



# Assessment of indigenous knowledge of medicinal plants used for livestock treatment in five selected Kebeles of Kersa District, Jimma Zone, South Western Ethiopia

Emiru Chimdessa Gemechu\*

Oromia Agricultural Research Institute, Adami Tulu Agricultural Research Center, PO.Box.35, Ziway, Ethiopia

## ABSTRACT

Plants have been as source of medicine in Ethiopia from time immemorial to treat different human and livestock ailments. The purpose of this study was to identify the medicinal plant species and associated indigenous knowledge in livestock treatment. A cross-sectional study was conducted to assess indigenous knowledge of local people on medicinal plants used for livestock treatment in five selected kebeles of kersa district from March to June 2014. A total of 40 traditional healers (33 male and 7 female) 7-9 from each study sites were selected purposively with the help of knowledgeable elders, local authorities and kebele leaders. Ethno botanical data regarding plant species, plant parts used, livestock disease treated, and method of preparation and route of administration were collected through structured interview and field observation. A total of 33 plant species distributed in 24 families were identified in the study area. The majority of the medicinal plants 63.63% were collected from the wild and 33.33% from home garden. The major growth habit of the medicinal plants identified in the study area were herbs 39.39%, followed by shrubs 33.33%. The most frequently harvested plant parts were leaves and roots with proportion of 57.7% and 21.21%, respectively followed by seeds (9.09%) and fruits (6.06%). Pounding and crushing were the most commonly used method of remedies preparation where as the widely used method of administration is oral. The study reveals that the local people of the study area harvest medicinal plants used to treat livestock health problem from the wild habitat. Therefore, awaring the local people of the study area to conserve medicinal plants in their home garden is recommended.

**KEYWORDS:** Indigenous knowledge, Medicinal plant, Traditional healers, Traditional medicine

**Received:** May 20, 2021

**Revised:** July 19, 2021

**Accepted:** July 20, 2021

**Published:** Jul 27, 2021

**\*Corresponding Author:**

Emiru Chimdessa Gemechu,  
E-mail: [imiruchimdessa@gmail.com](mailto:imiruchimdessa@gmail.com)

## INTRODUCTION

In all countries of the world, there exists traditional knowledge related to the health of animals. In Africa, traditional healers and remedies made from plants play an important in the health of millions of animals (Rukangria, 2001), which is studied by ethno veterinary medicine. Ethiopia is leading in livestock population in Africa, with an estimated population of 43 million cattle, 2.3 million sheep, 18.6 goats, 17 million horse, 0.6 camels, and 34.2 million poultry, 4.5 million donkeys and 0.36 million mules (2006/7 CSA). However, livestock productivity is relatively poor owing to inadequate availability of feed, widespread diseases, poor health services and insufficient knowledge on the dynamics of the different farming systems in the country (Yirga and Hassen, 2000). Ethno veterinary medicine is frequently used for treatment of livestock diseases by many different ethnic groups in Ethiopia. Nearly 90% of livestock production in the country

use plant based traditional medicine as their major health care system (Endashaw, 2007). Ethno veterinary medicine studies traditional knowledge, folk beliefs, skills, methods and practices used for treatment of livestock ailments (Tabuti *et al.*, 2003). It offers medicines which are cheap and locally available than pharmacotherapy.

Because of the higher price of modern medicines and lack of accessibility to a modern veterinarian in the rural areas, farmers rely on traditional veterinary healers for treatment of livestock ailment (Harun-or- Rashid *et al.*, 2010). In addition, they believe that the medicinal plants were more efficacious for treating of livestock ailments than modern medicine (Harun-or- Rashid *et al.*, 2010). Various researchers in Ethiopia have reported the loss of valuable medicinal plants due to population pressure, agriculture and deforestation (Abebe, 2001; Getachew and Shiferaw, 2002; Yirga, 2006). For generations, the ethno

Copyright: © The authors. This article is open access and licensed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>) which permits unrestricted, use, distribution and reproduction in any medium, or format for any purpose, even commercially provided the work is properly cited. Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made.

veterinary practices to treat and control livestock diseases is an old practice in a large part of the world, particularly developing countries where animal health services are still very poor or land are found scarcely located at urban areas (Kokwaro, 1976; McCorkle, 1995; Sinha *et al.*, 2002). In Ethiopia people have been using plant species for medication of different animal diseases over centuries when there was no modern health service delivery. The practice was not stopped with introduction of modern pharmacotherapy and plant remedies are still the most important and sometimes the only sources of therapeutics for nearly more than 90% livestock population (Tadeg *et al.*, 2005; Giday *et al.*, 2009).

However, information on veterinary herbal medicine has not been systematically documented (Sori *et al.*, 2004) and there is a danger that knowledge will soon be lost as traditional social patterns are increasingly disturbed by globalization (Giday *et al.*, 2009), environmental degradation, agricultural expansion, cultivation of marginal lands and urbanization (Teklehaymanot & Giday, 2007; Lulekal *et al.*, 2008; Giday *et al.*, 2009) warranting urgent need to document and preserve indigenous knowledge (Kalayou *et al.*, 2012). Thus, there is a gap in the documentation and records on medicinal plants in all parts of Ethiopia including Kersa district, Jimma Zone, Oromia Region, South Western Ethiopia. Therefore, this study was conducted to assess and document medicinal plant species and associated indigenous knowledge in livestock treatment in the study area.

## MATERIALS AND METHODS

### Study Area and Period

The study was conducted in Kersa; one of the districts found in Jimma Zone, Oromia Region, and South Western Ethiopia from March to June 2014. Kersa is situated 18 km away to the North East of Jimma town and 328 km south west of Addis Ababa. The district is bounded by Limmu Kossa, Tiro Afetta, Omonada and Manna Dedo to the North, East, West and South respectively. The district has 31 kebeles and found on 1600 to 2400 m above sea level.

### Study Design

A cross-sectional study was conducted to assess indigenous knowledge of local people on medicinal plants used for livestock treatment.

### Site Selection

For the ethno botanical survey, a total of five selected kebeles (the smallest administrative units in Ethiopia) were selected purposively from the Kersa district based on the availability of transportation and their closeness to Jimma town which are found at an average distance of 8 km from Jimma town. These kebeles were Merewa, Babo, Kombolcha, Kuja Muja and Ankaso.

### Informant Selection

Selection of informants was performed following Martin (1995) who indicated that when recording indigenous knowledge held by knowledgeable traditional healers or by certain social groups the choice of informant is crucial. According to Storck *et al.* (1991) the size of the sample depends on the available funds, time and other reasons and not necessarily on the total population. Accordingly, a total of 40 informants (33 male and 7 female) 7-9 from each Kebele were selected purposively with the help of Kebele elders and Kebele leader.

### Method of Data Collection

Ethno botanical data were collected through structured questionnaire and field observation. The questionnaire were prepared in English and translated to Afaan Oromoo Language.

### Method of Data Analysis

The collected data were analyzed using Microsoft Office Excel spreadsheet and presented using table, charts and graphs.

## RESULTS

The collected data regarding plant species, parts used, source, preparation method, route of administration, and ways of transferring knowledge and source of healing practice were analyzed and presented as follow:

### Socio-demographic Characteristics of the Informants

In this survey, a total 40 informants of which 33 male and 7 female informants were involved. The age of the informants ranged from 30 to 75 but the majority of the informant's age range from 30 to 50. Regarding the educational status, the majority of the informants were not educated 33 but only 7 have education below grade 9 (Table 1). This shows that even though most of the traditional healers are not educated, they know more about medicinal plant than educated ones as indigenous knowledge on medicinal plants transferred orally and secretly from generation to generation.

### Medicinal Plants used for Livestock Treatment

A total of 33 medicinal plant species belonging to 24 families were reported to be used for treating livestock ailment in the study area. Out of 24 families, the family Fabaceae was represented the highest number of species (4 species, 12.12%). (Table 2).

### Source of Medicinal Plants

Regarding distribution of medicinal plants, out of 33 plant species, 22 (66.66%) were obtained from wild whereas 11 (33.33%) from cultivated (Table 3 & 7).

**Table 1: Socio-demographic characteristics of the informants**

Characteristics	Gender				Total
	Male	Percentage	Female	Percentage	
Age					
30-40	10	25	4	10	35
40-50	11	27.5	3	7.5	35
50-60	5	12.5	-	-	12.5
60-70	4	10	-	-	10
70-75	3	7.5	-	-	7.5
Total	33	82.5	7	17.5	100
Educational status	Frequency	Percentage			
0	33	82.5			
1-4	4	10			
5-8	3	7.5			
Total	40	100			

**Table 2: Medicinal plants families in the study area with the corresponding number of species**

Family	Number of species	Percentage (%)
Fabaceae	4	12.12
Solanaceae	2	6.06
Rutaceae	2	6.06
Euphorbiaceae	2	6.06
Asteraceae	2	6.06
Cucurbitaceae	2	6.06
Crassulaceae	1	3.03
Cupressaceae	1	3.03
Alliaceae	2	6.06
Brussulaceae	1	3.03
Spindaceae	1	3.03
Compositae	1	3.03
Miempismaceae	1	3.03
Phytolaccaceae	1	3.03
Myscinaceae	1	3.03
Oliniaceae	1	3.03
Viscaceae	1	3.03
Myrtaceae	1	3.03
Rununculaceae	1	3.03
Bignoniaceae	1	3.03
Lamiaceae	1	3.03
Moraceae	1	3.03
Piperaceae	1	3.03
Sapindaceae	1	3.03

**Table 3: Source of Medicinal Plants**

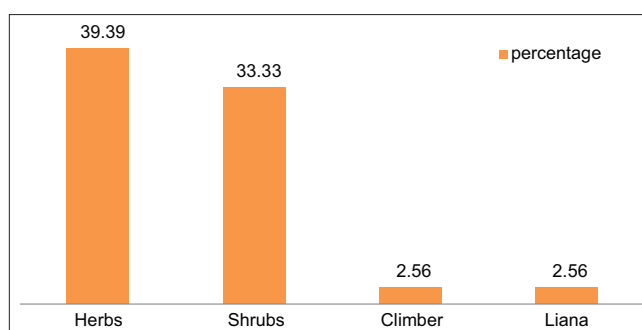
Source	Frequency	Percentage (%)
Wild	22	66.66
Cultivated	11	33.33
Both cultivated and wild	-	-
Total	33	100

## Growth Habit of Medicinal Plants

According to the interview result from the study area, herbs constitute the largest category 13(39.39%) followed by shrubs 11(33.33%) trees 7 (21.21 %), climber 1(2.56%) and lianal (2.56%) (Figure 1; Table 7).

## Plant Parts Used

According to the interview result in the study area, leaves are the most commonly used plants parts accounting for 57.57%

**Figure 1: Growth habit of medicinal plants**

followed by roots 21.21%, seeds 9.09%, fruits 6.06%, bark 3.03% and bulb 3.03% (Figure 2; Table 7).

## Method of Preparation

According to the interview result in the study area, pounding was the most commonly used method of preparation which accounts 48.48% followed by crushing 33.33%, powdering 12.12%, pulverization 3.03% and concoction 3.03% (Figure 3; Table 7).

## Routes of Administration

The major route of administration in the study area was oral 78.78% followed by dermal 9.09%, both nasal- oral 6.06% and oral-dermal 6.06% (Table 4; Table 7).

## Sources of Healing Knowledge

According to the interview result, most of the traditional healers of the study area reported the highest and most commonly cited sources of healing was from father mother, which accounts 7.5% (30) followed by wife husband 17.5% (7) and other neighborhoods 7.5% (3) (Table 5.2).

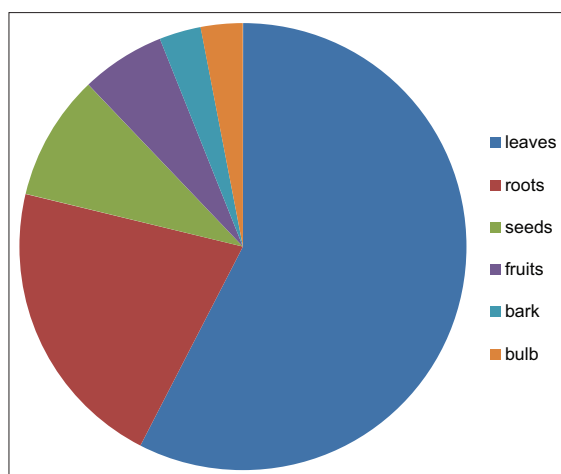
## Transferring Knowledge of Traditional Medicinal Plants

The informants from the study area reported that the highest number for the ways of transferring knowledge on traditional medicinal plants is to eldest son 19(47.5) followed by all children of the family 15(37.5%) and eldest daughter 6(15%) (Table 6).

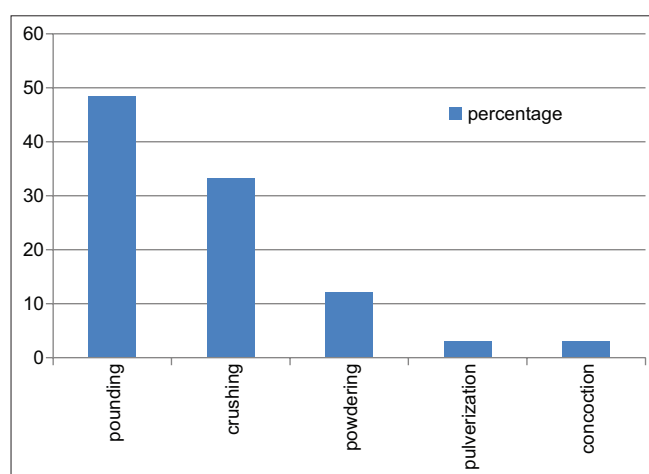
## DISCUSSION

In this study, a total 40 traditional healers of which 82.5% (33), male and 17.5% (7) female respondents were involved. The age of the respondents ranged from 30 to 75, the majority of the traditional healers were not educated 33 (82.5%) but only 7 (17.5%) have education below grade 8. This shows that even though most of the traditional healers were not educated, the know more about medicinal plants than educated ones as indigenous knowledge on medicinal plants transferred orally and secretly from generation to generation.

The results of this study revealed 33 medicinal plant species belonging to 24 families used to treat 13 livestock ailments in the



**Figure 2:** Plant parts used



**Figure 3:** Method of remedies preparation

**Table 4:** Routes of administration

Route of administration	Frequency	Percentage (%)
Oral	26	78.78
Nasal-oral	2	6.06
Dermal	3	9.09
Dermal-oral	2	6.06
Total	33	100

**Table 5:** Sources of healing knowledge

Source	Frequency	Percentage (%)
Father	30	75
Wife/husband	7	17.5
Sister/brother	-	-
Other neighborhood	3	7.5
Total	40	100

**Table 6:** Transferring knowledge of traditional medicinal plants

To whom transferred	Frequency	Percentage (%)
Eldest soon	19	47.5
Eldest daughter	6	15
All children of the family	15	37.5
Total	40	100

study area. The family Fabaceae was represented by the highest number of species 4(12.12%) followed by Solonaceae, Rutaceae, Euphorbiaceae, Asteraceae, Cucurbitaceae, Alliaceae, each represents 2 species (6.06%). Each of the remaining 17 families had single species represent actives. This finding is comparable with the results of Megersa (2010) study conducted in Wayu Tuka Woreda who showed that Fabaceae was the leading family in the study area.

Out of 33 identified medicinal plant species, 21(63.63%) were obtained from wild followed by domesticated 12 (36.36%). Similar study conducted by Giday *et al.* (2003) from Zay people in Ethiopia indicates harvesting of 82%medicinal plants from the wild. According to Megersa (2010) Wayu Tuka Wored revealed that large numbers of medicinal plants are collected from wild areas. This shows wild habitats are subjected to the loss of number of species due to anthropogenic factors such as fire wood, agricultural expansion, drought and other. Analysis of growth habits revealed that herbs and shrubs constitute the largest category with the proportion of 39.39% and 33.33% respectively followed by trees 21.21%, climber 2.56% and liana 2.56%.

The most commonly used plant parts for remedies preparation in the study area were leaves 57.7% followed by roots 21.21%, seeds 9.09%, fruits 6.06%, bark 3.03% and bulb3.03%. This findings is in line with the results of Tamene *et al.* (2000) study conducted in Cheffa showed that the highest plant parts used for preparation of remedies is leaf (56.89%). The methods of remedies preparation commonly used were pounding and crushing with the proportion of (42.42%) and (30.3%) respectively, followed by powdering (21.21%), concoction (3.03%) and pulverization (3.03%). This finding is also in agreement with the results of Tamene *et al.* (2000), in Cheffa who revealed that pounding, crushing and squeezing (88.88%) are the most commonly used mode of preparation. The route of administration commonly used in the study area were oral constituting the largest category of 78.78% followed by dermal 9.09%,both nasal-dermal 6.06% and oral -dermal6.06%. This is parallel with the results of Sori *et al.* (2004), in Borena who revealed that oral (54%) followed by topical (4%) are the main route of administration.

The finding of the study with regard to the source of healing knowledge showed that (75%) of healers acquired their knowledge and experience from their parent (Fathers/Mothers) followed by wife/husband (17.5%) and other neighborhoods (7.5%). In line with this study, the results of Abdurhaman (2010) in Ofra Woreda showed that the highest number for traditional medicinal plant knowledge gain is from father/mother 40(47.66%). Analysis of data from this study indicated that knowledge and practices on medicinal plants reside with few families. This finding agrees with the results of Abdurhaman (2010) who showed that the highest number for the ways of transferring knowledge on medicinal plants is to eldest son 25(29.6%). The secrecies of more knowledge and practices with less people could be series for the sustainability and continuity of traditional knowledge of medicinal plants.

Table 7: Medicinal plants used for treatment of livestock disease, scientific name, vernacular names, parts used, preparation method, disease treated and administration route

S.No	Vernacular name	Scientific name	Family name	Plant collection	Plant parts used and preparation method	Route of administration	Disease treated
1	Andoodee	<i>Phytolacca dodecandra</i>	Phytolaccaceae	w	Leaf concoction is drunk	Oral	Rabies
2	Abasuuda	<i>Nigella Sativa</i>	Rununculaceae	D	Seed is powdered ,mixed with water and given to cattle	Oral	Stomachache
3	Bakkanniisa	<i>Croton macrostachyus</i>	Euphorbiaceae	W	Leaves crushed ,and rubbed on infected part	-oral -Dermal	Bloating Scabies
4	Baargamoo adii	<i>Eucalyptus globulus</i>	Myrtaceae	D	Leaf is pounded ,boiled and drunk	Oral	Cough
5	Bosoqqee	<i>Kalanchoe petitiiana</i>	Crassulaceae	W	Root is pounded and given to affected cattle	Oral	Blackleg
6	Ceekaa	<i>Calpurniaurea</i>	Fabaceae	W	Leaves are pounded and used to wash scabies	Dermal	Scabies
7	Burii	<i>Impatiens rothii</i>	Miemespaceae	D	Fresh leaf is crushed and given to cattle	Oral	Bloating
8	Dambii	<i>Ficusthonningi blume</i>	Moraceae	W	Leaves are pounded and mixed with salt and given to cattle	Oral	Blackleg
9	Dichoo	<i>Civisium vulgare</i>	Asteraceae	W	Root is pounded and given to cattle	Oral	Diarrhea
10	Eebicha	<i>Ver amygdalina</i>	Asteraceae	W	Leaves crushed ,socked in water ad given to cattle	Oral	Blackleg
11	Faca'aa	<i>Cucumis ficifolius</i>	Cucurbitaceae	W	The root and leaf pounded ,mixed with salt and water then given to cattle	Oral	Blackleg
12	Botoroo	<i>Stereospermum kunthianumcham</i>	Bignoniaceae	W	Barks pounded ,mixed with water and drunk	Oral	Snakebite
13	Gaattiraa	<i>Juniperus procera</i>	Cupressaceae	D	Leaves crushed,mixed with water and given to cattl	Oral	Abdominal pain
14	Gurra hantuutaa	<i>Vigna vexillata</i>	Fabaceae	W	Leaves cushed and rubbed on affected part	Dermal	Spider poison
15	Gursadii	<i>Allophyllus macrobotryolsoile</i>	Sapindaceae	W	Fresh leaves are crushed ,mixed with water and given to cattle	Oral	Internal parasite
16	Harmoo	<i>Viscum tuberculatum</i>	Viscaceae	W	Leaf is pulverized and given to cattle	Oral	Blackleg
17	Hidda hantuutaa	<i>Vigna membraceae</i>	Fabaceae	W	Leaves are pounded ,dried ,mixed with water and given to cattle	Oral	Epilepsy
18	Ittacha	<i>Dodonaceae angustifolia</i>	Spindaceae	W	Fresh leaves are crushed with water added and given to cattle	Oral	Diarrhea
19	Haanquu	<i>Embelia schimperii</i>	Myscinanceae	W	Leaves are pounded, mixed with salt and water and given to cattle	Oral	Blackleg
20	Loomii	<i>Citrus lemon</i>	Rutaceae	C	Fresh paste is crushed and poured	Oral Dermal	Tick infestation
21	Maraarrisa	<i>Clerodendron mycricoides</i>	Lamiaceae	W	Root is pounded	Oral	Diarrhea
22	Minaan bofaa	<i>Momordica foetida schumach</i>	Cucurbitaceae	W	Root is pounded,mixed with water and gien to cattle	Nasal Oral	Abdominal colic
23	Noolee	<i>Olinia rochetiana</i>	Oliniaceae	W	Leaf is crushed,mixed with salt and gien to cattle	Oral	Internal parasite
24	Mimmixa	<i>Capsicum annum</i>	Solanaceae	D	Fruit is powdered,mixed with water and given to cattle	Oral	Bloating
25	Qullubbii adii	<i>Allium sativum</i>	Alliaceae	D	Bulbs are pounded and given to cattle	Oral	Blackleg
26	Sanaamakii	<i>Sennadidy mobotrya</i>	Fabaceae	W	Leaves are pounded and given to cattle	Oral	Blackleg
27	Shinfaa	<i>Lepidium sativum</i>	Brassicaceae	D	Seed is powdered, mixed with salt and given to cattle	Oral	Bloating
28	Sigiluu	<i>Fagaropsis</i>	Rutaceae	W	Fresh leaves are crushed, mixed with water and given to cattle	Oral	Blackleg
29	Qabarichoo	<i>Echinops kebericho mesfin</i>	Compositeae	W	Root pounded, mixed with water and given to cattle	Oral	Blackleg
30	Qobboo	<i>Ricinus communis</i>	Euphoriaceae	D	Leaves pounded, mixed with water and given to cattle	Oral	Blackleg
31	Tamboo	<i>Nicotinacum tabacum</i>	Solanaceae	D	Leaves are crushed,soaked in water	Oral Nasal	Leech Blackleg
32	Tunjoo	<i>Piper capense</i>	Piperaceae	W	Root is pounded and given to cattle	Oral	Leech
33	Sunqoo	<i>Allucepal</i>	Alliaceae	D	Seed is powdered ,mixed with water	Oral	Stomachache



## CONCLUSION

This study revealed 33 medicinal plant species used for livestock treatment. Majority of the reported medicinal plant species were from wild habitat. Leaves are harvested for medicinal purpose than other plant parts in the study area. Herbs and shrubs are highly utilized for medicinal purpose than others. Pounding and crushing are the most frequently used method of traditional medicine preparation. Most of the medicinal plants were administered orally. Most of the knowledge on herbal remedies in this study area acquired from the parents (fathers/mothers). The highest number for ways of transferring knowledge on traditional plants is to the eldest son.

## REFERENCES

- Abdurhatman, N. (2010). Ethno botanical study of medicinal plants used by local people n Ofra Wereda, Southern Zoe of Tigray Region, and Ethiopia. M.Sc. Thesis Addis Ababa University.
- Abebe, D. (2001). The role of medicinal plants in healthcare coverage of Ethiopia, the possible integration. In M. Zewdu, A. Demissie, (Eds.), Conservation and sustainable use of medicinal plants in Ethiopia proceeding of the national workshop on biodiversity conservation and sustainable use of medicinal plants in Ethiopia (pp.6-21), IBC, Addis Ababa.
- Central Statistical Authority (CSA) (February 2006/7). Agric sample survey report on livestock and livestock characteristics.volume 11 Addis Ababa, Ethiopia.
- Getachew, B., & Shifera, D. (2002).medicinal plants in Bonga forest and their uses. Biodiversity new slett. 1:9-10 IBCR, Addis Ababa.
- Giday, M., & Ameni, G. (2003). An ethno botanical survey on plants of veterinary importance in two Weredas of Southern Tigray, Northern Ethiopia. *SINET Ethiopia Journal of Science*, 20(2), 123-136
- Giday, M., Asfaw, Z., & Woldu, Z. (2009). Medicinal plants of the Meinit ethnic group of Ethiopia: an ethnobotanical study. *Journal of Ethnopharmacology*, 124(3), 513–521. <https://doi.org/10.1016/j.jep.2009.05.009>
- Harun-or-Rashid, M., Tanzin, R., Ghosh, K. C., Jahan, R., Khatun, M. A., & Rahmatullah, M. (2010). An ethno veterinary survey of medicinal plants used to treat cattle diseases in Birishiriarea, Netrakona Distirict, Bangladesh. *Advances in Natural and Applied Sciences*, 4(1), 10-13.
- Kalayou, S., Haileselassie, M., Gebre-Egziabher, G., Tiku'e, T., Sahle, S., Taddele, H., & Ghezu, M. (2012). *In-vitro* antimicrobial activity screening of some ethnoveterinary medicinal plants traditionally used against mastitis, wound and gastrointestinal tract complication in Tigray Region, Ethiopia. *Asian Pacific Journal of Tropical Biomedicine*, 2(7), 516–522. [https://doi.org/10.1016/S2221-1691\(12\)60088-4](https://doi.org/10.1016/S2221-1691(12)60088-4)
- Kokwaros J. O. (1976). Medicinal plants of East Africa, General printers LTD. Homabay Nairobi, Kenya
- Lulekal, E., Kelbessa, E., Bekele, T., & Yineger, H. (2008). An ethnobotanical study of medicinal plants in Mana Angetu district, southeastern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 4, 10. <https://doi.org/10.1186/1746-4269-4-10>
- McCorkle, C. (1995). Back to the future: Lessons from ethnoveterinary RD & E for studying and applying local knowledge, Agriculture and Human Values. *The Agriculture, Food, & Human Values Society*, 12(2), 52-80. <https://doi.org/10.1007/BF02217297>
- Megersa, M. (2010). Ethno botanical study of medicinal plants in Wayu Tuka Wereda, East Wollega Zone of Oromia Region, Ethiopia, Unpublished M.Sc.
- Rukangira, E., (2001). The African herbal industry. Constraints and challenges. In proceedings of the natural products and cosmeceuticals conference. Erboristeria Domani. 1-23.
- Sinha, P., Govil, N. J., & Singh, V. K. (2002). Diseases and their management, recent progress in medicinal plants. Sctech, public, USA.PP.1-105.
- Sori, T., Bekana, M., Adugna, G., & Kelbessa, E. (2004). Medicinal plants in ethno veterinary practices of Borana pastoralists, Southern Ethiopia. *International Journal of Applied Research in Veterinary Medicine*, 2, 220-225.
- Storck, H., Bezabih, E., Berhanu, A., Borowieck, A., & Shimalis,W. (1991). Farming systems and farm management practices of small holders in the Hararghe highlands. Farming systems and resource economics in the tropics, Vol.11.Wissenschaft Surlang vauk.Kiel, Germany.
- Tabuti, J. R., Dhillon, S. S., & Lye, K. A. (2003). Ethnoveterinary medicines for cattle (*Bos indicus*) in Bulamogi county, Uganda: plant species and mode of use. *Journal of Ethnopharmacology*, 88(2-3), 279–286. [https://doi.org/10.1016/s0378-8741\(03\)00265-4](https://doi.org/10.1016/s0378-8741(03)00265-4)
- Tadeg, H., Mohammed, E., Asres, K., & Gebre-Mariam, T. (2005). Antimicrobial activities of some selected traditional Ethiopian medicinal plants used in the treatment of skin disorders. *Journal of Ethnopharmacology*, 100(1-2), 168–175. <https://doi.org/10.1016/j.jep.2005.02.031>
- Tamene, B., Bekele, T., & Kelbesa, E. (2000). An ethnobotanical study of the semi-wetland vegetation of Chefa, Ethiopia. Master Thesis. Addis Ababa University, Addis Ababa, Ethiopia.
- Teklehaymanot, T., & Giday, M. (2007). Ethnobotanical study of medicinal plants used by people in Zegie Peninsula, Northwestern Ethiopia. *Journal of ethnobiology and ethnomedicine*, 3, 12. <https://doi.org/10.1186/1746-4269-3-12>
- Yirga C, Hassen M (2000). Crop-Livestock Farming System in the Highland of Ethiopia: Smallholder Farmers Management Practice and Constraints In: Wheat and Weeds; Food and Feeds Processing of Two Stakeholder Workshop. Improving The Production of CropLivestock Production in Wheat Based Farming System in Ethiopia. Addis Ababa, Ethiopia
- Yirga, G. (2006). Use of traditional medicinal plants by indigenous people in Mekelle town, capital city of Tigray regional state of Ethiopia. *Journal of Medicinal Plants Research*, 4(17), 1799-1804.