Journal of Plant Sciences
2017; 5(1): 34-42
http://www.sciencepublishinggroup.com/j/jps
doi: 10.11648/j.jps.20170501.15
ISSN: 2331-0723 (Print); ISSN: 2331-0731 (Online)

An Ethnoveterinary Study of Medicinal Plants Used for the Management of Livestock Ailments in Selected Kebeles of Dire Dawa Administration, Eastern Ethiopia

Atinafu Kebede[1, *], Shimels Ayalew[1], Akalu Mesfin[1], Getachew Mulualem[2]

[1]Department of Biology, College of Natural and Computational Sciences, Dire Dawa University, Dire Dawa, Ethiopia

[2]Ethiopian Biodiversity Institute, Mekele Center, Mekele, Ethiopia

Email address:

atnafukebede@yahoo.com (A. Kebede), shimels2080@gmail.com (S. Ayalew), akesha05@gmail.com (A. Mesfin), gechozol@gmail.com (G. Mulualem)

[*]Corresponding author

To cite this article:

Atinafu Kebede, Shimels Ayalew, Akalu Mesfin, Getachew Mulualem. An Ethnoveterinary Study of Medicinal Plants Used for the Management of Livestock Ailments in Selected Kebeles of Dire Dawa Administration, Eastern Ethiopia. *Journal of Plant Sciences.* Vol. 5, No. 1, 2017, pp. 34-42. doi: 10.11648/j.jps.20170501.15

Received: December 20, 2016; **Accepted**: January 14, 2017; **Published**: March 2, 2017

Abstract: Ethnoveterinary study of medicinal plants in selected kebeles of Dire Dawa Administration, eastern Ethiopia was carried out with the aim of assessing and documenting the indigenous knowledge of medicinal plants used in the local communities. In Ethiopia traditional medicine is often used for the management of livestock aliments by various ethnic groups. About 90% of livestock population is said to be dependent on traditional medicine for primary healthcare services and most of these remedies come from plants. The study sites were selected purposefully based on the reconnaissance survey conducted prior to the actual study and recommendations of elders in the study area. Ethnoveterinary data collection was carried out from December to June 2016 from 48 informants using semi-structured interviews. The informants were with an average age of 46 years. Males were the leading representing (83%) of the respondents. Generally, (60%) of the respondents were above 50 years. A total of 33 ethnoveterinary medicinal plant species belonging to 30 genera and 20 families were documented and identified for treating 22 different livestock ailments. Most of the ethnoveterinary medicinal plants were collected from the wild (88%) and leaves were the most frequently used (38%) parts for remedy preparations. Oral application is the most frequently employed (64%), followed by the dermal application which accounts for 11%. There was a significant positive correlation (Pearson correlation coefficient, $r= 0.39$, at $\alpha = 0.05$, $p = 0.04$) between the informants' age and the number of species cited. However, there was a significant negative correlation (Pearson correlation coefficient, $r = -0.31$, at $\alpha = 0.05$, $p < 0.001$) between the number of species cited and the educational background of the informants. The information generated from this study can be used as baseline data for farther studies.

Keywords: Ailments, Dire Dawa Administration, Ethnoveterinary, Livestock, Medicinal Plants

1. Introduction

Ethnoveterinary medicine is the use of medicinal plants, surgical techniques and traditional management practices to prevent and treat a spectrum of livestock diseases [1]. Ethiopia has a huge but largely unused livestock resources, the country is believed to have the largest livestock population in Africa. As per the livestock survey results, there are about 47.57 million cattle, 26.12 million sheep, 21.71 million goats, 1.78 million horses, 5.57 million donkeys, 0.38 million mules, and one million camels, and 39.6 million poultry [2]. Livestock production in Ethiopia is either a means of livelihood in the pastoral systems and the major form of engagement in the highland crop livestock production systems, it provides multiple functions as sources of meat, milk and egg production, sources of draft power, sources of manure to support crop production and means of transport particularly in the rural areas [3]. However, the

productivity is far below the possible expectations and the country couldn't fulfill its demand and hence importing animal products, the major challenges of livestock production in the country among others are scarcity of feed both in quality and quantity and livestock diseases [4].

Traditional medicine in Ethiopia has been widely used by various ethnic groups, about 90% of livestock population depends on traditional medicine and most of it comes from plants [5], this could be because of the high prices of modern drugs and unavailability of adequate health services [6] moreover, the few available veterinary health posts are not accessible to the majority of livestock raisers especially of pastoralist living in the arid and semi-arid areas as they lead non sedentary way of living [7].

Similar to other forms of traditional knowledge, the ethnoveterinary medicinal plant knowledge is passed in spoken form from generation to generation and as a result precious information can be gone when the herbalist passes without conveying his knowledge to the succeeding generation [8, 9]. What is more is that the condition is worsened by impacts of science and technology on society [10, 11]. In addition, the disappearance of medicinal plant species due to population growth, expansion of agriculture and deforestation is consistently reported by different ethnoveterinary studies [12, 13]. As a result, the need to document the medicinal plants and the associated indigenous knowledge should be a task that needs attention before anything.

Although Ethiopian ethnoveterinary medicinal inventories including those of [14, 15, 16, 17, 18], have attempted to document veterinary importance of traditional medicinal plants in some ethnic groups, it is limited when compared to the 85 different ethnic groups found in the country, which have still remained mostly undiscovered. Hence, the present research aims to fill this gap by documenting the wealth of indigenous knowledge on utilization of ethnoveterinary plants used in Dire Dawa Administration, Eastern Ethiopia, which has never been explored for its ethnoveterinary wealth. In addition, it aims to select candidate ethnoveterinary plant species for further phytochemical and pharmacological analyses in subsequent studies.

2. Materials and Methods

2.1. Description of the Study Area

Dire Dawa administration has 9 urban and 38 rural kebeles. The Administration is geographically located in the eastern part of the country specifically lying between 9°27' and $9^0$49' N latitudes and between 41° 38' and 42° 19'E longitudes and the town is 515 Km from Addis Ababa the capital city of Ethiopia and 333 Km from the international port of Djibouti. The total area of the administration is 128,802 ha. Dire Dawa Administration characterized by only two broad Agro-ecological Zones, its altitude ranging from 1000 to 2000 meters above sea level [19]. The region characterized by semi-arid climate with low and erratic rainfall, with annual rainfall that amounts to 604mm. The average monthly temperature is 24.8°C. The total livestock population in Dire Dawa Administration is 219, 323 of this goats comprise 54.2%, followed by sheep 21.1%, cattle 18.4%, asses 4% and camel 2.3% [2].

2.2. Study Site Selection

The study sites were selected based on the availability of traditional healers identified with the assistance of local administrators and a reconnaissance survey conducted by the researchers from February 22 to 30, 2015, Consequently, the selection resulted in six study kebeles, namely Wahil, Legeoda, Chire Miti, Jeldesa, Gerba Aneno and Asseliso. Kebele is the smallest administrative unit in Ethiopia. The location of the selected kebeles is given in (Figure 1).

2.3. Traditional Healer Selection and Data Collection

A total of 48 traditional healers were sampled. The study was conducted between December to June 2016. Prior to data collection discussion was made with the traditional healers to get their verbal informed consent. Semi-structured interview (was conducted in local language(s), Oromo and Somali) with the help of interpreter and field observation were employed to collect basic information on the local name(s), diseases treated, parts used, method of preparations and routes of administration. Field walks with traditional healers were employed to collect specimens of each medicinal plant species. Identification of specimens was made by comparing their voucher specimen with authentic specimens deposited in the National Herbarium, Addis Ababa University and by getting assistance from taxonomic personnel.

2.4. Data Analysis

The collected ethnoveterinary medicinal data were analyzed using descriptive statistics and the percentiles, figures and tables were used to summarize the collected data. The MS Excel Spreadsheet was also utilized for drawing bar graphs. Preference ranking was computed according to [20]. To evaluate the agreement among informants, Informant consensus factor (ICF) values were determined as it is recommended by [21].

$$\mathrm{ICF} = \frac{\mathrm{Nur}-\mathrm{Nt}}{(\mathrm{Nur}-1)} \quad (1)$$

Where,

Nur: Number of use-reports for a particular use category

Nt: Number of taxa used for a particular use category by all informants

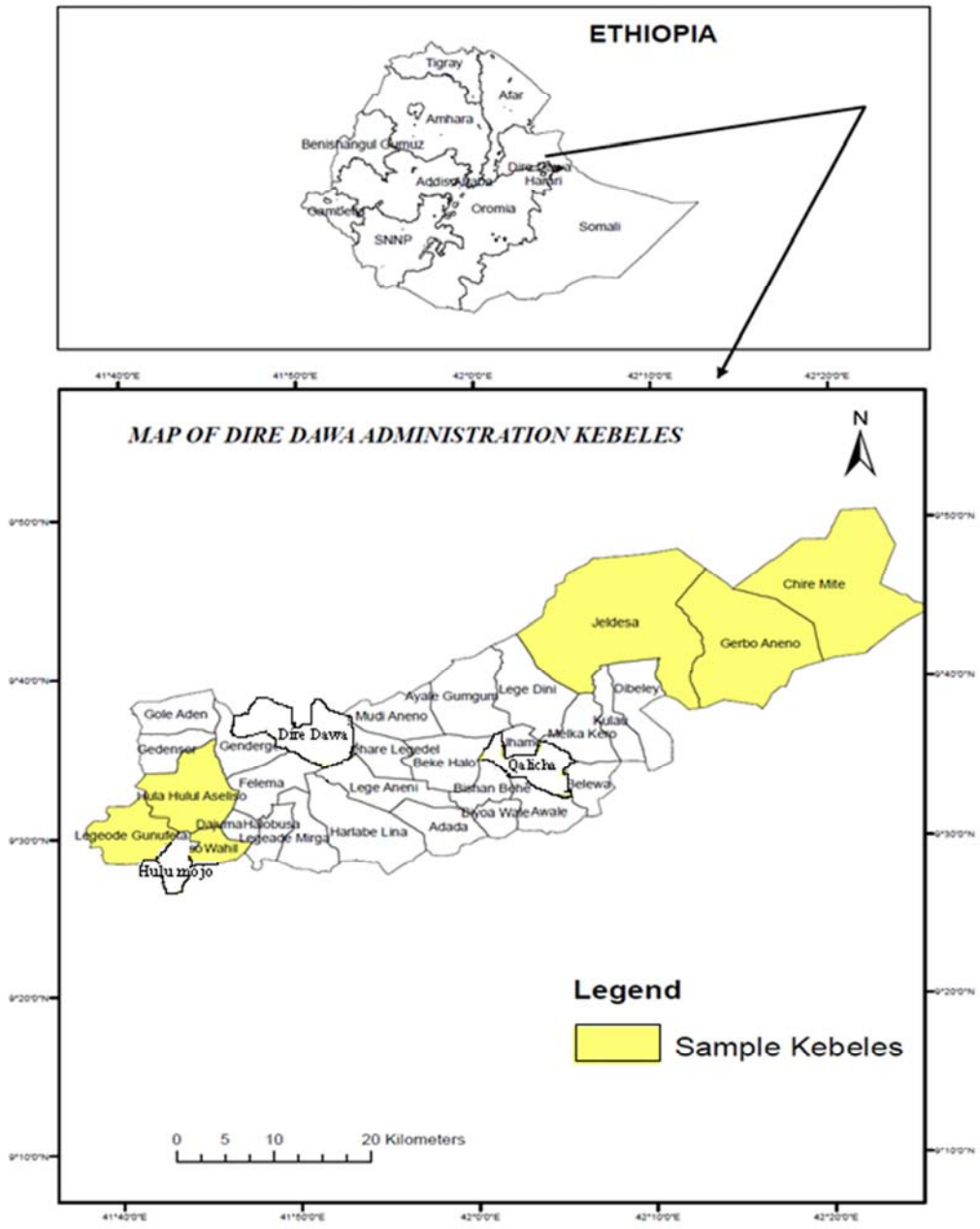

Figure 1. *Map of the selected kebeles.*

3. Result

3.1. Characteristics of Respondents

A total of 48 traditional healers (40 males and 8 females). Among the 48 informants, 12 key informants were selected with the assistance of community leaders, elderly people and kebele administrators. The age of the respondents were ranging from (35 to 85) with an average age of 46 years. Males were dominant representing (83%) of the respondents. Generally, (60%) of the respondents were above 50 years (Figure 2). Generally, the informants were grouped into three age groups, young (20-35), adult (36-50) and elderly (above 50) to see how the knowledge varies with age as described in [22]. There was a significant positive correlation (Pearson correlation coefficient, r =0.39, at $\alpha = 0.05$, $p = 0.04$) between the age of informants and the number of species reported. However, there was a significant negative correlation ($r = -0.31$, at $\alpha = 0.05$, $p<0.001$) between the number of species reported and informants 'educational level.

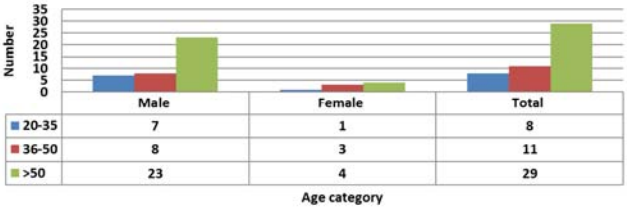

Figure 2. *Characteristics of the informants.*

Table 1. *List of ethnoveterinary medicinal plants used for treating livestock diseases.*

Voucher No.	Scientific name	family	Plants Local name	Habitat	Habit	Part used	Livestock disease treated	Mode of Preparation (MP)	Mode of Administration
AK01	Plectranthus cylinderaceous	Lamiaceae	Abrasha gara	W	H	Ba	Mastitis	Fresh bark implanting in the skin of cattle dewlap.	Implantation
AK02	Flueggea virosa	Euphorbiaceae	Adulal	W	H	L	Swollen body part/GOFLA	dry leaves of these five d/t plants will be pounded together mixed with water	Taken oral &dermal
AK03	Xanthium strumarium	Asteraceae	Aredo (banda)	W	H	R	skin disease	fresh or dry crushed root mixed with water	Taken oral
AK04	Gomphocarpuspurpurascens	Asclepiadaceae	Ariyuyo	W	Sh	Fr	lactation failure	implanting in the cattle dewlap	Implantation
AK05	Eucalyptus globulus	Myrtaceae	Nech bahir zaf	HG	T	L	Ecto-parasite	Dried leaves smoked.	smoke bath
AK06	Croton dichogamus	Euphorbiaceae	bala addi	W	Sh	L	lactation failure	Dry or fresh root and leaf pounded and the powder is boiled in water.	Taken oral
AK07	Croton macrostachyus	Euphorbiaceae	Bekenisa	W	T	L	Febrile illness in donkey MITCH	fresh leaves squeezed +water	Taken oral
						L	Expulsion uterine mass in camel	Dry leaves pounded with water	Taken oral
AK08	Cadaba rotundifolia	Capparidaceae	Delensisa	W	Sh	L	Internal parasite	Pounded and mixed with water and given to the cattle as a drink.	Taken oral
						WP	Skin disease	Whole part crushed and applied on the skin.	Dermal
						L	lactation failure	fresh/dried crushed	Taken oral
AK09	Solanecio sp.	Asteraceae	Dineras	W	H	L	milk that do not curdle	Squeezed root and leaf added in the milk	

Table 1. *Continue.*

Voucher No.	Scientific name	family	Plants Local name	Habitat	Habit	Part used	Livestock disease treated	Mode of Preparation (MP)	Mode of Administration
AK10	Tragia plukeneti	Euphorbiaceace	Dobi (sama)	W	H	L	Myiasis in goat	Water is added on pounded fresh leaves	Taken oral
AK11	Malva verticillata L.	Malvaceae	Gadiso	W	H	WP	Emaciation	Water is added on crushed fresh or dried whole part	Nasal and Oral
AK12	Capparis tomentosa	Capparidaceae	Gumero	W	T	Ba	Evil eye	Piece of bark tied on the neck of the animal	
AK13	Verbasculum sinaiticum	Scrophulariaceae	Gura haree /adayoo	W	Sh	R	Blackleg	Crushed root mixed with water	Taken oral
						R	Swollen body/GOFLA	Water is added on crushed fresh leaves.	Taken oral
						St	abdominal pain	Fresh stem crushed and water is added on it	Taken oral
						St	Loss of appetite	Water is added on fresh stem crushed	Taken oral
AK14	Cucumis ficifolius	Cucurbitaceae	Hari goge	W	H	R	Rabies	Fresh epidermis of the root is peeled and pounded in water	Taken oral
						Se	Anthrax	Dry or fresh seeds pounded mixed with water and drunk	Taken oral
AK15	Gloriosa superba L.	Colchicaceae	Harmel kubra	W	H	R	Skin disease	fresh root crushed and mixed with water and applied on the skin	Taken oral &Dermal
						R	lactation failure	Fresh root crushed and applied on the body.	Dermal
AK16	Solanum incanum L.	Solanaceae	Hidi (enbuay)	W	H	Fr	Respiratory disease	Fresh fruit is put in a hot ash and squeezed and the juice added through the nose drop by drop.	Nasal

Table 1. *Continue.*

Voucher No.	Scientific name	family	Plants Local name	Habitat	Habit	Part used	Livestock disease treated	Mode of Preparation (MP)	Mode of Administration
						L	lactation failure	Dry or fresh mixture of Fruit and leaf pounded and mixed with water	Taken oral
AK17	Withania somnifera	Solanaceae	Hidi bude, gizawa	HG	H	L	Evil eye	Fresh leaves crushed and squeezed with cloth	Nasal
						R	Cough	Fresh leaf crushed and mixed with water and drunk.	Taken oral
AK18	Commicarpus plumbagineus	Nyctaginaceae	Kontoma hare	W	Cl	R	urine retention	Dry or fresh root crushed and mixed with water and taken oral.	Taken oral
AK19	Parthinum hystrophorus	Asteraceae	Kuban	W	H	L	wound	Fresh crushed and applied on the wound	Dermal
AK20	Plumbago zeylanica L.	Plumbaginaceae	Mexres	W	H	L	urine retention	Fresh leaf crushed and mixed with water taken oral	Taken oral
AK21	Euclea racemosa	Ebenaceae	Miesa	W	H	R	urinary retention	Dry or fresh root crushed and mixed with water and drunk.	Taken oral
AK22	Melhnia zavattari	Sterculiaceae	Muka bira	W	Sh	L	General emaciation	Fresh leaves crushed and soaked in water and will be left stand for one night and the cattle will drink from 2-3 liters for 3 days.	Taken oral
AK23	Caralluma priogonium	Asclepiadaceae	Muka buti	W	H	WP	Mastitis (Jigo)	Fresh leaves pounded and tied on the breast with cloth.	Dermal
AK24	Cissampelos mucronata	Menispermaceae	Muka Hadhawa	W	H	R	Anthrax	Fresh root crushed and water added and drunk	Taken oral
						L	Sudden illness	Fresh leaves and stem crushed and mixed with water.	Taken oral

Table 1. *Continue.*

Voucher No.	Scientific name	family	Plants Local name	Habitat	Habit	Part used	Livestock disease treated	Mode of Preparation (MP)	Mode of Administration
						R	Blackleg	Fresh root crushed and mixed with water taken oral.	Taken oral
AK25	Kalanchoe marmorata	Crassulaceae	Muka jigo	W	Sh	R	Teat obstruction	Fresh root implanted under the skin of the cows dewlap	Implantation
AK26	Echidnopsis dammanniana	Asclepiadaceae	Muka mesqa	W	Sh	L	Snake poison	Fresh leaf pounded and tied on the cut body part and also the pounded leaf is mixed with water and drunk.	Taken oral & Dermal
AK27	Trachyspermum ammi	Apiaceae	Nech azmud	HG	H	Se	Urine retention	Seeds crushed and mixed with water and drunk.	Taken oral
AK28	Carica papaya	Caricaceae	Papaya	HG	T	Se	Internal parasite	Dried seeds pounded and mixed with water and drunk.	Taken oral
AK29	Maerua triphyla	Capparidaceae	qelqelicha	W	T	R	Respiratory disease	Fresh whole root crushed and squeezed and the juice is applied through the nose	Nasal
AK30	Solanum somalense	Solanaceae	Qerxaxume	W	Cl	R	Mastitis (Jigo)	Fresh root crushed and mixed with water and taken oral.	Taken oral
						R	Skin diseases	Fresh root crushed and mixed with water taken oral.	Taken oral
AK31	Premna oligotricha	Lamiaceae	Qetisa	W	T	L	Milk that cannot curdle	Fresh leaf crushed and mixed with water and the cow drinks.	Taken oral
AK32	Cadaba farinosa	Capparidaceae	Shifoweyin	W	T	R	Swollen body part/GOFLA	Fresh root crushed and mixed with water and applied on the breast.	Dermal
AK33	Maytenus sp.	Celasteraceae	Sibilu	W	T	L	Mastitis (Jigo)	Dry root crushed and mixed with water.	Taken oral

Habit: Sh-shrub, T-tree, Cl-climber, H-herb; Part Used: L-leaf, Ba-bark, St-stem, R-root, Fr-fruit, Se-Seed, and WP- whole part; Habitat: W-wild, HG-home garden.

3.2. Medicinal Plants Reported

A total of 33 ethnoveterinary medicinal plant species belonging to 30 genera and 20 families were documented with details on route of administration, mode of preparation, plant part used, habit, habitat, family name, scientific name, local name and code (Table 1). Euphorbiaceae and Capparidaceae had a relatively high number of species 4 (12%) each, followed by Asclepiadaceae, Asteraceae and Solanaceae 3 (9%) species, Lamiaceae had 2 (6%) species, and the rest 14 families had 1 (3%) species each (Figure 3).

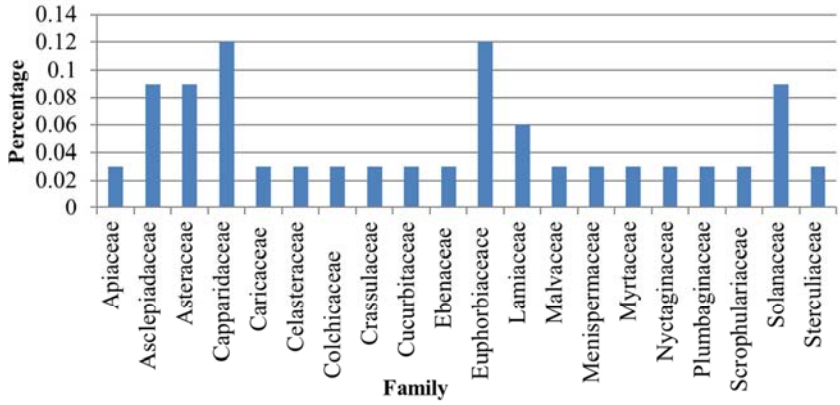

Figure 3. *Family distribution of medicinal plants.*

3.3. Habitat of Medicinal Plants

In the present study, most of the medicinal plants were collected from the wild (88%) and others were from home gardens (12%) (Figure 4).

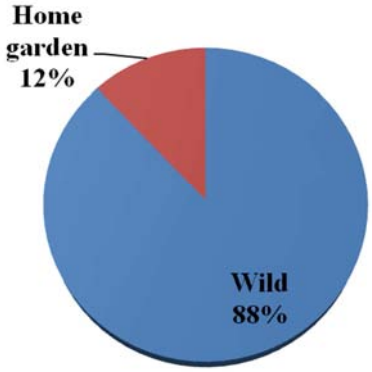

Figure 4. *Percentage of medicinal plants on the basis of their habitats.*

3.4. Plant Parts Used for Medicine

Leaves (38%) were the plant parts most widely used to treat livestock diseases followed by root (34%) (Figure 5).

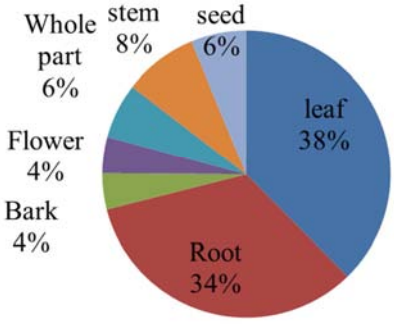

Figure 5. *Percentage of plant parts used in the treatment of livestock diseases.*

3.5. Route of Administration

The major routes of administration in the study area were oral, dermal, nasal, implantation and smoke bath. Oral application is the most frequently employed (64%), followed by dermal application which accounts for 11% and nasal, implantation, oral and dermal accounts 7% each (Figure 6).

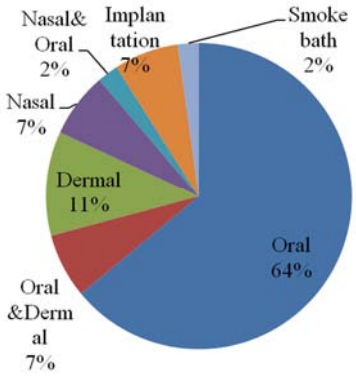

Figure 6. *Percentage of route of administration.*

3.6. Habit of the Medicinal Plants

The habit of the medicinal plants indicated that most of them were herbs (49%) followed by trees (24%), shrubs (21%) and climber (6%) (Figure 7).

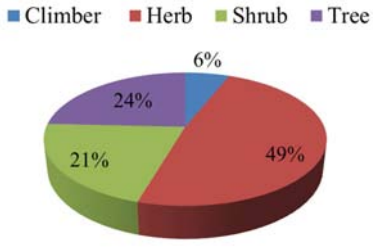

Figure 7. *Habit of the reported Medicinal plants.*

3.7. Informant Consensus Factor (ICF)

In the present study ailments with high ICF value were snake poisoning, abdominal pain, evil eye, loss of appetite that had ICF values of 1, each, respectively. Seven ailments categories had ICF value of zero (0) (Table 2).

Table 2. *ICF of ethnoveterinary medicinal plants by aliment groups.*

Aliment category	No. of species	Species (%)	No. use citations	ICF
Snake poisoning	1	2.5	18	1
Abdominal pain	1	2.5	9	1
Evil eye	1	2.5	10	1
Loss of appetite	1	2.5	7	1
Expulsion of uterine mass	2	5	13	0.91
Mastitis	3	7.5	21	0.9
Respiratory disease	2	5	12	0.9
Swollen body part	3	7.5	20	0.89
Black leg	2	5	9	0.87
Anthrax	2	5	3	0.5
Emaciation	2	5	3	0.5
Myiasis	1	2.5	3	0.5
Skin diseases	4	10	6	0.4
Internal parasite	2	5	4	0.33
Urine retention	4	10	5	0.25
Ecto-parasite	1	2.5	1	0
Lactation failure	4	10	4	0
Rabies	1	2.5	1	0
Wound	1	2.5	1	0
Fibril illness	1	2.5	1	0
Teat obstruction	1	2.5	1	0
Sudden illness	1	2.5	1	0

A species may fall in more than one ailment category

3.8. Threats to Medicinal Plants

Deforestation followed by Agricultural expansion and drought were the major threats for the medicinal plants in the study area (Table 3).

Table 3. *Ranking of threats to medicinal plants in the study area.*

Respondents (R1-R6)								
Factors	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**Total**	**Rank**
Deforestation	6	5	6	6	6	6	35	1st
Drought	4	3	4	4	4	4	23	3rd
Agricultural expansion	5	6	3	5	5	5	29	2nd
Invasive species	2	2	1	3	3	2	13	4th
Over harvesting	3	4	5	2	1	3	18	5th
Over grazing	1	1	2	1	2	1	8	6th

3.9. Medicinal Plant Conservation Efforts of the Local People

About (60.62%) of the informants reported that they had awareness of the importance of conserving medicinal plant species and however 12% of them were practicing some conservation activities like cultivation in home gardens. The rest of the informants (39.38%) were not practicing any conservation effort. They simply went to the wild to collect medicinal plants as their need arose and did not bother about the long term survival of these plants.

4. Discussion

There was a significant negative correlation ($r = -0.31$, at $\alpha = 0.05$, $p<0.001$) between the number of species reported and informants 'educational level. Differences in medicinal plants knowledge among age groups were also reported in other studies [23, 24, 25]. This might be attributed to the current expansion of education and health centers to kebele level which has resulted in the young generation focusing on modern medicines [26] and advancement in science and technology has also changed the social values and therefore, transformed the younger generation at a faster rate into the new tradition [9, 11].

According to [27] and [28] the majority of plant species constituted family Asteraceae accounting for 13.8% and 11.6%, respectively. According to [13] Fabaceae constituted a bigger proportion of the reported medicinal plants accounting for 12%, followed by Solanaceae (7%). Whereas, [29] reported that Solanaceae was the leading family containing 8 species (16%) followed by Euphorbiaceae containing 5 species (10%).

Most of the medicinal plants were collected from the wild. Similar results were reported by other studies in the country [28, 30], Pakistan [31] and Brazil [32]. People in the study area simply went to the wild and harvest them as their need arose and did not bother about the long term survival of these plants.

Leaf was reported as the most frequently used plant part in other Ethnoveterinary studies [13, 28, 29, 33, 34, 35] Oral application is the most frequently employed (64%), This result is in agreement with the finding of [16] who reported that oral route of administration was the most common (72.41%).

Similar patterns were reported by some ethnoveterinary studies [13, 28, 29] where herbs are the largest plant growth habits which constituted 45.8%, 46.45% and 44%, respectively. In other studies, shrubs are reported as the largest plant growth habits [26, 36, 37]. According to [35] trees constituted 52% of the growth habit of ethnoveterinary medicinal plants.

Studies by [38, 39] had also reported deforestation and agricultural expansion as the main factors for the disappearance of medicinal plants. In addition, improper use of resources such as harvesting the whole part and the underground part (root) of a medicinal plant could be a considerable threat to medicinal plants as; our result showed that roots were the second most used plant parts where 34% of the medicinal plant species were harvested to treat livestock ailments. Root as the most commonly used plant part in remedy preparation was reported by [30, 40, 41].

5. Conclusions

Generally, 33 species belonging to 30 genera and 20 families were identified and documented in the study area. The plants were mainly collected from the wild. Deforestation followed by Agricultural expansion and

drought were the main threats for the ethnoveterinary medicinal plants. The study suggests that there is a significant amount of indigenous knowledge on ethnoveterinary medicinal plant it is believed to add up the communities' knowledge in the country's database of traditional knowledge. In addition; it provides a baseline data for future studies.

Competing Interests

We declare that we do not have competing interests.

Authors' Contributions

AK performed the field study and analyzed the data and wrote the manuscript. SA AM&GM performed the field study and revised the manuscript, and gave substantial input. All of us read the final manuscript and agreed on its submission.

Acknowledgements

We would like to acknowledge Dire Dawa University for its financial support and the informants for their valuable information. Authors also are grateful to the National Herbarium (ETH) of Addis Ababa University for identification of the plant specimens. We would also like to extend our appreciation to Mr. Tesfaye Wasihun for his help in making map of the study area.

References

[1] Nguyen TM., Van Binh D., Orskov ER. (2005). Effect of foliages containing condensed tannins and gastrointestinal parasites. Anim. Feed Sci. Tech. 121: 77-87.

[2] Central Statistical Agency (2007). The 2007 Population and Housing Census of Ethiopia Results for Dire Dawa Administration: Federal Democratic Republic of Ethiopia, Addis Ababa.

[3] Zerhiun and Mesfin (1990). The Status of the Vegetation in the Lake Region of the Rift Valley of Ethiopia and Possibilities of Its Recovery. *SINET*: *Ethiopian Journal of Science*, 392, 97-120.

[4] Wondimu, T., Asfaw Z., and Kelbessa E. (2007). Ethnobotanical Study of Medicinal Plants around "Dheeraa" Town, Arsi Zone, Ethiop. *Journal of Ethnopharmacology*, 112, 152-161.

[5] Endashaw (2007). Study on Actual Situations of Medicinal Plants in Ethiopia Prepared for Japan Association for international Collaboration of Agriculture and Forestry, 1: 76.

[6] Rashid MD., Tanzin R., Ghosh KC., Jahan R., Khatun A., Rahmatullah M. (2010). An ethnoveterinary survey of medicinal plants used to treat cattle diseases in Birishiri area, Netrakona district, Bangladesh, Advances in Natural and Applied Sciences, 4 (1): 10-13.

[7] Nasir T., Mohammed A. and Nandikola J. (2011) Ethnobotanical Survey of Medicinal Plants in the Southeast Ethiopia Used in Traditional Medicine. *Spatula DD*, 1, 153-158.

[8] Abebe and Ayehu (1993) Medicinal Plants and Enigmatic Health Practices of Northern Ethiopia. B. S. P. E, Addis Ababa, 419-431.

[9] Awas T (2007). Plant Diversity in Western Ethiopia: Ecology, Ethnobotany and Conservation. PhD Dissertation, Faculty of Mathematics and Natural Sciences, University of Oslo, Norway.

[10] Tabuti J. S., Dhillion S. S and Lye K. A.(2003) Ethnoveterinary Medicines for Cattle (*Bos indicus*) in Bulamogi County, Uganda: Plant Species and Mode of Use. *Journal of Ethnopharmacology*, 88, 279-286.

[11] Murad W., Azizullah A, Adnan M., Tariq A., Khan U., Waheed S., Ahmad A (2013). Ethnobotanical assessment of plant resources of Banda Daud Shah, District Karak, Pakistan. *Journal of Ethnobiology and Ethnomedicine*, 9: 77.

[12] Hedberg, I. and Edwards, S., Eds. (1989) Flora of Ethiopia and Eritrea. Pittosporaceae to Araliaceae. Vol. 3, the National Herbarium, Addis Ababa, Ethiopia, and Department of Systematic Botany, Uppsala, Sweden.

[13] Giday M and Ameni G (2003). An Ehnobothanical Survey of Plants of Veternary Importance in Two Woredas of Sothern Tigray, Northern Ethiopia. SINET: *Ethiop. J. Sci*., 26 (2): 123-136.

[14] Alemu L (1993). Studies on the Traditional Medicinal Plants of Veterinary Importance in and Around Bahir Dar. DVM Thesis. Addis Ababa: Addis Ababa University.

[15] Sori T., Bekana M., Adugna G and Kelbessa (2004). Medicinal plants in the ethnoveterinary practices of Borana pastoralists, Southern Ethiopia. Int J Appl Res Vet Med, 2: 220–225.

[16] Yineger H., KelbessaE., Bekele T., Lulekal E (2007). Ethnoveterinary medicinal plants at Bale Mountains National Park, Ethiopia, Journal of Ethnopharmacology, 112: 55–70.

[17] Yineger H., Yewhalaw D., Teketay D. (2008). Plants of veterinary importance in Southwestern Ethiopia: the case of Gilgel Ghibe area. Forests, Trees and Livelihoods, 18: 165–181.

[18] Lulekal. E., Asfaw Z., Kelbessa E and Van Damme. P (2014). Ethnoveterinary plants of Ankober District, North Shewa Zone, Amhara Region, Ethiopia, Journal of Ethnobiology and Ethnomedicine, 10: 21.

[19] Mohammed A., Kidanu A., Mohamed A., Asrat P., Abera K., Shemles., Befikadu Y., Zewdu M., Tesfaye A., Yohans., Birhanu G., Jemal M (2011). Dire Dawa Administration Program of Adaptation to Climate Change. DDAEPA. Dire Dawa, Ethiopia.

[20] Martin J (1995). Ethnobotany: A Methods Manual. Chapman and Hall, London 1995.

[21] Heinrich M., Ankli A., Frei B., Weimann C and Sticher O (1998). Medicinal plants in Mexico: Healer's Consensus and Cultural Importance. *Social Science and Medicine, 47*: 1863-1875.

[22] Belayneh A., Asfaw Z., Demissew S., Bussa N (2012). Medicinal plants potential and use by pastoral and agro-pastoral communities in Erer Valley of Babile Wereda, Eastern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 8: 42.

[23] Yigezu Y., Haile D., Yenet W. (2014). Ethnoveterinary medicines in four districts of Jimma zone, Ethiopia: cross sectional survey for plant species and mode of use. BMC Veterinary Research, 10: 76

[24] Chekole G., Asfaw Z., Kelbessa E (2015). Ethnobotanical study of medicinal plants in the environs of Tara-gedam and Amba District northwest Ethiopia. *Journal Ethnobiology Ethnomedicine*, 11.

[25] Tugume P., Kakudidi E., Buyinza M., Namaalwa J., Kamatenesi M., Mucunguzi P. and Kalema J (2016). Ethnobotanical survey of medicinal plant species used by communities around Mabira Central Forest Reserve, Uganda. *Journal of Ethnobiology and Ethnomedicine*, 12: 5.

[26] Belayneh and Bussa (2014). Ethnomedicinal plants used to treat human ailments in the prehistoric place of Harla and Dengego valleys, eastern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 10: 18.

[27] Tekle Y. (2015a). Study on Ethno Veterinary Practices in Amaro Special District Southern Ethiopia. Med Aromat Plants 4: 186.

[28] Taddese B., Abera D., Ejeta E (2015). Ethinobotanical Study of Medicinal Plants in Selected Horro Gudurru Woredas, Western Ethiopia, journal of Biology, Agriculture and Healthcare, 5: 1.

[29] Teklay. A (2015). Traditional medicinal plants for ethnoveterinary medicine used in Kilte Awulaelo District, Tigray Region, Northern Ethiopia, *Advancement in Medicinal Plant Research,* 3 (4): 137-150.

[30] Gidey M., Asfaw Z., Woldu and Teklehaymanot T (2009). Medicinal plant knowledge of the Bench ethnic group of Ethiopia: Ethnobotanical investigation. Journal of Ethnobiology and Ethnomedicine 5: 34.

[31] Farooq Z., Iqbal Z., Mushtaq S., Muhammad G., Zafar M., Iqbal A. M (2008). Ethnoveterinary practices for the treatment of parasitic diseases in livestock in Cholistan desert (Pakistan). J. Ethnopharmacol, 118: 213-219.

[32] Monteiro MV., Bevilaqua CM., Palha MC., Braga RR., Schwanke K (2011) Ethnoveterinary knowledge of the inhabitants of Marajó Island, Eastern Amazonia, Brazil.

[33] Teklehaymanot and Giday (2007). Ethnobotanical study of medicinal plants used by people in Zegie Peninsula, Northwestern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*. 3: 12.

[34] Tekle Y (2014). An ethno-veterinary botanical survey of medicinal plants in Kochore district of Gedeo Zone, Southern Nations Nationalities and Peoples Regional State (SNNPRs), Ethiopia. Journal of Scientific and Innovative Research 2014; 3 (4): 433-445.

[35] Tekle, Y. (2015b). Medicinal Plants in the Ethno Veterinary Practices of Bensa Woreda, Southern Ethiopia. Open Access Library Journal, 2: 1258.

[36] Hunde, D., Zemede Asfaw and Ensermu Kelbessa (2006). Use of traditional medicinal plants by people of 'Boosat' sub district, Central Eastern Ethiopia. *Ethiopian Journal of Health Science* 16 (2): 141-155.

[37] Alemayehu G., Asfaw Z., Kelbessa E (2015). Ethnobotanical study of medicinal plants used by local communities of Minjar-Shenkora District, North Shewa Zone of Amhara Region, Ethiopia. *Journal of Medicinal Plants Studies*, 3 (6): 01-11.

[38] Kebu B., Ensermu K.., Zemede A (2004). Indigenous medicinal utilization, management and threats in Fentale area, Eastern Shewa, Ethiopia. Ethi. J. Bio. Sci., 3: 1-7.

[39] Yirga G (2010b). Ethnobotanical Study of Medicinal Plants in and Around Alamata, Southern Tigray, Northern Ethiopia, Current Res J. Bio. Sci., 2 (5): 338-344.

[40] Lulekal E., Asfaw Z., Kelbessa E., Van Damme P (2013). Ethnomedicinal study of plants used for human ailments in Ankober District, North Shewa Zone, Amhara region, Ethiopia. J Ethnobiol Ethnomed, 9: 63.

[41] Maryo M., Nemomissa N., Bekele T. (2013). An ethnobotanical study of medicinal plants of the Kembatta ethnic group in Enset-based agricultural landscape of Kembatta Tembaro (KT) Zone, Southern Ethiopia. *Asian Journal of Plant Science and Research*, 5 (7): 42-61.