# Medicinal plants and non-plant remedies used in the treatment of livestock ailments in Dawuro Zone, Southwestern Ethiopia

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## Abstract

Ethnoveterinary medicine is part of indigenous knowledge that has been used for many centuries in the world, particularly in developing countries. Owing to its history and wider utility in our society, a survey on ethnoveterinary practice was undertaken between October 2018 and December 2019, to assess and document this traditional practice in the treatment of livestock ailments in the Dawuro zone. Data on the type of herbs/shrubs and other non-plant consumables or materials were gathered from purposively selected 81 informants using a semi-structured questionnaire. Focus group discussions, participant observations, and field trips were also made. Data obtained from the questionnaire survey were analyzed using descriptive statistics and quantitative ethnobotanical methods. Samples of plants claimed to have medicinal value were collected and botanically identified. The study revealed that 92 plant species belonging to 44 families were in use. The family Asteraceae was the most frequently reported species (11.4%). Herbs (31.7%) were the main source of traditional prepared medicine followed by shrubs (31.5%). The leaves (40.5%) and roots (34.5%) were more commonly utilized parts of plants while pounding (78.8%) was the major formulation. Among the non-plant materials, bear faeces, sharp hot iron or wire/knife, and common salt showed the highest utility level (100%). *Azadirachta indica* was the most preferred species to treat blackleg and also with the highest use value (UVs=0.36). The study revealed that the local communities of the study areas were rich in indigenous knowledge of ethnoveterinary practices. Thus, a strong protective policy is needed to safeguard the plant species; and develop regulations in the applications of ethnoveterinary knowledge. Moreover, bioactive validation of plant chemical

content, along with testing for efficacy and safety would be part of indispensable technicalities for rational utility in the future.

**Keywords:** Dawuro zone; Ethnoveterinary Practice; Medicinal plant; Non-plant Remedies.

## Introduction

Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine, and general utility including tremendous botanical expertise. This implies that humans are dependent on other organisms for their life. Although various animal and mineral products contribute to human welfare, the plant kingdom is essential to human well-being, especially in supplying basic needs (Martin, 1995). The modern animal health care system is still at its lowest point in the country characterized by a lack of adequate clinics, workforce, and drug supplies. Furthermore, most conventional drugs are prohibitively expensive for the majority of Ethiopian farmers and pastoralists (Wabe *et al*., 2011; Kalayou *et al*., 2012; Melaku *et al*., 2014).

Therefore, the majority of Ethiopian farmers and pastoralists rely on traditional knowledge, practices, and plants to control livestock diseases (Giday and Teklehaymanot, 2013; Lulekal *et al*., 2014). On the other hand, non-plant materials are also reported to be used in ethnoveterinary management here in our country and elsewhere. In this regard, the Fulani pastoralist in Nigeria uses wood ash, honey, oils, kerosene, kaolin, potassium, local soap, and spent engine oil (Alhaji and Babalobi, 2015). The use of animals tissue (Ferreira *et al*., 2009; Volpato *et al*., 2015), salt, plant charcoal, alcohol, sugar, bee honey, and buffalo milk in eastern Amazonia of Brazil is not uncommon (Monteiro *et al*., 2011). The use of spent engine oil in the management of wounds, kerosene for foot rot, and local soap as a disinfectant in animals were also reported by McCorkle (1995). In light of its historical value and wider utility, Ethnoveterinary medicine should have been given special attention to its therapeutic potential development and low-cost alternative for allopathic medications (Matekaire and Bwakura, 2004), and could have contributed to the discovery of new drugs (Monteiro *et al*., 2011).

However, this indigenous knowledge, medicinal plants, and non-plant materials used in the treatment are not properly documented. Often handed down orally from generation to generation. The knowledge about plant use and the method of preparation is often kept secret (Gebrezgabiher *et al.*, 2013; Lulekal *et al.*, 2014). In addition, the loss of valuable medicinal plants due to population pressure for settlement, agricultural expansion, deforestation, overgrazing, and over-harvesting is alarmingly growing in Ethiopia (Fenetahun and Eshetu, 2017; Kebebew and Mohamed, 2017).

Despite the challenge, herbal and nonherbal materials used for animal disease treatment is a common traditional practice in Ethiopia. In this regard, Borena pastoralists and highlanders in Oromia consider ethnoveterinary medicine as one of the animal health service alternatives (Sori *et al.*, 2004; Amenu, 2007; Yigezu *et al.*, 2014). Likewise in Afar (Seifu *et al.*, 2006; Giday and Teklehaymanot, 2013; Teklehaymanot, 2017); in Tigray (Gebrezgabiher *et al.*, 2013; Teklay, 2015), in Amhara (Lulekal *et al.*, 2014); and some parts of southern region (Tekle, 2014; Eshetu *et al.*, 2015) evidence of its utility are available. To our knowledge, study on the ethnoveterinary practices of herbal and non-plant source medicine is uncommon in the Dawuro zone. Even though the practice is widely known among the traditional community. Therefore, the present study aimed to assess and document ethnoveterinary medicinal plants and non-plant materials used in the management of livestock ailments in the Dawuro zone, Southwestern region.

## Materials and methods

### Description of the study area

The present study was conducted in two selected districts of Dawuro zone, Southwestern region, Ethiopia: Tocha and Mareka districts representing similar agro-ecologic zone (highland, midland, and lowland) altitudes. The indigenous people inhabiting the area belong to the Omotic ethnic group. They speak *Dawurotsuwaa*, the local language of the area. Tocha Idiget is the administrative capital of the Tocha district lies between $6^0$ 97` to $7^0$ 25` North of latitude and $36^0$ 81` to $37^0$ 14` East of longitude with an elevation ranging from 501-3000 meters above sea level. The mean annual temperature ranged from 15.1-25 $^0$C and the mean annual rainfall ranged from 1401-1800 mm. The total human population of the district is 124, 472; of which are males (68, 109) and females (56, 363). The livestock population reared in the district comprised cattle (154, 218), sheep (165, 571), goats (86, 243), donkeys (14, 472), horses

(9, 260), mules (10, 127), and poultry (188, 734) (Dawuro Zone Finance and Economic Development Department, 2017, unpublished).

Mareka district is one of the ten districts of the Dawuro zone. Waka is the administrative capital of the Mareka district and is located at $6^0$ 97` to $7^0$ 21` North of latitude and $37^0$ 01` to $37^0$ 26` East of longitude and its altitude ranges from 1401-2300 meters above sea level. It has a total human population of about 161,621. Of the total population, the males and females were 83,399 and 78,222, respectively. The mean annual temperature and rainfall are 15.1-25 $^0$C and 1401-1800 mm, respectively. The district's livestock population comprised cattle 134,290 sheep 145,451, goats 44,568, horses 10,350, mules 10,926, donkeys 18,321, and poultry 185,418 (Dawuro Zone Finance and Economic Development Department, 2017, unpublished). The map of the study area is depicted in Figure 1**.**

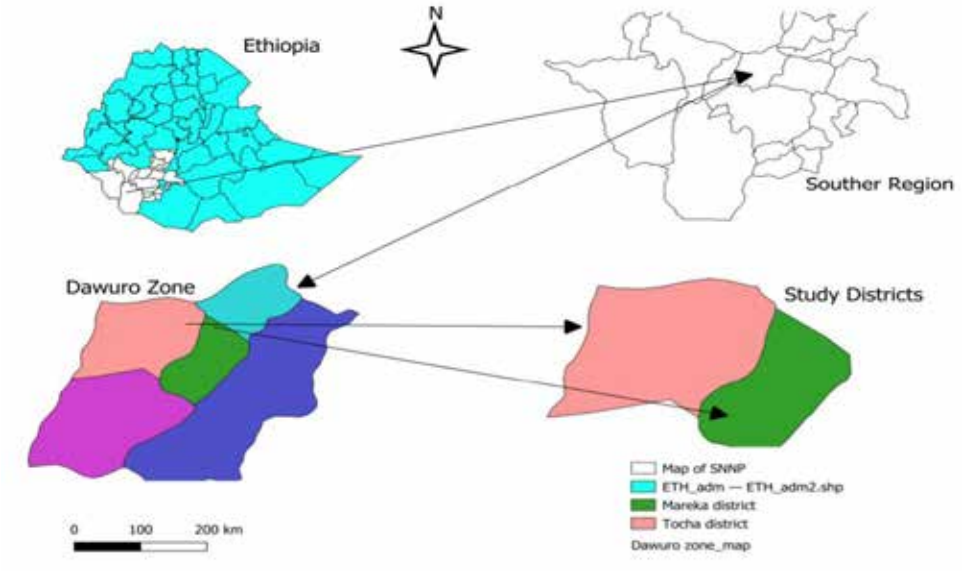


**Figure 1. Map of the study area**

## Sampling method and specimen collection

A cross-sectional ethnoveterinary survey was conducted between October 2018 and December 2019, in ten *kebeles* (Peasant Associations) in Tocha and Mareka districts. A purposive sampling strategy was used to select informants

and study districts based on the wide use of ethnoveterinary practices and the availability of traditional healers. Ethnoveterinary data was collected from 81 informants (76 males and 5 females): 50 informants from Tocha and 31 informants from Mareka districts based on the availability of traditional practitioners. A face-to-face interview was made by using pre-tested semi-structured questionnaires prepared in English and translated into the *Dawurotsuwaa* local language. The interviews addressed questions regarding age (young [20-35 years], middle age [36-45 years], and adult/old [above 45 years]), gender (male, female), level of education (unable to read and write, able to read and write, elementary[1-8 grade]), secondary [9-12 grade]), above 12 grades]), occupation (government employee, farmer, trader), religion (orthodox, protestant, catholic), local names of medicinal plants, ailments treated, the habit of the species, sources (wild/cultivated or both), parts used, methods of preparation, dosage formulation, routes of administration, noticeable side effects of remedies, use of antidotes for side effects, source of knowledge, ways of indigenous knowledge transfer, and other uses of species mentioned were recorded. Each informant was separately interviewed in their local languages to keep the secrecy of their indigenous knowledge. In addition, 10 focus groups (6-10 participants) discussions were undertaken to gain further information on medicinal plants' knowledge of the community and prove the reliability of the data collected through semi-structured interviews (Martin, 1995; Cotton and Wilkie, 1996; Tefera and Kim, 2019).

Field trips were made with local herbalists for the collection of the reported medicinal plants. Voucher specimens of medicinal plants were collected on the field with the help of traditional healers and field assistants. Collected medicinal plants were dried, numbered, pressed, labeled, and brought to the Ethiopian Herbarium for further botanical identification. Specimen identification and confirmation were undertaken by using Flora of Ethiopia. Finally, the specimens were deposited at the National Herbarium (ETH) at Addis Ababa University.

**Data management and analysis**

Ethnoveterinary data collected were entered, coded using MS Excel, and transferred to the Statistical Package for Social Sciences Software (SPSS, 20). A descriptive statistical method such as percentage, frequency, and tables was employed to analyze the data. In addition, the fidelity level analytical ap-

proach was also used in evaluating the plants and non-plant remedies in the study area. The fidelity level is mathematically expressed as FL = Ip/Iu × 100, where FL is the fidelity level of each plant or non-plant material, and Ip is the number of informants who mentioned that a plant or non-plant material has specific ethnoveterinary uses against a particular disease condition, and Iu is the total number of key informants who independently suggested that the same plant or non-plant material has any therapeutic uses (Alhaji and Babalobi, 2015). Furthermore, the direct matrix ranking and use value methods were undertaken to evaluate multipurpose tree/shrub, and herb species and their relative importance to the local people, and the extent of the existing threats related to their use values (Phillips and Gentry, 1993).

## Results

### Socio-demographic profiles and indigenous knowledge of ethnoveterinary plants

Eighty-one (81) well-knowledgeable informants were interviewed; of which 76(93.8%) were males and 5(6.2%) were females (Table 1).

**Table 1. Socio-demographic profiles of informants in the Dawuro zone**

| Profiles | Description | Number of respondents | (%) |
|---|---|---|---|
| Gender | Male | 76 | 93.8 |
| | Female | 5 | 6.2 |
| Age | 20-35 years (young) | 16 | 19.8 |
| | 36-45 years (middle age) | 21 | 25.9 |
| | Above 45 years (adults) | 44 | 54.3 |
| Marital status | Married | 76 | 93.8 |
| | Single | 3 | 4.3 |
| | Divorced | 2 | 2.38 |
| Occupation | Employee | 5 | 6.2 |
| | Farmer | 73 | 90.12 |
| | Trader | 3 | 3.7 |
| Education level | Unable to read and write | 38 | 46.9 |
| | Able to read and write | 2 | 2.5 |
| | Elementary (1-8 grade) | 27 | 33.3 |
| | Secondary (9-12 grade) | 7 | 8.6 |
| | Above 12 grades | 7 | 8.6 |

| Profiles | Description | Number of respondents | (%) |
|---|---|---|---|
| Religion | Orthodox | 44 | 54.3 |
| | Protestant | 35 | 43.2 |
| | Catholic | 2 | 2.5 |

In this study, a total of 92 plant species reported to be used belonging to 44 families of medicinal plants were collected and identified for ethnoveterinary treatments of a wide range of livestock health problems. The best representation of ethnoveterinary species of the family Asteraceae with 10 species is the highest, followed by Fabaceae, Lamiaceae, and Euphorbiaceae, respectively. The reported medicinal plants and their respective indications, preparation, and parts used for preparation (additional file). Most (58.2%) of the traditional medicinal plants were harvested from a wild source. The area's most commonly used plant parts for herbal preparations were leaves (40.5%) followed by roots (34.5%).

## Methods of preparation, routes of administration, and dosages variation and side effects

Different methods of preparation and application for different types of ailments were employed. As presented in Figure 2 herbal remedies were prepared mainly as pounding and homogenizing with water followed by crushing and grounding using either single or combining different plants.

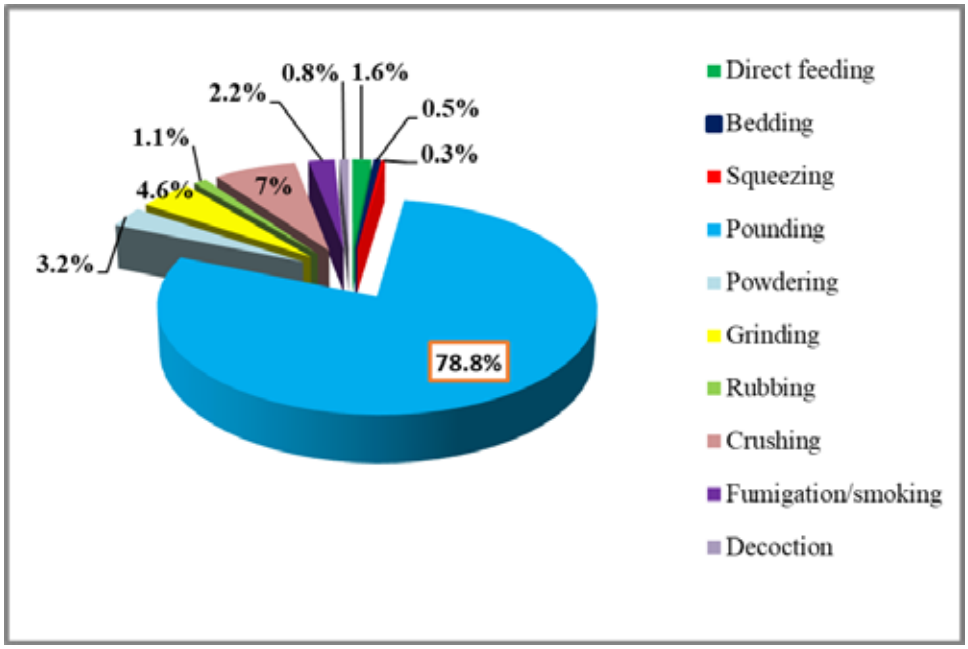


**Figure 2. Modes of remedy preparations in the Dawuro zone**

There was no standardized dosing; weight measurements and treatment duration were set by traditional healers on the number of herbal prescriptions for different livestock ailments. Due to the lack of standardized doses of herbal preparations, traditional herbalists observed some symptoms of side effects of herbal preparations on their animals in the study area such as shock and lacrimation. On the other hand, different utilizations of medicinal plants other than their ethnoveterinary roles were recorded. Of the total, 20.5% were for human disease treatment followed by firewood (7.1%) and construction (5.7%). About 93% of traditional practitioners reported that there are no taboos associated with the use of medicinal plants while few herbalists (7%) preferred days and times for plant collection like Sunday and Wednesday, and in the early morning without contact with any person.

## Fidelity level, use value, and direct matrix ranking

Concerning fidelity level value, *Cyphostema* sp. and *Pentas schimperiana* showed the highest fidelity level value (100%) for diseases of the reproductive

system like mastitis and retained placenta, ectoparasites infestations (tick, lice, and leech), and fattening and bone fracture. Under the infectious therapeutic category, the highest fidelity level value was recorded for *Eucalyptus globulus* L. (91.67%) and *Croton macrostachyus* (90.9%) also showed a relatively high healing potential record under the wound and traumatic injuries disease category (Table 2).

**Table 2. Fidelity level (FL) of medicinal plants commonly reported against a given veterinary ailments category in the Dawuro zone**

| No | Scientific name | Local name | Therapeutic category | IP | IU | FL% |
|---|---|---|---|---|---|---|
| 1 | *Azadirachta indica* | *Mimmiyaa mitsa* | Infectious/Blackleg | 25 | 29 | 86.2 |
| 2 | *Aloe otallensis* Baker | *Godare utsa* | Diseases of the respiratory system | 9 | 11 | 81.8 |
| 3 | *Cyphostema* sp. | *Higishsha d'aliya* | Diseases of the reproductive system/ Mastitis | 22 | 22 | 100 |
| 4 | *Croton macrostachyus* | *Anka* | Wound and traumatic injury | 20 | 22 | 90.9 |
| 5 | *Ageratum conyzoides* | *Kirkissa* | Diarrhea /dysentery | 9 | 11 | 81.8 |
| 6 | *Capsicum frutescens* | *Mis'imis'uwa* | GIT parasitism | 14 | 16 | 87.5 |
| 7 | *Echinops kebericho* | *Burssa* | Snake poising | 11 | 14 | 78.6 |
| 8 | *Pentas schimperiana* | *Dawuridama/ Dalbantsaa* | Fattening and bone broken | 22 | 22 | 100 |
| 9 | *Vernonia amygdalina* | *Gara* | Anti-trypanosomosis and tsetse fly control | 14 | 21 | 66.7 |

*IP =Number of informants who use a species for a specific ailment; IU = Total number of informants who mentioned the plant for any other use, FL=Fidelity Level*

Among the 92 identified plants, 465 reports of ethnoveterinary use were recorded. The species with the highest use-value were "*Mimmiya mitsa*" (*Azadirachta indica*) (UVs= 0.36) followed by "*Botsa Barzaafiya*" (*Eucalphytus globules*), and "*Higishsha d'aliya/Ba'oo*" (*Cyphostema* spp.) (UVs = 0.29), and the plants with 0.025 were considered as the lowest use-value by informants. Direct matrix ranking was undertaken to evaluate the multipurpose tree species, their relative importance to the local people, and the extent of the existing threats related to their use values (Table 3). The results of direct matrix ranking showed that *Arundinaria alpine* and *Eucalyptus globulus* L. were ranked 1st and 2nd, and hence are the most preferred medicinal plants by local people for multipurpose uses and are the most threatened species as the informants

reported while *Maesa lanceolata* and *Prumnas africana* were the least ranked species in multi-purpose importance in the study area.

**Table 3. Average scores for direct matrix ranking of eight medicinal plant species based on their general use values (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used, and o= not used)**

| Plant species | Use categories | | | | | | | | | Total | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Medicine | Construction | Forage | Furniture | Food | Fencing | Charcoal | Shade | Firewood | | |
| *Azadirachta indica* | 5 | 4 | 0 | 0 | 0 | 3 | 0 | 5 | 5 | 22 | 5th |
| *Croton macrostachyus* | 5 | 4 | 0 | 3 | 0 | 1 | 2 | 0 | 5 | 20 | 6th |
| *Eucalyptus globulus* | 5 | 5 | 0 | 3 | 0 | 5 | 0 | 4 | 5 | 27 | 2nd |
| *Juniperus procera* | 3 | 4 | 0 | 5 | 0 | 3 | 0 | 5 | 4 | 24 | 4th |
| *Maesa lanceolata* | 4 | 2 | 0 | 0 | 0 | 0 | 4 | 0 | 5 | 15 | 8th |
| *Prumnas Africana* | 2 | 4 | 2 | 1 | 0 | 1 | 2 | 2 | 4 | 18 | 7th |
| *Syzygium guineense* | 3 | 4 | 0 | 2 | 4 | 0 | 4 | 4 | 5 | 26 | 3th |
| *Arundinaria alpine* | 4 | 5 | 5 | 5 | 0 | 5 | 0 | 1 | 5 | 30 | 1st |
| Total | 31 | 32 | 7 | 19 | 4 | 18 | 12 | 21 | 38 | 182 | |
| Rank | 3 | 2 | 8 | 5 | 9 | 6 | 7 | 4 | 1 | | |

## Non-plant remedies used in livestock health management

In this study, the community depended on traditional medicines for the primary livestock healthcare system. The traditional non-botanical ethnoveterinary practices are used in managing other cattle disease conditions as depicted in (Table 4).

**Table 4. Fidelity level (FL) value of non-plant remedies used to treat livestock ailments in the Dawuro zone**

| S/N | Materials | Local name | Ethnovet erinary uses | IP | IU | FL (%) |
|---|---|---|---|---|---|---|
| 1 | Hyena faeces, Wood ash | *Babark'iya shi'aa*, *bidintsaa* | Listeriosis, evil eye | 8 | 10 | 80 |
| 2 | Kerosene | *Laambbaa* | Tick expulsion | 6 | 8 | 75 |
| 3 | Dear feaces | *Babantsaa shi'aa* | Blackleg | 5 | 5 | 100 |
| 4 | Hot wire/knife | *Ho'oo biraata/ Mashaa*) | Blackleg | 10 | 10 | 100 |
| 5 | Porcupine meat | *K'us's'ariya ashhuwa* | Blackleg | 17 | 19 | 89.5 |
| 6 | Milk | *Maatsaa* | Plant poising | 6 | 6 | 100 |
| 7 | Fermented kocho | *C'aalaa unc'c'a* | Stomatitis, Foot and Mouth Disease | 5 | 10 | 50 |
| 8 | Porridge and the end product of local kocho (*Ensete ventricosum (Welw.) Cheesman*) | *Shendeerannee Zaalima* | Antidotes, antitoxic for plant poising | 8 | 9 | 89.5 |
| 9 | Oil, soap | *Zaayttiya* | Blackleg, bloat | 4 | 6 | 66.7 |
| 10 | Honeydew | *Degeriya eesaa* | Blackleg | 9 | 10 | 90 |
| 11 | Common salt | *Mas's'inniya/ as'uriyaa* | Mineral deficiency, fattening, appetizer | 6 | 6 | 100 |

## Discussion

The present study showed the rich knowledge of ethnoveterinary medicinal plants in the Dawuro zone that was indicated by the number and diversity of plants reported. The number of plants reported by females was ranging from 2 to 8 and by males from 2 to 15 plants indicating both men and women members of the community have good knowledge of medicinal plant use. This finding did not agree with other studies conducted in the country (Giday *et al*., 2009; Lulekal *et al*., 2014; Teklehaymanot, 2017) reported that men had more knowledge of plant usage because they are naturally selected during childhood to be apprentices of ethnoveterinary practices.

In this study, the knowledge regarding the treatment of animal ailments was relatively comparable between different age groups. In other studies, however, it was observed that the number of medicinal plants reported increased with age, and the older informants reported more medicinal plants than younger individuals (Begossi *et al*., 2002; Teklehaymanot, 2009; Monteiro *et al*., 2011; Usmane *et al*., 2016). This could be related to the curiosity and knowledge of the elderly herbalists with curative plants than that of younger individuals in the community. Informants who could not read reported more medicinal plants than literate members did. This might be oral transfer, the influence of modernization and technological changes, and a lack of curiosity by educated generations to acquire indigenous knowledge like their fore parents (Monteiro *et al*., 2011; Lulekal *et al*., 2014). This finding is in agreement with the previous studies in Ethiopia (Seifu *et al*., 2006) and elsewhere in the world (Tariq *et al*., 2014; Randrianarivony *et al*., 2017) who reported as the majority of informants are illiterate while only a few of them reached the high school diploma level.

Oral transfer and secrecy on the acquisition of knowledge on ethnoveterinary practices within the study districts, most of the time-tested indigenous knowledge of the herbalists' passes away might also explain the decline of indigenous knowledge going down the generation ladder. This result agrees with other findings in Ethiopia (Lulekal *et al.,* 2008; Yineger *et al*., 2008; Giday *et al*., 2009; Teklehaymanot, 2009; Gebrezgabiher *et al*., 2013) and elsewhere in other countries (Begossi *et al*., 2002; Uniyal *et al*., 2006; Silva *et al*., 2011) share a similar concern on the knowledge gap down generations in different cultural groups.

The family Asteraceae was the best representation of plant species followed by Fabaceae and Solanaceae. The wider utilization of the Asteraceae family might be due to its plenty in the study area or high bioactivity (Tariq *et al*., 2014). This finding was, however, different from that of (Offiah *et al*., 2011; Tekle, 2014) who in an ethnoveterinary survey reported Solanaceae and Fabaceae families were the best use. The difference among studies might be related to the different dominant vegetation of the areas or might be associated with traditional beliefs of different cultures in using traditionally specific plants.

The present findings showed that the most commonly used medicinal plants in the study area are herbs followed by trees in the preparation of treatment. The present finding was in contrast with other investigators (Bekalo *et al*., 2009; Mesfin *et al*., 2009) who reported the dominance of shrub species for

ethnomedicinal preparation in Ethiopia. The variation might be related to different ethnolinguistic groups in the country and could be attributed to the wide agroecological diversity and specific indigenous knowledge of different communities.

The finding showed that leaves were the most harvested plant parts followed by roots in the treatment preparation. This finding is in line with the results of other ethnomedicinal studies (Amenu, 2007; Monteiro *et al*., 2011; Ugulu, 2012; Agize *et al*., 2022). The first line of choice for leaf might be associated with traditional beliefs in communities about no difficulty of collection, easy preparation, and effectiveness and efficacy against ailments. The dose administered often varied with the parts of the plant used and the methods of preparation. In this study, the majority of the treatments are taken orally as also reported earlier in other parts of Ethiopia (Lulekal *et al*., 2014; Kebede *et al*., 2017).

The physical manifestation of the diseased animal and visually confirmed degree of severity of illness are used to determine preparation doses to treat livestock ailments. Due to the lack of standardized doses of herbal preparations, traditional practitioners observed some side effects and symptoms of herbal preparations on their animals in the study area like shock and lacrimation. For example, the high amount of *Azadirachta indica* A. Juss. and *Solanum incanum* L. administered might cause noticeable side effects. However, no death cases were reported by the informants because they use different traditional antidotes like drinking and sprinkling cold water immediately on the body of animals especially the forehead region, milk, porridge, and the end product of traditional *kocho* fluid "*Zaalima*" to manage plant side effects.

In this study, traditional healers prepare ethnoveterinary recipes mostly in the forms of pounding and homogenizing with water followed by crushing. This finding is in agreement with those (Legesse; 2010; Lulekal *et al*., 2014; Eshetu *et al*., 2015) who reported pounding the remedial part and homogenizing it with water was found to be the major mode of remedy preparation. The present study showed that the claimed medicinal plants have values other than their medicinal roles. The community uses them for different purposes such as human disease treatment, firewood, construction, timber production, animal fodder, fence, edibles, spices, and other uses such as agricultural tools and soil conservation. This finding is similar to other studies from different parts of Ethiopia (Amenu, 2007; Tekle, 2014; Kebebew and Mohamed, 2017).

The results also revealed that few traditional herbalists preferred days and times for plant collection like on Sunday and Wednesday and in the early morning without contact with any person, which they believe, could make the treatment more efficacious to cure diseases. Nearly similar findings were reported from the Ejaji area (Chelya Woreda) in West Shoa. Amenu (2007) pointed out that medicinal plant collection and provision were restricted to and done on Sunday, Wednesday, and Friday. However, the majority of traditional healers reported that there is no taboo association with medicinal plant collection and uses in the study area. This result is in line with the finding from other parts of Ethiopia (Yineger *et al*., 2008).

Highest fidelity level values were obtained for *Cyphostema* sp. for diseases of the reproductive system, *Calpurnia aurea* for ectoparasites, and *Pentas schimperiana* for fattening and orthopedic disease category accounts followed by *Eucalphytus globules* for the infectious/blackleg disease category and *Croton macrostachyus* for the wound and trauma category. This indicates the relatively high healing potential of the species for treating ailments under the respective categories. The highest FL might be related to the cited plant species with more healing power due to the presence of bioactive compounds for the respective ailments.

According to Monteiro *et al.* (2011), the use value is a quantitative method that demonstrates the relative importance of species locally known. This method can be used to choose species for garden cultivation or to create medical works with scientific backing. Results showed that *Azadirachta indica* and *Eucalyptus globulus* were the species with the highest use-value, probably because they are dominant vegetation and have high curative activity. The plant species cited by more than two informants are considered the most used medicinal plants (Randrianarivony *et al*., 2017).

Direct matrix ranking analysis indicated that *Arundinaria alpine* and *Eucalyptus globulus* were ranked 1st and 2$^{nd}$, and hence are the most preferred medicinal plants by local people for multipurpose uses and are the most threatened species as the informants reported while *Maesa lanceolate* and *Prumnas Africana* were the least ranked species in multipurpose importance in the study area.

There is an abundant undocumented traditional knowledge of non-plant materials used to treat a wide range of livestock diseases in the study area that had

a significant effect on animal health practices. The survey also revealed that eleven non-plant remedies were used in the Dawuro zone. Some of the non-plant materials reported include hyena faece, wood ash, honeydew, oils, kerosene, local soap, salt, porcupine meat, dear faece, sharp hot iron or knife, milk, fermented *kocho* (*Ensete ventricosum*), porridge and the end product of *Ensete ventricosum* fluid traditionally called *Zaalima* which they believed were effective in ethnoveterinary management. Nearly similar ethnoveterinary studies conducted in Nigeria (Alhaji and Babalobi, 2015) share a similar concern on the knowledge of non-plant remedies found that sharp hot iron or branding for treatment of blackleg and inflammation due to trauma, salt used for appetite promotion, and vegetable oil for managing bloat. However, hyena faece, wood ash, dear feaces, porcupine meat, fermented *kocho* or *C'aalaa unc'c'a*, the end product of local kocho fluid (*Zaalima*), and honeydew have not been reported before another ethnoveterinary survey of non-plant remedies used in Ethiopia.

According to Souto *et al*. (2011), the use of zootherapy for medicinal purposes is part of a body of traditional knowledge that is increasingly becoming more relevant to discussions on conservation biology, public health policies, sustainable management of natural resources, biological prospection, and patents. From this perspective, the present study was also undertaken to document information about local ethnoveterinary practices by traditional herbalists in the Dawuro zone. Accordingly, the products and parts of porcupines, hyenas, cattle, bears, and aphids (insects) were used by the community in ethnoveterinary practices. Other studies have likewise highlighted these medicinal animal products used in ethnoveterinary practices from other parts of the world (Padmanabhan and Sujana, 2008; Souto *et al*., 2011; Vats and Thomas, 2015).

The driving factors for medicinal plants and non-plants use as ethnoveterinary treatments were easy accessibility, an inadequate number of formal veterinary clinics and veterinarians, primary healthcare system, apparent effectiveness, lack of adequate modern drugs supplies, long distance to veterinary clinic station, affordability, and low cost, and outbreaks; available in the area that would never be enough to provide healthcare services for more than 3,543,417 livestock population in the area. Moreover, almost all of the rural community lives in marginal areas which are not easily accessible to the rare modern veterinary services which are also known for their scorching prices unaffordable to the less economically endowed people living there. This finding is similar to the work of (Wabe *et al*., 2011; Lulekal *et al.,* 2012) in Ethiopia, South Africa (Soyehu and Masika, 2009), and Brazil (Souto *et al*., 2011).

## Conclusions

The present study showed that the Dawuro community used a wide range of plant species for ethnoveterinary medicine purposes. A total of 92 plant species belonging to 44 families were documented; of which the family *Asteraceae* represented 10 species. Herbs and leaves were the most commonly used plants and plant parts, respectively. *Cyphostema* sp. and *Pentas schimperiana* showed the highest fidelity value as plant materials while dear feaces, and milk as non-plant remedies. Hotwire/knife were materials used for branding or any other manipulation. In a nutshell, this study attempts to contribute a piece of evidence for ethnoveterinary practice documentation, which could be instrumental for future scientific studies. However, the loss of indigenous knowledge due to oral transfer by and large; and the unwillingness of elder herbalists to share their knowledge, requires immediate intervention. Therefore, strong government policy support to safeguard plant species is indispensable. Besides, there is a need for research and development in the applications of ethnoveterinary knowledge; and evaluation of bioactive material in the plant material with safety, efficacy, and toxicity level.

## Ethical approval

This study was approved by the Ethical and research review Board of the Office of Jimma University, College of Agriculture and Veterinary Medicine. The consent of each respondent was asked verbally to participate in the study. Consequently, the confidentiality of their traditional property owners was completely maintained during data collection.

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