and exploited to cure and control the livestock and human diseases [30]. This result indicates that medicinal plant species poorly preserved in the study area.

Plant parts used and mode of remedy preparation

The traditional healers were using different parts of medicinal plants identified in the study area (Figure 1). Roots of the plants were the parts most frequently used to treat livestock ailments, followed by leaves however mixed uses of plant parts were rare (Figure 1). The finding agrees with the result of Gabriel [17] who stated that root was identified as the most frequently used (70%) plant part followed by whole plant (7.5%), fruit (5%), leaves and stem (5%) for treatment of cattle diseases in Uganda. Many studies conducted elsewhere in Ethiopia showed the dominance of leaves in the preparation of remedies. This was because leaves contain many metabolites with characteristic anti-illness effects [24,32,37,38]. In contrast, Birhane et al. [39] indicated root as the most commonly harvested plant part in a study carried out in other Ethiopian regions. A study conducted in Oromia region of Ethiopia also witnessed the common usage of root [23]. Harvesting root of a plant poses more threat to survival of plant than collecting other parts such as fruits, seeds and leaves [40]. Such widespread harvesting of roots or leaves, which are important for plant survival, threatens the survival and continuity of valuable medicinal plants. A plant whose roots are most used is more susceptible to extinction than that whose leaves and fruits are used unless proper conservation and sustainable measures are considered [18].

Medicinal plant used in this study were in the form of fresh (67.7%), dry (22.6%) and both in the form of fresh and dry (9.4%) (Table 6). Most of traditional healers (97.8%) reported that they collected and immediately use with no preservation but few (2.2%) preserved the plant materials by various ways like pounding and saving the powder or hanging the dried plant part either in the roof of their home or under the leaves. Ref. [16] reported similar findings, as local community employed several methods of preparation of traditional medicines from plants, 91.5% of herbal preparations were from fresh plant parts followed by dried parts in agro-pastoralists. For immediate application of fresh plant, most healers (97.8%) chop and soak in water with salt overnight then squeezed to separate liquid extract whereas few (2.2%) practiced crushing and forming powder then diluted by water when need arise for plants used in dry form and it were made from preserved parts of plant. This finding is analogous to [41] who reported grinding or crushing and soaking or boiling as the most common

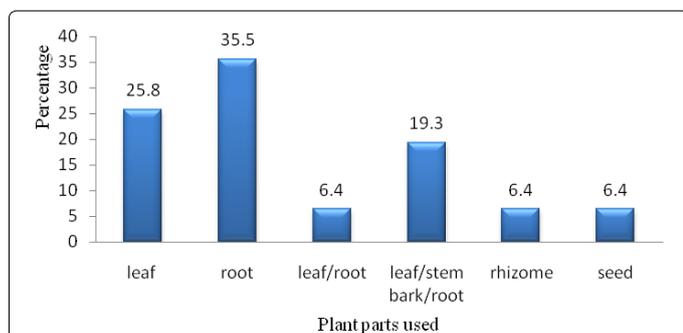


Figure 1: Parts of medicinal plants used as remedy for livestock treatment in the study areas.

method of drugs extraction from plants. Preparations of remedies in study area involved single medicinal plant, which is in agreement with the findings of studies conducted elsewhere in Ethiopia [28,42] while it is believed that the potency of plant remedies could be enhanced when they are used in concoction form [43].

Route of remedy administration and dosage

Analysis of mode of administration showed oral route (71%) was the most common followed by topical (22.6%) and nasal (6.4%) route. Those findings were consistent with findings of Teshale who reported as most of medicinal plants used by pastoralists administered through oral route followed by dermal route [44]. In study conducted by Kebu et al. reported that greater than half of plant remedies studied administered orally [45]. A few studies, however, reported predominantly the dermal application of remedies and to lesser extent oral administration [35]. Similar to this study finding, Ashagre et al. reported oral route as the most commonly used route of administration of traditional remedies [16]. Similarly, Gabriel A reported three different routes of administration of which oral route (68.5%) was the highest, followed by topical route (22.2%) and eye drop (9.3%) [17]. Majority of traditional healers (94.85%) were not reported standardized dosing and treatment duration while few respondents were using different local measurement units to determine the dosage of plant medicine and treatment duration. Local units for instance, half cup, full cup, and liter employed depending on age and types of livestock species to be treated. The dose determination varied from healer to healer, disease to disease, even for the same type of ailment and the dose given depends on age, physical appearance and health conditions. This also observed in other ethno-veterinary surveys [13,14,27]. Majority healers (87.6%) prescribed plant remedies for livestock treatments until cure whereas few healers (12.4%) administered for a week. In this study, all respondents reported as the remedies have no adverse effects on animals. The variation in quantity, unit of measurement, and duration of treatment of prescribed plant preparations also noted in a study conducted elsewhere in the country [39]. Getahun reported that lack of precision and standardization of preparations are two of the drawbacks of traditional health care system [46].

Preference ranking of medicinal plants

The first two preferred medicinal plants used against diarrhea were *Acalyph indica* L, and *Olea europeae* L according to preference ranking conducted using traditional healers (Table 4).

Mode of ethno-veterinary knowledge transfer

The mode of transfer of indigenous knowledge on ethno-veterinary medicinal plants in the study area was not codified in written form; all healers are accepted orally from their forefathers and transmitted similarly to their children, most often to the one who keep their secret. This was corresponding with studies in other parts of Ethiopia [13], Pakistan [13] and Brazil [47,48]. The apparent lack of transfer of ethno-veterinary knowledge from older to younger generations was a cause of concern in all studies [49,50].

Threats to medicinal plants

The major factors affecting the wealth of medicinal plants in the study area indicated in Table 5. The principal threats of medicinal plants in the area reported to include expansion of invasive plants (*Prosopis juliflora*), agricultural activity, drought, overgrazing, and firewood collection. The key informants also emphasized that *Prosopis juliflora* as a major threat to the ethno-veterinary plant species, which cover

Plant species to treat livestock diarrhea	Key informants (1-12)												Total	Rank
	1	2	3	4	5	6	7	8	9	10	11	12		
<i>Acalyph indica</i> . L	2	5	3	5	4	4	3	5	4	3	4	5	47	1
<i>Mentha longifolia</i> L	1	2	4	3	3	2	5	2	2	4	5	3	36	3
<i>Butea monosperma</i> . Taub	4	3	1	1	2	3	2	4	3	2	3	2	30	5
<i>Balanites aegyptiaca</i>	3	1	2	4	1	1	4	1	5	1	2	1	33	4
<i>Olea europeae</i> . L	5	4	5	2	5	5	1	3	1	5	1	4	46	2

Table 4: Result of preference ranking of medicinal plants reported for treating livestock diarrhea. N.B: Score in the table indicate ranks to given to medicinal plants based on their efficiency. Highest number (5) for plant remedy that the key informants thought was most effective in treating livestock diarrhea in the study area and the lowest number (1) for the least effective plant remedy.

Factors	Number of informant listed	Proportion (%)
Expansion of <i>Prosopis juliflora</i>	48	26.7
Agricultural activity	39	21.7
Drought	37	20.5
Overgrazing	31	17.2
Collection as fire wood	25	13.9
Total	180	100

Table 5: List of different factors that affect medicinal plant species in the study area.

Scientific names of plant	Family	Local name of plants	Growth form	Diseases treated	Parts used	Form used	Method of preparation	Dosage administered/ Route of admini.	Livestock type
<i>Berberis lyceum</i> . Royle	Berberidaceae	Shifowayne	Sh	CCPP/ Cough	Root	Dr	Chopped with water	1 liter, oral	Camel, cattle, goat and sheep
<i>Paederia foetida</i> . L	Rubiaceae	Carmo'sageer	Sh	Wound healing	Root	Fr	Roots Chopped with water	Wash for the injured part for 3-4 times, topical	Camel, cattle, goat and sheep
<i>Trichilia</i> spp.	Meliaceae	Malmal	T	Ectoparasites (ticks)	Seed	Dr	Chopped with water and extract	Wash external parasite few days, topical	Camel, cattle, goat and sheep
<i>Indigofera amorphoides</i> . Jaub	Fabaceae	Duqus	H	Bloating	Seed	Fr/dr	Crushed with water	¼ liter, oral	Cattle
<i>Acalyph indica</i> . L	Euphorbiaceae	Shunfax/salid	H	Diarrhea	Leaf	Dr	¼ kg of leaves powders mixed in water	given orally	Camel
<i>Aspharagus racemosus</i> . Mill	Liliaceae	Dhiiga dumarka	H	Bloating	Rhizome	Dr	Rhizome powder mixed with water	4-5 pieces of rhizome 2cup, oral	Camel
<i>Olea europeae</i> . L	Olearaceae	Dhaqabka	T	Diarrhea	Leaf	Fr	Leaves were Chopped and mixed	1cup given, oral	Goats
<i>Euphorbia abyssinica</i>	Euphorbiaceae	Cir wisiisi	Sh	Evil eye	Leaf and root	Fr	Crushed and mixed with water & drink	¼ liter, oral	Sheep/goat
<i>Malva neglecta</i> . Wall	Euphorbiaceae	Qalan	Sh	Body swell	Root	Fr	Chopped with water	1lit, oral	Camel
<i>Aloe trichosantha</i> . Berger	Aloeaceae	Daqalsa	H	CCPP/ Cough	Leaf, stem and root	Fr	Fresh parts were chopped and juice given	2cups, oral	Cattle
<i>Azadirachta indica</i> . Juss	Meliaceae	Geed hindi	T	Body swell	Leaf, stem and root	Fr	Extracts mixed with water and salt	Depend on type, oral	Cattle, camel & goat
<i>Syzygium cumini</i> . L	Myrtaceae	Wiyiil	T	Diarrhea	Leaf, stem & root	Fr	Stem bark juice given twice a day	1lit, decoction	Camel
<i>Pueraria tuberosa</i> . Will	Fabaceae	Lalayas	Sh	Kidney problems	Leaf and root	Fr	Crushed leaf or root extract given orally	Depend type of size decoction	Camel and cattle
<i>Rumex nervosus</i>	Polygonaceae	Barartiire	H	Eye problems	Root	Dr	Root powder used to heal wound	2 spoons, topical	Goat
<i>Mallotus philippensis</i> . Lam	Euphorbiaceae	Dibbaw	H	Hayna bite	Leaf, stem and root	Fr/Dr	Liquid juice over the wound	wash the wound	Camel

<i>Nicotiana tobacum</i>	Solanaceae	Jiic	H	Body swell	Leaf	Fr	Leaves crushed with water	2cups, nasal	Cattle and camel
<i>Euphorbia geniculata</i>	Euphorbiaceae	iin	H	Skin diseases	Root	Fr	Roots grounded and extract juice	1lit, polish over the skin	Camel and goat
<i>Aloe spp</i>	Aloaceae	Dacar	Sh	Snake bite	Root	Fr	Chop with water and wash	One and half lit, topical	Young camel
<i>Vernonia amygdalina</i>	Asteraceae	Calyocad	T	Internal parasite	Leaf, stem and root	Fr	Chop with water and given orally	2cups, oral	Camel, cattle, sheep
<i>Lawsonia inermis. L</i>	Lythraceae	Calyodhig	T	Diarrhea	Root	Fr	Grounded fresh root mixed with camel milk	1cup, decoction	Cattle
<i>Acacia oerfota</i>	Fabaceae	Xiiga	Sh	Kidney problem	Leaf, stem and root	Fr	Parts were grounded and mixed with water	1-2 cups based on size, decoction	Cattle
<i>Senna alexandrina. Mill</i>	Fabaceae	Jaleelo	Sh	Internal parasite	Leaf	Dr	Mix powder with water and drink	2cups, oral	Cattle, goat and sheep
<i>Solanum hastifolium. Hochst</i>	Solanaceae	Kariir	Sh	Rabies	Root	Fr	Crush root bark with water	2cup, decoction	Camel
<i>Senna italic. Mill</i>	Fabaceae	Jaleloo	Sh	Rabies	Leaf	Dr	Dried leaf powder	½ lit, decoction	Goat and sheep
<i>Mentha longifolia. L</i>	Lamiaceae	Xabakadi	Sh	Diarrhea	Root	Fr	Roots were boiled & given to cattle	2 cups, oral	Camel
<i>Butea monosperma. Taub</i>	Fabaceae	Dhaqab	T	Diarrhea	Leaf	Fr	Leaves were crushed with water	1lit, oral	Cattle
<i>Balanites aegyptiaca</i>	Balanitaceae	Geed dhqii	T	Diarrhea	Root	Fr	Grounded root juice	1lit, decoction	Goat
<i>Cyperus rotundus. L</i>	Cyperaceaea	---	H	Fever/shivers	Root	Fr	Root crushed and juice given orally	2 cups, oral	Cattle and goat
<i>Ruta chalepensis. L</i>	Rutaceae	Taltan	H	Wounds on skin	Leaf	Fr	Leaves grounded with water	Wash twice a day, topical	Cattle and goat
<i>Zinger officinale. Rose</i>	Zingiberaceae	Singibill	H	CCPP/ Cough	Rhizome	Fr/dr	Rhizome crushed	1cup/1/2lit, nasal/ decoction	Sheep/goat
<i>Calpurnia aurea. Benth</i>	Fabaceae	Dhekat	Sh	Internal parasite	Leaf	Fr	Crushed leaves mixed with water	1 cup, oral	Sheep

Table 6: List of medicinal plants identified as ethno-veterinary for treatment of livestock ailments.

many parts of the land reducing capacity to grow medicinal plants as well as forage plants. This finding disagree with the result of Yibrah [30] who noted that the medicinal plants largely found in the natural habitats faced a major threat to their survival of the mother plants due to the combined effect of factors like cultivation of marginal lands and herbal preparation in the other part of the country. Likewise, Lulekal reported that deforestation due to agricultural expansion is the greatest threat to woody plants in southeast part of Ethiopia [23].

Medicinal plant marketing

Majority of medicinal plants were not on sale in the local markets of the study area, but only a few were reported to be sold, for instance, *Nicotinum tobacum* and *Zinger officinale* were available in market for sale as medicinal plants in few occasion as well as spices or stimulant. However, anyone who needs them for curing livestock disease should immediately contact the traditional healers in the community and described the symptoms of disease then healers soon collect appropriate plant part. Those traditional healers request a little charge for remedies but the charges vary based on the sources and availability of medicinal plants and number of animals treated. Traditional healers gave remedies free of charges for relatives.

Conclusions

Thirty-one plant species belonging to eighteen families identified to cure livestock health problems that have uncomplicated symptoms such as wound healing, local swellings, bloating, ectoparasites, tapeworm, diarrhea, snakebites, and rabies. Majority of plant species fall under Fabaceae and Euphorbiaceae family that are largely shrubs and principally collected from wild environment. The most commonly used plant parts were roots in fresh immediately after collection. Remedy preparation was mainly through chop then soaked overnight in concoction of water and salt then squeezed to separate liquid extract for plants used in fresh. However, few healers practice crushing and forming powder then diluted by water when need arise for plants leave used in dry form. Oral, topical and nasal route were the common mode of administration with no standardized dosing and treatment duration. The principal threats to medicinal plants were include expansion of invasive plants (*Prosopis juliflora*), drought, overgrazing, agricultural activity and firewood collection. Endogenous knowledge on ethno-veterinary medicinal plants was accepted orally from healer's forefathers and transmitted similarly to their children. Identified medicinal plants were not on sale in the local markets though healers requested a little charge. Awareness should raise and ethno-veterinary knowledge should integrate in to livestock extension delivery systems for the need to exploit the possibility of discovering more medicinally

viable plants and conservation measures should undertake to ensure the continued availability of effective medicinal plants. Further studies needed under controlled conditions on the efficacy and veterinary properties of such plant products and livestock disease treatments.

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Conflict of Interest

Authors declare that there is no existing conflict of interest.

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