Ethnobotanical study of medicinal plants used to treat livestock ailment in Delomena district southeast Ethiopia.

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Abstract

Traditional knowledge on the use of medicinal plants is in danger of extinction because of different changes taking place all over the world including Ethiopia and thus there is a need for its immediate documentation for the purpose of conservation, sustainable utilization and development. Thus, an ethnomedical study was conducted in Dalomana District, Oromia Regional State of Ethiopia to document and analyze local knowledge on medicinal plants used for the treatment of animal diseases. The overall objective of the study were to investigate ethnomedical of traditional medicinal plants used to treat livestock diseases in Dalomana district, Bale Zone, Oromia, Ethiopia. Data were collected between June, 2021 and February, 2022 mainly through semi-interviews conducted with purposively selected informants. Data collected mainly included demographic information of respondents, local names of medicinal plants, plant parts used, preparation methods, mode of applications, diseases treated, and habit and habitat of the reported plants. Based on data obtained through interviews, Informant Consensus Factor (ICF) values were computed. A total of 55 medicinal plants used to manage livestock ailment were reported by informants in the Dalomana District. Herbs were commonly used in the preparation of remedies. Leaf was the most frequently utilized plant part accounting for 49.1% of the total reported medicinal plants. The majority (69.0%) of the medicinal plants used in the study District were uncultivated ones mainly harvested from edges of forests and bushlands, roadsides, river banks and grasslands. High ICF values were obtained for ophthalmological (0.82), dermatological (0.79), febrile (0.77) and gastro-intestinal ailments (0.77). The current study shows that there is still rich traditional knowledge on the use of plants to control various animal diseases in study District. However, such claim needs to be scientifically verified with piority given to medicinal plants used in the treatment of ailment catagories with high ICF values as such plants are considered to be good candidates for further pharmacological evaluations.

Introduction

Ethnoveterinary medicine deals with people's knowledge, skills, methods, practices and beliefs about the care of their animals (Appelgren 2009) Ethnoveterinary knowledge is acquired through practical experience and has traditionally been passed down orally from generation to generation. Widespread interest in documenting and validating ethnoveterinary practices arose in the early 1980s. Since then, several studies have been carried out, many reports written and numerous conferences and workshops held. These activities have saved ethnoveterinary knowledge from extinction: most knowledge resided with elderly community members and disappeared as they died. The introduction of modern practices also made it difficult for the younger generations to appreciate and use the beliefs and practices of their forefathers. Despite recent efforts to promote the use of ethnoveterinary knowledge worldwide, much information is only documented in field reports and scientific publications (Ngeh et al., 2007). Plant resources have remained an integral part of human society throughout history. After fulfilling the primary needs like food and shelter, man has sought for a suitable remedy among plants for curing various diseases [WHO, 2002].
Traditional medicine is defined as indigenous medicine that is used to maintain health and to prevent, diagnose, and treat physical and mental illnesses differently from allopathic medicine based on theories, beliefs, and experiences (WHO, 2012). Traditional medicine has been used for thousands of years with great contributions made by practitioners to human health, particularly as primary health care providers at the community level and has maintained its popularity worldwide (WHO, 2012). According to Sofowora ([A. Sofowora, 2001) about 60–85% of the population in every country of the developing world has to rely on traditional medicine. The practice of traditional medicine is widespread in China, India, Japan, Pakistan, Sri Lanka, Thailand, and Korea (H. L. Park, et al., 2012). In China, traditional medicine accounts for around 40% of all health care delivered and is used to treat roughly 200 million patients annually (WHO, 1999).

In Ethiopia, plants have been used as a source of medicine from time immemorial to treat different ailments due to its long history, and traditional medicine has in fact become an integral part of culture (R. Pankhurst, , 1965). These traditional medical practices and remedies are recorded in oral tradition and in early medico-religious manuscripts and traditional pharmacopoeias, which, according to the estimates of some historians, date back to the 15th century AD (WHO,2001). Ethiopia possesses about 6,000 species of vascular plants which could be due to its different topography and climatic conditions (IBC,2012). About 80% of human population and 90% of livestock rely on traditional medicine in this country (PGRC 10). Traditional medicine of Ethiopia is commonly used to treat various human and livestock ailments. Traditional healers known by different names in different parts of the country are the primary players in the curative aspect of traditional medicine practice ( Kassaye 2006). Thus, this study were initiated to document the traditional medicinal plants knowledge accumulated by local communities of Delomena district. The importance of botanical products to treat livestock in relation to organic meat comparing to modern chemicals and accessible to small scale farmers because of its cost.

**Materials And Methods**

**Description of the Study Area**

Dallo Mena district is located in Oromia regional state, Bale zone and covers about 461,665 hectares. It lies between latitudes 5˚51’N and 6˚45’N, and longitudes 39˚35’E and 40˚30’E (Fig. 1). The altitude ranges from 1314 to 1508 m.a.s.l. The major soil type of the woreda is Nitosol which is the dominant soil in the area (Lulekal,. (2008) Climatically the area characterized by bimodal rainfall with the main rainy season occurring early March through June and the short rain late September through November. The mean annual rainfall is 986.2 mm and the mean annual temperature is 22.5˚C. According to 2007 Population and Housing Census of Ethiopia, the population number of Dallo Mena was 89,670 (CSA) (2012). The indigenous inhabitants of the area are

primarily Oromo peoples. In addition to this few ethnic groups Gurage and Amhara are also settled in the area. Dallo Mena forest has mixed broad-leaved and coniferous montane forest species. According to (IBC) (2005) classification, this forest is categorized as Dry Evergreen Afromontane forest type. The
dominant farming activities in Dallo Mena woreda is mixed farming systems, livestock and subsistence crop production farming.

**Sampling design**

A reconnaissance survey was conducted between June, 2021 and February, 2022. The study sites was selected depending on recommendation from elders, local authorities, and altitudinal range. Thus, the study was carried out in eight PA from two agro-climatic zones. Dallo Manna has 18 PA and from selected PA four are bada dare or semi pastoralist and four are pastoral from arid. A total of 60 participants (41 men and 19 women) were selected from the representative kebeles. Representative common participants and knowledgeable traditional medicine practitioners (key participants) of Delo Mena district were selected using random and purposive sampling approaches, respectively, following Martin (G. J. Martin, 1995). Twenty key participants were selected purposively and systematically based on the recommendations of knowledgeable elders, local authorities, and development agents. The selection of key participants were also based on the quality of explanations that particular participants gave during an interview. Local healers automatically qualified as key participants being traditional experts who are guardians of indigenous knowledge on medicinal plants.

**Ethnobotanical Data Collection.**

The standard data collection methods (G. J. Martin, 1995) have been followed to document indigenous knowledge of the local community on health, use, conservation, and threats of medicinal plants. The techniques employed for data collection was semistructured interviews, group discussion, guided field walks, and observations with participants. Semistructured interviews was undertaken based on checklist of questions prepared in English and latter translated to Afaan Oromo, the official language of the study area.. The interview was guided to cover the key topics on the checklist. The place and the time for interview was set based on the interest of the participants. Field observations was performed with the help of local guides on the morphological features and habitats of each medicinal plant species in the field. group discussions were made with participants regarding the use and threats to medicinal plants and on. Letter of consent was taken from Madda Walabu, prior to the data collections. Verbal consents were also obtained from the participants by performed group discussions about the objectives of the study prior to the interviews, and all data were collected through their oral consents. The voucher specimens were collected on site during guided field walk, numbered, pressed, dried, and deep frozen for identification. Identification of specimens were carried out both in the field and in the herbarium. Identification were also carried out using Flora of Ethiopia comparing with already identified specimens.

**Data Analysis**

The collected ethnobotanical data was entered into Excel spreadsheet and analyzed using descriptive statistical methods such as frequency and percentage, and presented in tables, and graphs. Moreover Preference ranking and paired comparison were computed following (M. Alexiades, "1996). Preference ranking was conducted for five important medicinal plants used to treat sick animal. Ten randomly
selected participants from total key participants were participated in this exercise to identify the best preferred medicinal plants for treatment of sick animal. In paired comparison, ten participants were selected and asked to choose the best item from every pair according to personal perception in treating wound. The total number of possible pairs (M. Heinrich, 1998) were obtained by applying the formula \( \frac{n(n-1)}{2} \), where \( n \) is the number of medicinal plants being compared. A total rank of paired comparison were obtained by summing the number of times each item were chosen. An item with the highest frequency of choices had the highest score. Direct matrix ranking is used to compare multipurpose uses of a given plant species based on information gathered from participants, number of multipurpose species were selected out of the total medicinal plants, and use diversities of these plants were listed for four randomly selected key participants to assign use values to each species. Informants consensus factor (ICF) were calculated for each category to identify the agreements of the participants on reported cures for the group of ailments.

**Result**

**Medicinal plants used and ailments managed**

The current study documented 55 medicinal plant species that were used in Dallomana District to manage several livestock ailments (Appendex 1). The plants were distributed across 36 families and 53 genera. Of the total medicinal plants reported, relatively higher numbers of medicinal plants belonged to the families Euphorbiaceae and Lamiaceae, each contributing five species. The families Fabaceae and Solanaceae contributed four medicinal plants each, and the families Acanthaceae, Asteraceae, Malvaceae, Ranunculaceae and Rubiaceae contributed two medicinal plants each. The rest of the families contributed one medicinal plant each. Herbs were the most commonly used ones in the preparation of remedies in the study District accounting for 32 species (58.2%), followed by shrubs (17 species; 30.9%) and trees (6 species; 10.9%). The highest number of medicinal plants (29 species) was used to manage gastro-intestinal complaints including bloat, colic, endoparasites infections and diarrhea which largely affect cattle, sheep and goats. Good number of medicinal plants was also used to treat febrile illness (9 species) and eye infection (5 species).

**Part used, methods of preparation and route of administration**

Leaf was the most commonly used plant part in the preparation of remedies accounting for 49.1% of the total reported medicinal plants, followed by those used for their root (21.8%) and seed (12.7%) parts (Fig. 1). Result shows that most (62.7%) remedies in the study District were prepared by crushing (Fig. 2). There was very little practice of storing plant materials for future use in the study District; plant parts were mostly harvested for their immediate uses. As a result, the majority (72.1%) of remedies were prepared from fresh plants materials. Only few were prepared from dry (22.9%) or dry or fresh (5.0%) materials.
Most (85.3%) remedies were processed with the addition of water. The majority (58.2%) of medicinal plants preparations were revealed to be administered orally, and some were administered dermally (19.5%), taken nasally (18.8%) or applied through the eyes (3.5%).

### 4.3 Informant consensus factor

ICF values were calculated for major disease categories against which at least five informant use reports were recorded. Accordingly, ophthalmological (0.82), dermatological (0.79), febrile (0.77) and gastrointestinal (0.77) ailments were found to be the major disease categories that scored high ICF values in the study District (Table 2).

### Habitat

The majority (69.0%) of the claimed medicinal plants in the study District were found to be uncultivated ones mainly harvested from edges of forests and bushlands, roadsides, river banks and grasslands. Few of the uncultivated ones were weeds growing in cultivated fields and homegardens. Some (31.0%) of the reported medicinal plants were cultivated in homegardens but primarily for other purposes. Only Ocimum lamiiifolium, Ocimum urticifolium and Lepidium sativum were cultivated in home gardens primarily for their medicinal uses.

### Comparison of knowledge of medicinal plants between different social groups

Analysis of data collected revealed significant difference (p < 0.05) in medicinal plant knowledge between the older (≥ 46 years of age) and the younger (< 46 years of age) people. The mean number of medicinal plants reported by the older people was 5.2 while that reported by the younger people was 3.0. The study further showed significant difference (p < 0.05) between males and females in the mean number of medicinal plants reported; 4.5 and 3.2 were the mean numbers of medicinal plants reported by males and females, respectively. However, there was no significant difference (p > 0.05), in the mean number of medicinal plants reported, between illiterate (4.3) and literate (4.1) people.

### Discussion

The number of medicinal plants (55 species) documented from Dallomana District that were used to manage several livestock ailments is comparable to a figure reported by a study conducted in Midakegn District of West Shoa Zone, to which also Ambo District belongs, which revealed the use of 60 medicinal plants to treat different livestock ailments (Kitata et al., 2017). On the other hand, the number of medicinal plants reported by the current study is much higher as compared to figures reported by studies conducted in different districts of three neighboring zones of the Oromia Region, namely Horro Gudurru, Jimma and East Wollega zones (Yigezu et al., 2014, Birhanu and Abera, 2015, Tadesse et al., 2014). Twenty eight medicinal plants were documented from East Wollega Zone (Tadesse et al., 2014), 25 medicinal plants were documented from Horro Gudurru (Birhanu and Abera 2015) and 21, 20, 19 and 14
medicinal plants, were recorded from Manna, Dedo, Kersa and Seka Chekorsa districts of the Jimma Zone, respectively (Yigezu et al., 2014). The fact that higher number of medicinal plants was reported from the study district as compared to some neighboring districts or zones could be attributed to the rich livestock population in the district as reported in Tamiru et al. 2014. The fact that Euphorbiaceae and Lamiaceae contributed higher number of plants to the medicinal plants flora of the study District may be related to their respective sizes in terms of the number of species each comprises in the Flora of Ethiopia. Euphorbiaceae and Lamiaceae are among the largest families in the Flora of Ethiopia and Eritrea containing 209 and 184 species, respectively (Gilbert, 1995 and Ryding, 2006). The relative richness of the two families in medicinal plants may also be related to their richness in some active principles. The common use of herbaceous plants in the study District in the preparation of remedies could be attributed to the better abundance of the same as compared to other life forms as was also observed by the investigators of the study during their visits to the study area. The common use of herbs was also reported by other ethnoveterinary studies carried out in Midakegn District of West Shewa Zone (Kitata et al., 2017) and some districts of Horro Gudurru (Birhanu and Abera, 2015) and East Wollega (Tadesse et al., 2014) zones. The use of high number of medicinal plants for the treatment of gastro-intestinal complaints could be an indication of high prevalence of this ailment category in the study District. According to Bacha and Taboge (Bacha and Taboge 2003), gastrointestinal ailments are among the commonly occurring diseases in the study District. Leaf was the most commonly used plant part in the preparation of remedies, which is in agreement with studies conducted in other parts of the country (Birhanu and Abera 2015, Kitata et al., 2017, Tadesse et al., 2014). The wider use of leaves may be related to the fact it is much easier and faster to prepare remedies from such plant part. Most remedies in the study District were prepared by crushing, a method which is also commonly applied in the preparation of remedies elsewhere in the country (Belayneh et al, 2012, Bekele et al., 2018, Yirga et al., 2012, Teklay,2015 and Usmane et al., 2016). The common use of crushing in the preparation of remedies may be related to its easiness. Most remedies in the study District are prepared from fresh plants materials and other studies conducted in different parts of Ethiopia (Birhanu and Abera ,2015, Mohammed et al., 2016, Bekele et al., 2018, Usmane et al., 2016, Lulekal et al., 2014) also reported the common use of fresh materials. The wider use of fresh materials in remedy preparation could indicate the availability of most of the needed plant parts in the vicinity any season of the year. The common use of water as diluent in processing remedies in the study District may be related to its property in dissolving many active compounds. The fact that most remedies were administered orally could be attributed to the common occurrence of gastro-intestinal tract ailments in the study District. A study reveals that gastro-intestinal ailments are among the top animal health problems in the study District (Bacha and Taboge, 2003).

Ophthalmological, dermatological, febrile and gastro-intestinal ailments were the major disease categories that scored high ICF values in the study District and medicinal plants used against such ailments categories could be considered as good candidates for further pharmacological evaluation as they are expected to exhibit better potency as compared with those that are used to treat ailment categories with low ICF values (Heinrich et al, 1998).
The majority of the claimed medicinal plants in the study District were found to be uncultivated ones, which is in agreement with reports of other studies conducted elsewhere in the country (Birhanu and Abera, 2015, Bekele et al., 2018, Usmane et al., 2016 and Giday et al., 2013). The fact that the majority of medicinal plants were harvested from the wild indicates serious threat to the same amid ongoing deforestation and habitat destruction that are taking place in the country.

The fact that older people in the study District had better knowledge of medicinal plants as compared with the younger ones may indicate the problem medicinal plant knowledge transfer, across generations, is facing, which could be related to lack of interest by the younger generation to practice traditional medicine due to acculturation. Other Studies conducted elsewhere in different parts of the country also demonstrated that older people have better knowledge of medicinal plants as compared with younger ones (Gedif and Hahn, 2003, Lulekal et al., 2013). The reason why males had better knowledge of medicinal plants as compared with females could be related to the fact that, in Ethiopia, traditional medical practice is dominated by men which is rejected in the choice of knowledgeable people to transfer their knowledge along the male line (Teklehaimanot et al., 2009). There was no difference on knowledge of medicinal plants between illiterate people and literate ones as was also reported by study conducted in Ankober District of Amhara Region of Ethiopia (Lulekal et al., 2013).

**Conclusion And Recommendation**

The present study revealed rich knowledge on the use of medicinal plants for treatment of various livestock ailments in Dallomana District. It was found out that the highest number of medicinal plants was used to manage gastro-intestinal complaints, an indication of high prevalence of this ailment category in the area. Most remedies in the study District were prepared by crushing leaves and this may be related to their easiness. The majority of the claimed medicinal plants were found to be harvested from the wild and this indicates their serious threat amid ongoing deforestation and habitat destruction taking place in the country. The highest ICF value was obtained for ophthalmological problems. Thus, priority for evaluation should be given to medicinal plants used in the treatment of ophthalmological problems as medicinal plants used in the treatment of ailment with high ICF values are considered to be good candidates for further pharmacological studies.

**References**


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**Declarations**

Ethical Consideration Ethical clearance was obtained from the Institutional Review Board of Medawalabu University with the Ref. no EC118/2021. Furthermore, verbal informed consent was obtained from traditional healer and household individuals participated in the study, after explaining the purpose of the study in their local language (Afan Oromo). Data Availability The raw data used to support the findings of this study is available at correspondent author and accessed if requested. Conflicts of Interest The authors declare that they have no conflicts of interest. There is no conflict of interest. Funding No funding. Authors’ Contributions Sufian A. generated the idea, proposal, and paper write-up completed the paper, and analyzed data. Awal H. has taken part in paper write-up, data analysis, and edition of the manuscript. All authors read and approved final version of the manuscript and conceived the study. Acknowledgments The authors are thankful to Traditional healers who participate in study. Consent for publication Not applicable

**Tables**

All tables are available in the supplementary files section.
Figures

Figure 1

Map of Dallo Mena Woredas of Bale zone, Southeast Ethiopia.
Figure 2

Figure legend not available with this version.

Supplementary Files

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- Appendix.docx
- Table.docx