

Full Length Research Paper

Ethno-medicinal study of plants in Boricha district: Use, preparation and application by traditional healers, Southern Ethiopia

Sintayehu Tamene^{1*}, Dagne Addisu² and Etana Debela³

¹Department of Chemistry, College of Natural and Computational Science, Hawassa University, P. O. Box 05, Hawassa, Ethiopia.

²Wondo Genet College of Forestry and Natural Resources, Hawassa University, P. O. Box 128, Shashemene, Ethiopia.

³College of Natural and Computational Science, School of Veterinary Medicine, Hawassa University. P. O. Box 05, Hawassa, Ethiopia.

Received 6 January, 2020; Accepted 6 April, 2020

Plants have been used as a source of traditional medicine in Ethiopia. However, this valuable ethnobotanical knowledge is not formally documented and thus the objective of this study was to investigate ethno-medicinal plants, their preparation and application in treating ailments in humans and livestock in the boricha district of Sidama Zone, Ethiopia. Forty two traditional healers (37 male and 5 female) of different ages (30–80 years) were purposively and randomly selected with the help of local elders, agricultural office workers and administrative personnel. Prior to the interview process, discussions was held with the informants through assistance of local elders to clarify the purpose of the study and build confidence of the respondents to provide reliable information without suspicion and were asked to provide information on plant(s) use against any kind of illness in humans and livestock. Forty two plant species belonging to 29 families and 35 genera were documented. Of the 42 species, 33% were trees, 45% shrubs, 17% herbs and 5% climbers. Leaves were the most utilized plant part (62%), followed by stem bark (19%) and seed (12%). The routes of administration are mainly internal in which oral administration is the common one. Informants Consensus Factor indicated that clustered numbers of plant species used for treatment of ailments such as febrile illness, sudden sickness and headache (11 species) followed by skin, eye infection and ecto-parasite related (7 species), glandular swelling and cancer related problems (6 species). Based on the finding, Informants claimed that fresh forms of the preparations were considered more powerful than dried ones to treat the ailments in humans and livestock and oral administration of prepared medicine were the common one.

Key words: Boricha, ethnobotany, informant consensus factor, medicinal plants, traditional knowledge.

INTRODUCTION

In Ethiopia, there is a long history of using medicinal plants to treat a variety of diseases (Mesfin et al., 2014) and endowed with a variety of agro-ecological zones, attributing to existence of various plant species including many cultivated and wild plant, and cultural diversities and their associated indigenous knowledge. Similarly, according to scholars view, Ethiopia is believed to be

home for about 6,500 species of higher plants, with approximately 12% of these endemic (Mesfin et al., 2014). Approximately 80% of humans and 90% of the livestock population in the country rely on traditional medicinal plants to cure different ailments (Dawit, 2001) due to difficulties in accessing modern health facilities, the cultural acceptability of healers, and low cost of

traditional medicine (Nguta et al., 2010). Different scholars in their study described that, the greater concentrations of medicinal plants are found in the south and southwestern parts of the country following the concentration of biological and cultural diversity (Belayneh et al., 2012; Mesfin et al., 2014). Despite the use of traditional medicine over many centuries, relatively small numbers of tree and shrub species have been studied.

Beside the importance, Ethiopia's traditional medicine as elsewhere in Africa is faced with problems of continuity and sustainability (Ensermu et al., 1992). Nowadays herbal practitioners have to walk greater distance for collection of herbal medicine that once grew in the vicinity of their homes. Bizuneh et al. (2018) in their ethnobotanical study reported that, valuable indigenous knowledge associated with medicinal plants was under risk and need to be properly documented. Those studies so far conducted in medicinal plants also reported that, the existing medicinal plants were on conservation risk (Belachew and Behailu, 2018; Muluken et al., 2018). Bizuneh et al. (2018) also stated that the problem is further compounded by the fact that traditional knowledge on traditional medicine is also being lost at an alarming rate.

Some findings also reflect potentially important information gaps and need for standardization of ethno-medicinal studies on indigenous medicinal plants in Ethiopia (Getachew et al., 2017). Additionally, According to Gonfa et al. (2015), Solomon et al. (2016) and Banchiamlak and Yound (2019), those medicinal plants available in the study region are becoming extinct and the associated knowledge held by elders has received less attention and hence, they are in the verge of disappearance. Additionally in the study area, medicinal plants are exposed to various destructive anthropogenic activities and this situation calls for integrated conservation measures. Furthermore, the rich ethnomedicinal knowledge held by the Sidama community at large and traditional medicine practitioners, in particular, needs an in-depth study and documentation (Nigatu et al., 2018). In line with this, this study was conducted to document the knowledge of traditional healers on the use of medicinal plants against certain illnesses in human and livestock in Boricha district and to validate the traditional use and identify more bioactive secondary metabolites in support of its traditional uses.

MATERIALS AND METHODS

Description of the study area

Boricha district is located in Sidama Zone, in Southern Nations

Nationalities and Peoples Regions (SNNPR), at 311 km (Figure 1). Its geographical location extends from 6°46'N to 7°01'N and 38°04'E to 38°24'E with an estimated area coverage of 588.05 km², administratively, the district comprise 39 villages. Based on the information from BoFED (2016) of SNNPR, BorichaWereda has an estimated total population of 255,514 of these 130,757 are men and 124,757 women. About 95.6 percent of the populations are estimated to be rural inhabitants (Southern Nation Nationalities and Peoples Regional State, Bureau of Finance and Economic Development, 2016).

Selection of informants, plant specimen collection and identification

Forty two traditional healers (37 male and 5 female) of different ages (30 to 80 years) were purposively selected as key informants with the help of local elders, agricultural office workers and administrative personnel of Boricha district. These traditional healers come from Sidama nation and the language of communication was Sidama or native to the study area. The data was collected in two rounds. The first round from December 01 to 17, 2018 and the second round from February 02 to 16, 2019. Prior to the interview process, discussions were held with the informants through assistance of local elders to clarify the purpose of the study and build confidence of the respondents to provide reliable information without suspicion. Face-to-face meetings were held with traditional healers. A key informant interview guide was used to collect the data. These key informants were asked to provide information on plant(s) use against any kind of illness in humans and livestock, and the type of plant and the parts used, the methods of remedy preparation, the routes of administration, the dosage used and threats. The traditional healers were used as guides during field trips to collect voucher specimens. Voucher specimens were taxonomically identified by a botany specialist (Dr. MeseleNegash). A voucher specimen were labeled with scientific and vernacular names and deposited in a herbarium at Wondo Genet College of Forestry and Natural Resource, Hawassa University.

Data collection and analysis

Based on the information obtained from the informants, the ailments reported were grouped and medicinal plant use variability was estimated. The level of homogeneity among information provided by different informants was calculated by the Informants' Consensus Factor, ICF (Trotter and Logan, 1986) using the following formula:

$$ICF = \frac{Nur - Nt}{Nur - 1}$$

Where, Nur = number of use reports from informants for a particular plant-use category; Nt = number of taxa or species that are used for that plant use category for all informants. ICF Values range between 0 and 1, where '1' indicates the highest level of informant consent. Descriptive statistics were used to analyze and summarize the ethnobotanical data.

$$ICF = \frac{Nur - Nt}{Nur - 1}$$

*Corresponding author. E-mail: sintebeye@gmail.com. Tel: +251-932670557.

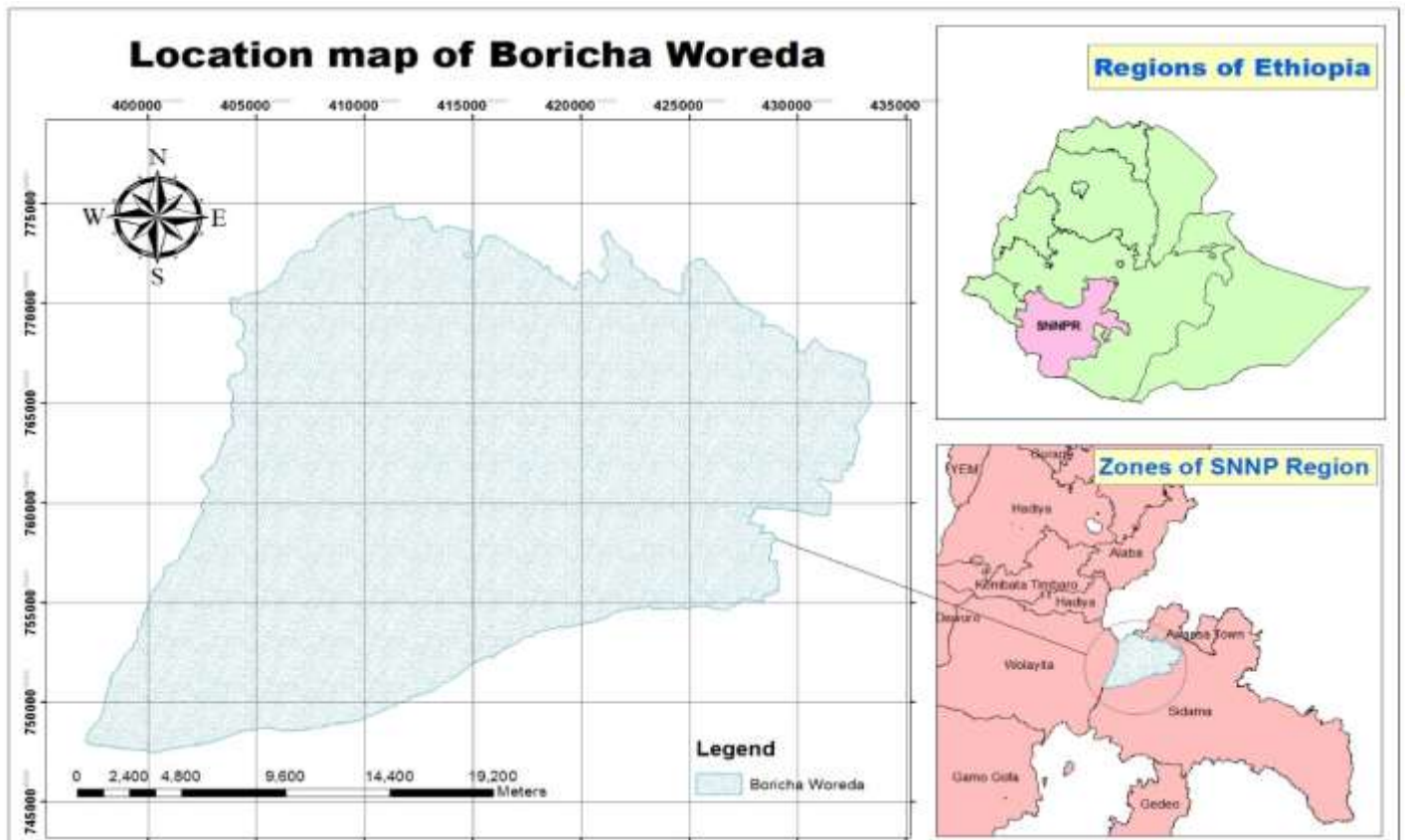


Figure 1. Location of Boricha district in southern Ethiopia.

Ethical considerations

Participants gave their informed consent before commencing with the interview schedules as required by the University of Hawassa University ethics committee. Approval for the study was obtained from the Hawassa University, approval number: VPRTT/034/2016.

RESULTS

Diversity of species used

Forty two species distributed across 29 families and 35 genera were mentioned by traditional healers. These medicinal plant species are used to treat 17 ailments; 24 in humans, 6 in livestock and 12 in both human and livestock. The Lamiaceae were most presented with four species, followed by the Anacardiaceae, Boraginaceae, and Solanaceae families with three species each. Asteraceae, Cucurbitaceae, Cupressaceae, Euphorbiaceae and Rutaceae each with two species and the rest representing one species. Whereas, *Clusia abyssinica*, *Lactuca inermis* and *Clerodendrum myricoides* were the most frequently mentioned plant species, followed by *Lagenaria siceraria* and *Stephania*

abyssinica. Shrubs constituted (45.24%) followed by trees (33.33%), herbs (16.67%) and climbers (4.76%) of the used species. Fifty nine percent of the medicinal plants were collected from the wild and the remaining ones from home gardens.

Informant consensus factor

Based on the used citations of the key informants, plants species were clustered into nine different categories (Table 1) to calculate the ICF values. The ICF values range between 0.81 (for lung infection and cough) and 0.98 (for gonorrhoea and sexual transmitted disease). Thus, all clusters had an ICF value greater than 0.5 showing that all of them could be considered for validation in support of its traditional use

DISCUSSION

Diversity of species used

This study demonstrated that plant species claimed by the key informants as having important medicinal

Table 1. Informant consensus factor (ICF) values of use category of multiple plants claimed as having medicinal values.

Use category	Plant species used	Total use citations	ICF value
Febrile illness, sudden sickness and headache	<i>Achyranthes aspera</i> , <i>Cucumis prophetarum</i> , <i>Dodonaea angustifolia</i> , <i>Ehretia cymosa</i> , <i>Ocimum jamesii</i> , <i>Ocimum urticifolium</i> , <i>Pittosporum abyssinicum</i> , <i>Phytolaccadodecandra</i> , <i>Solanum incanum</i> , <i>Zanthoxylum americanum</i> and <i>Momordica boivinii</i>	93	0.89
Skin, eye infection and ecto-parasite related	<i>Cupressus lusitanica</i> , <i>Dodonaea angustifolia</i> , <i>Rhamnus prinoides</i> , <i>Olea europea subsp. cuspidata</i> , <i>Sidaovata</i> , <i>Urticadioeca</i> and <i>Momordica boivinii</i>	73	0.92
Glandular swelling and cancer related problem	<i>Achyranthes aspera</i> , <i>Cucumis prophetarum</i> , <i>Dodonaea angustifolia</i> , <i>Pittosporum abyssinicum</i> , <i>Momordica boivinii</i> , <i>Clerodendrum myricoides</i>	77	0.93
Intestinal parasite, abdominal pain and stomach related problem	<i>Justicia schimperiana</i> , <i>Nicotiana tabacum</i> , <i>Clutia abyssinica</i> , <i>Phytolacca dodecandra</i> , <i>Zanthoxylum americanum</i> and <i>Clerodendrum myricoides</i> ,	91	0.94
Gonorrhoea and sexual transmitted disease	<i>Clutia abyssinica</i> , <i>Lactuca inermis</i> , <i>Clerodendrum myricoides</i>	89	0.98
Wound, body swelling and muscle contraction	<i>Arundodonax</i> , <i>Cordia africana</i> , <i>Croton macrostachyus</i> , <i>Juniperus procera</i> and <i>Measa lanceolata</i>	31	0.87
Jaundice	<i>Lagenariasiceraria</i> and <i>Stephaniaabyssinica</i>	33	0.96
Diarrhea and evil eye	<i>Cucumisprophetarum</i> , <i>Vernoniaamygdalina</i> , <i>Urticadioeca</i>	21	0.90
Lung infection and cough	<i>Cucumisprophetarum</i> , <i>Dodonaeaangustifolia</i> , <i>Rutachalepensis</i> and <i>Clerodendrummyricoides</i> ,	17	0.81

properties for human and livestock in providing remedies required in healthcare system in the area due to the absence of modern medicine to treat livestock diseases (Appendix 1). For this reason, the use of traditional medicinal plants remains a vital component of Ethiopian livestock production (Girish and Satish, 2008; Lulekal et al., 2014; Gonfa et al., 2015; Banchiamlak and Young, 2019). Ethnoveterinary uses of plant species such as *Phytolacca dodecandra*, *Vernonia amygdalina*, and *Dodonaea angustifolia* were reported to be used against endo-parasite while, *Momordica boivinii*, *Achyranthes aspera* and *Urtica dioeca* were reported to be effective against selected ecto-parasites of livestock (Appendix 1). Among the wide variety of its

uses by traditional healers (Appendix 1), *Phytolacca dodecandra* has been reported in the treatment of leeches, helminthiasis and intestinal worms (Lulekal et al., 2014; Nigatu et al., 2018). *Vernonia amygdalina* was reported to gain wider application in the treatment of amoebic dysentery and helminthiasis (Gonfa et al., 2015; Nigatu et al., 2018); antimicrobial and anti-parasitic activities (Banchiamlak and Young, 2019). In this study, *Croton macrostachyus* has been reported to treat wound (Gonfa et al., 2015). *Momordica boivinii* leaves were reported to be used to treat skin infection and glandular swelling (Appendix 1). Moreover, the roots, fruit and leaves of the same plant species were reported to treat spiritual

ailments and stomach ache (Pakia and Cooke, 2003; Banchiamlak and Young, 2019) and stems and leaves were used in the treatment of stomach problem (Choi et al., 2015). *Achyranthes aspera* is an indigenous medicinal plant in Africa which was reported to be used by traditional healers for treatment of different ailments in Ethiopia (Abraha et al., 2013; Lulekal et al., 2014; Tefera et al., 2015). However, in this study, informants claimed that leaves and young stem fractions of *A. aspera* is an important remedy against ailments such as sudden sickness, cough and skin cancer both in human and livestock (Appendix 1). Similarity of medicinal plant species used in different communities can be attributed to cross-

fertilization of cultural knowledge among different ethno-linguistic groups.

Informed consensus factor

ICF values were determined to know the agreement among the informants of Boricha area for use of plants to treat certain ailment categories. Eleven plant species were reported to be used for treatment of febrile illness, sudden sickness and headache followed by skin, eye infection and ecto-parasite related (7 species); glandular swelling and cancer related problem (6 species), intestinal parasite, abdominal pain and stomach related problem (6 species); wound, body swelling and muscle contraction related illness (5 species); lung infection and cough (4 species); diarrhea and evil eye (3 species); gonorrhea and sexual transmitted disease (3 species) and jaundice (2 species). The ICF values are presented in the (Table 1) and it is clear that the ICF values varied from 0.81 up to 0.98. Gonorrhea and sexual transmitted disease has the highest ICF value 0.98 with 89 use-reports for 3 plant species. The species responsible for this high consensus was *Clutia abyssinica*, *Lactuca inermis*, and *Clerodendrum myricoides* with 89 of the 42 reported medicinal plants, followed by jaundice (ICF = 0.96; 33 use-reports, 2 species), intestinal parasite (ICF = 0.94; 91 use-reports, 4 species), glandular swelling and cancer (FIC= 0.93, 77 use reports, 6 species). Medicinal plants supposed to be efficient in treating particular ailment have high ICF values. The high ICF value for gonorrhea and sexual transmitted disease probably showed that this ailment is common in the study area due to lack of awareness in the region and there is a better communication established among informants for treating this ailment category. High ICF values also indicate that the species traditionally used to treat these ailments are more consensus and believe than the others. The least agreement (ICF=0.81) between the informants was observed for plants used to cure lung infection and cough.

Ethno-medicinal plants, parts used, preparation and application

Informants claimed that shrubs and trees were commonly abundant and year-round, easy to obtain and withstand long dry seasons compared to other habits of plant groups. Consistent with this study, earlier reports (Mesfin et al., 2009; Kefyalew, 2015; Abiyot et al., 2018) indicated that shrubs and trees are found to be widely used plant habits as having remedies against certain ailments. Balcha (2014), Lulekal et al. (2014), Getachew (2016), Getachew et al. (2017), Nigatu et al. (2018) and Abiyot et al. (2018) reported that, the majority of the plant materials were harvested from wild sources for medicinal purposes. Similarly, this study reports that most of the medicinal

plants were obtained from wild sources calling for the need to conserve them at botanical garden. The same idea was raised from earlier study by Ensermu et al. (1992) nowadays herbal practitioners have to walk greater distance for collection of herbal medicine that once grew in the vicinity of their homes Consistent with this study, (Figure 2A) large proportion of herbal preparations from leaves were reported (Tesfaye et al., 2009; Gonfa et al., 2015; Bizuneh et al., 2018; Abiyot et al., 2018; Nigatu et al., 2018 and Banchiamlak and Yound, 2019). This difference attributed to differences in the variations in the concentration of the active ingredients in botanical fractions as a result of climatic and edaphic factors reported on the proportion of root fractions (Lulekal et al., 2014; Melesse et al., 2015). Extensive use of root fractions may pool attention as uprooting may result in destruction of the plant species claimed as having medicinal properties. Furthermore, leaves carry copious amounts of plant secondary metabolites that have medicinal properties (Bhattarai et al., 2006). Informants claimed that fresh forms of the preparations were considered more powerful than dried ones to treat the ailments in humans and livestock (Figure 2D). Similar results were reported earlier (Endalew, 2007; Seyoum, 2009; Belachew and Behailu, 2018, Abiyot et al., 2018; Nigatu et al., 2018) which could be associated to the components and activities of active principles of fresh preparations. In this study, remedy preparation from single plant parts accounted for 82% and preparations from combined plant species were about 18% (Figure 2D). This consensus was in agreement with Bizuneh et al. (2018) earlier founding. This indicated that preparations from single plant part were reported to be high and disagrees with the earlier report of (Mirutse et al., 1999) who claimed that the combined plant materials were reported to have high proportion in remedy preparations. Medicinal trees and shrubs in the study area were prepared in different forms. The most common mode of preparation was crushing (38%), followed by chewing (32%). This result is in agreement with the earlier founding of Emiru et al. (2011), Gonfa et al. (2015) and Bizuneh et al. (2018) who noted that the principal method of remedy preparation was through crushing. Internal and external route of applications were reported by the informants in the treatment of various ailments. Oral application accounted for 72%. The choice of oral administration is related to the use of some solvents or additives (honey, milk, butter and food) that are commonly believed to serve as a vehicle to transport the remedies (Tolossa et al., 2013; Balcha, 2014; Abiyot et al., 2018; Belachew and Behailu, 2018; Nigatu et al., 2018; Banchiamlak and Young, 2019). The additives are also important to minimize discomfort, improve the taste and reduce adverse effects such as nausea and vomiting. It is also believed to be enhancing the efficacy and healing conditions. Earlier similar findings were reported by other researchers

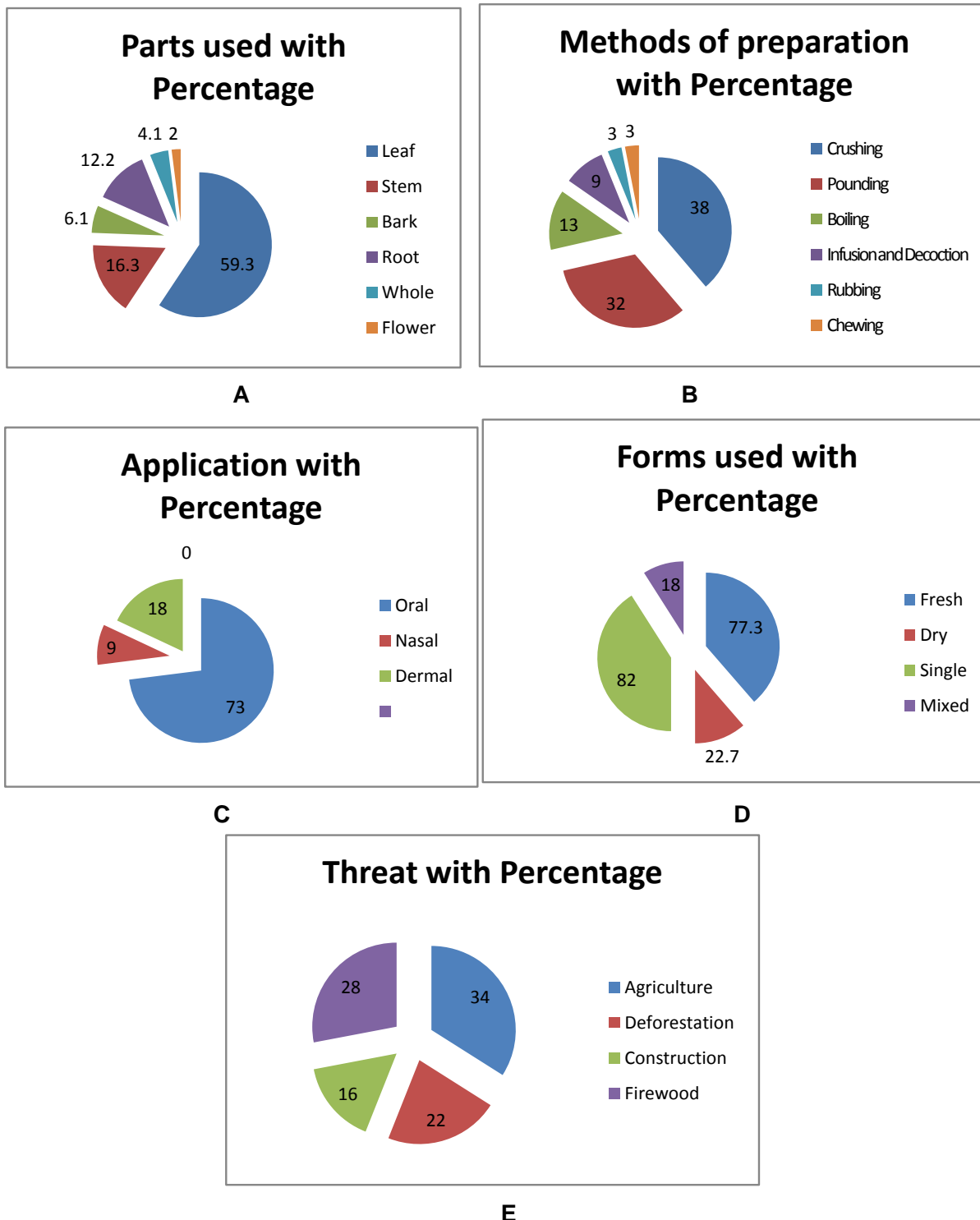


Figure 2. Medicinal plants of boricha district, Sidama zone, southern Ethiopia. A: Plant parts used, B: Mode of preparations, C: Routes of administration, D: Forms used, E: Threats to medicinal plants.

(Mesfin et al., 2009; Filate et al., 2009) indicating the oral route as the most preferred mode of administration. However, there is no consensus on the dosage used and frequency of the medication among healers.

Threats to medicinal plants

In the study area, human related activities such as deforestation, firewood collection and construction were

recorded as the main threats to the existence and use of plant species in general and to medicinal plants in particular. Similarly, different scholars Gonfa et al. (2015), Solomon et al. (2016), Abiyot et al. (2018), Nigatu et al. (2018) and Banchiamlak and Young (2019) reported that, the same problem were observed in their study area.

Conclusion

About forty two medicinal plants species were distributed across 29 families and 35 genera as having medicinal properties against 17 human and livestock ailments used by the local community were collected and recorded. The medicinal plant resource in the area is considerable, the Wereda being relatively rich in medicinal plant diversity. The associated knowledge of the local people is deep-rooted in the time-honoured use practices of herbal medicine. Of the identified medicinal plants, 24 species were noted to treat human ailments, 6 species for livestock ailment treatment and 12 species for both human and livestock health treatments. Shrubs were found to be dominant as traditional medicinal plant remedy sources in the study area followed by trees, herbs and climbers. Leaves were also found to be the most harvested plant parts for the preparation of the remedies followed by bark and roots. In the preparation of medicines, single plants were used to prepare the medicines to cure the diseases rather than mixing with each other. The routes of administration are mainly internal in which oral administration is the common one. Lack of awareness, agricultural expansion in relation to population growth, secrecy and oral based knowledge transfer were observed problems in the study area. The medicinal plant resources, the associated traditional knowledge and medical practices are in dire need of protection through implementation of appropriate conservation strategies and development of the plants and the knowledge in a modern context. Furthermore, the information generated will also inform future validation studies to increase the acceptability of plant-based remedies in human and animal healthcare systems. Thus, human related activities are threat for the existence of plants claimed medicinal plants calling for creditable measures for sustainable utilization of the resource.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

ACKNOWLEDGMENTS

The authors' sincere gratitude goes to Hawassa University for funding this project. They also appreciate the informants who without reservation shared their

ethnomedicinal knowledge with them, the elders and the local administration for their support in facilitating the interview process and Hawassa University Department of Botany for supporting them in plant identification process.

REFERENCES

- Abiyot T, Birhanu K, Firew K (2018). Ethnobotanical study of medicinal plants used to treat human ailment in Guduru District of Oromia Regional State, Ethiopia. *Journal of Pharmacognosy and Phytotherapy* 10(3):64-75.
- Abraha T, Balcha A, Mirutse G (2013). An ethnobotanical study of medicinal plants used in KilteAwulaelo District, Tigray Region of Ethiopia. *Journal of Ethnobiology and Ethnomedicine* 9:65.
- Banchiamlak N, Young-Dong K (2019). Ethnobotanical study of medicinal plants in the HawassaZuria District, Sidama zone, Southern Ethiopia. *Journal of Ethnobiology and Ethnomedicine* 15:25.
- Balcha A (2014). Medicinal plants used in traditional medicine by Oromo people, Ghimbi District, Southwest Ethiopia *Journal of Ethnobiology and Ethnomedicine* 10:40.
- Belachew G, Behailu B (2018). A Review on Ethnobotanical Study of Traditional Medicinal Plants Used for Treatment of Liver Problems in Ethiopia. *European Journal of Medicinal Plants* 26(1):1-18.
- Belayneh A, Asfaw Z, Demissew S, Bussa N (2012). Medicinal plants potential and use by pastoral and agropastoral communities in Erer Valley of BabileWereda, Eastern Ethiopia. *Journal of Ethnobiology and Ethnomedicine* 8:42.
- Bizuneh W, Reta R, Tibebe A, Moa M (2018). Medicinal Plants Used for Treatment of Diarrhoeal Related Diseases in Ethiopia Review Article. *Hindawi Evidence-Based Complementary and Alternative Medicine* 2018, Article ID 4630371, 20 p. <https://doi.org/10.1155/2018/4630371>
- Bhattarai S, Chaudhary RP, Taylor RSL (2006). Ethnomedicinal plants used by the people of Manang district, Central Nepal. *Journal of Ethnobiology and Ethnomedicine* 2:41.
- Choi CW, Song SB, Oh JS, Kim YH (2015). Antiproliferation effects of selected Tanzanian plants. *African Journal of Traditional, Complementary and Alternative Medicine* 12(2):96-102.
- Dawit A (2001). The role of medicinal plants in healthcare coverage of Ethiopia, the Possible Integration. In: Conservation and Sustainable Use of Medicinal Plants in Ethiopia. (MedhinZewdu and DawitAbebe (eds). Proceeding of The National Workshop on Biodiversity Conservation and Sustainable Use of Medicinal Plants in Ethiopia, 28 April-01 May 1998, IBCR, Addis Ababa, Ethiopia. pp 6-21
- Emiru B, Ermias A, Wolde M, Degitu E (2011). Management, use and ecology of medicinal plants in the degraded dry lands of Tigray, Northern Ethiopia. *Journal of Medicinal Plants Research* 5(3):309-318.
- Endale A (2007). Use and management of medicinal plants by indigenous people of Ejaji area (ChelyaWereda) West Shewa, Ethiopia. An Ethnobotanical Approach. M.Sc. Thesis. Addis Ababa University.
- Ensermu K, Sebsebe D, Zerihun W, Edwards (1992). Some threatened endemic plants of Ethiopia. In: The Status of Some Plants in Parts of Tropical Africa. (Edwards, s. and ZemededeAsfaw (eds). *Botany* 200, NAPREC, Monograph series number 2:35-55. Addis Ababa University, Ethiopia.
- Filate T, Gedif T, Asres K, G/Mariam T (2009). Ethnomedical survey of Berta ethnic group Assosa zone, Benishangul-Gumuz regional state, mid-west Ethiopia. *Journal of Ethnobiology and Ethnomedicine* 5:14.
- Getachew A, Befikadu U, Amha W (2017). Systematic review on traditional medicinal plants used for the treatment of malaria in Ethiopia: trends and perspectives. *Malaria Journal* 16(1):307.
- Getachew M (2016). Ethnobotanical investigation of traditional medicinal plants commercialized in the markets of Dire Dawa city, Eastern Ethiopia. *Journal of Medicinal Plants Studies* 4(3):170-178.
- Girish V, Satish S (2008). Antibacterial activity of selected medicinal plants on human pathogenic bacteria-a comparative analysis. *World Applied Sciences Journal* 5(3):267-271.

- Gonfa K, Tesfaye A, Ambachew D (2015). Indigenous Knowledge on the Use and Management of Medicinal Trees and Shrubs in Dale District, Sidama Zone, Southern Ethiopia.
- Kefyalew A (2015). Ethnobotanical study of medicinal plants in ada'aWereda, Eastern Shewa Zone of Oromia region, Ethiopian Journal of Ethnobiology and Ethnomedicine 11:25.
- Lulekal E, Zemedede A, Ensermu K, Patrick VD (2014). Ethnoveterinary plants of Ankober District, North Shewa Zone, Amhara Region, Ethiopia. *Journal of Ethnobiology and Ethnomedicine* 10:21.
- Melesse M, Sileshi N, Tamirat B (2015). 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 Research* 5(7):42-61.
- Mesfin F, Demissew S, Teklehaymanot T (2009). An ethnobotanical study of medicinal plants in Wonago Woreda, SNNPR, Ethiopian Journal of Ethnobiology and Ethnomedicine 5:28.
- Mesfin F, Seta T, Assefa A (2014). An ethnobotanical study of medicinal plants in Amaro Woreda, Ethiopia. *Ethnobotany Research and Applications* 12:341-354.
- Mirutse G, Teklehaymanot T, Animut A, Mekonnen Y (1999). Medicinal plants of Shinasha Agew-awi and Amhara peoples in Northwest Ethiopia. *Journal of Ethnopharmacology* 110:516-525.
- Muluken W, Mezinew S, Mohammedbrhan A, Haimanot Reta, Dagninet D (2018). Ethnobotany of Medicinal Plants used to treat Various Mental illnesses in Ethiopia: A Systematic Review. *Asian Journal of Plant Science and Research* 8(1):9-33.
- Nigatu T, Petros B, Asfaw Z (2018). Medicinal plants used by traditional healers to treat malignancies and other human ailments in Dalle District, Sidama Zone, Ethiopia. *Journal of Ethnobiology and Ethnomedicine* 14:15.
- Nguta JM, Mbaria JM, Gakuya DW, Gathumbi PK, Kiama SG (2010). Antimalarial herbal remedies of Msambweni, Kenya. *Journal of Ethnopharmacology* 128(2):424-432.
- Pakia M, Cooke A (2003). The ethnobotany of the Midzichenda tribes of the coastal forest areas in Kenya: 2. Medicinal plant uses. *South African Journal of Botany* 69(3):382-395.
- Seyoum G (2009). Ethnobotanical study of Medicinal Plants in Debre-Libanos Wereda, North Shewa Zone of Oromia Region, Ethiopia. M.Sc. Thesis, Addis Ababa University. 94
- Solomon A, Tilahun T, Ariaya H, Berhanu E, Mirutse G (2016). Survey of Medicinal Plants Used to Treat Malaria by Sidama People of Boricha District, Sidama Zone, South Region of Ethiopia. *Hindawi Publishing Corporation Evidence-Based Complementary and Alternative Medicine* Volume 2016, Article ID 9690164, 9 p <http://dx.doi.org/10.1155/2016/9690164>
- Tefera M, Mirutse G, Ensermu K (2015). Ethnobotanical study of homegarden plants in Sebeta-Awas District of the Oromia Region of Ethiopia to assess use, species diversity and management practices. *Journal of Ethnobiology and Ethnomedicine* 11:64.
- Tesfaye H, Sebsebe D, Zemedede A (2009). An ethnobotanical study of medicinal plants by local people in the lowlands of Konta Special Wereda, SNNPRS, Ethiopia. *Journal of Ethnobiology and Ethnomedicine* 6:25-45.
- Tolossa K, Etana D, Spiridoula A, Adugna T, Gebeyehu G, Jos H (2013). Ethno-medical study of plants used for treatment of human and livestock ailments by traditional healers in South Omo, Southern Ethiopia. *Journal of Ethnobiology and Ethnomedicine* 9(1):32.
- Trotter RT, Logan MH (1986). Informant census: A new approach for identifying potentially effective medicinal plants. In: Etkin, L.N. (Ed.), *Plants in indigenous medicine and diet*. Redgrave, Bedford Hill, New York, pp. 91-112.

APPENDIX

Appendices 1. Medicinal plants used in the Boricha District, Sidama Zone, Southern Ethiopia.

Scientific/Botanical name	Family	Local name (Sidama)	Vouch. number	Habit	Habitat/sources	Ailments	Parts used and preparation	Target group
<i>Acokanthera schimperi</i> (A.DC.) Schweinf.	Apocynaceae	Qararo	Br41	Sh	Hg	Esophagus infection	Young stem chewed and swallowed (taken orally)	Human
<i>Achyranthesaspera</i> L.	Amaranthaceae	Nole	Br09	Sh	W	Sudden sickness, cough, skin cancer	Young stem or leaves crushed, boiled and filtered, then the decoction taken orally	Human/livestock
<i>Albiziagummifera</i> (J.F. Gmel.) C.A. Sm.	Fabaceae	Maticho	Br26	T	Hg	Pregnancy problem	Fresh leaves washed, crushed together with water, filtered and taken orally	Human
<i>Arundodonax</i> L.	Poaceae	Lemicho	Br31	Sh	Hg	Leg swelling	Fresh leaf crushed and painted on skin	Human
<i>Cordiaafricana</i> Lam.	Boraginaceae	Wadicho	Br23	T	Hg	Wound treatment	Dry leaf together with <i>Bersama abyssinica</i> crushed and pounded and painted on skin	Human
<i>Cucumisativus</i> L.	Cucurbitaceae	Basubaqula	Br06	H	Hg	Pneumonia, cough sudden sickness, cancer	Fresh stem bark and/or dry root crushed, pounded with water and filtered, then drunk after breakfast in the morning until recovery	Human/livestock
<i>Clematis hirsuta</i> Guill. &Perr.	Rununculaceae	Fide	Br12	Cl	W	Wound	Whole plants crushed, boiled, filtered and taken orally	Human
<i>Clutia abyssinica</i> Jaub. And spach.	Euphorbiaceae	Binjile	Br13	H	W	Stomach problem, sexually transmitted diseases	Leaf mixed with <i>Croton macrostachyus</i> , crushed and pounded, mixed with water, filtered and finally taken orally	Human
<i>Croton macrostachyus</i> Hochst. ex Delile	Euphorbiaceae	Masinna	Br35	T	W	Leg/body swelling	Dry stem bark crushed and pounded and mixed with water and painting on	Human
<i>Dodonaevaviscosa</i> (L.) Jacq.	Sapindaceae	Itancha	Br17	T	W	Ecto-parasite; glandular swelling; diarrhea; sudden sickness	Fresh/dry leaves are crushed and pounded with water then taken orally and pounded leaf are applied topically	Human/livestock
<i>Ehretiacymosa</i> . (Thonn.)	Boraginaceae	Gidicho	Br30	T	W	Febrile illness	Fresh leaf crushed, pounded and then mixed with water, finally by filtering taken orally	Veterinary
<i>Juniperusprocera</i> Hochst. exEndl.	Cupressaceae	Awashu honcho	Br22	T	Hg	Body swelling	Fresh leaf together with <i>Croton macrostachyus</i> leaf crushed and pounded and then, mixed with water and then filtered and taken orally	Human

<i>Justicia schimperiana</i> (Hochst. ex A.Nees) T.Anders	Acanthaceae	Cikicho	Br08	Sh	W	Intestinal parasite	Dry/fresh root is chewed and swallowing	Human
						Body swelling	Dry/fresh leaves crushed, boiled and filtered, taken orally	Livestock
<i>Lactucainermis</i> Forssk.	Asteraceae	Amessa	Br20	H	W	Sexually transmitted diseases	Fresh leaf washed, crushed, boiled and decoction taken orally	Human
<i>Lagenaria siceraria</i> (Molina) Standl.	Cucurbitaceae	Surupha	Br05	H	W	Jaundice	Dry root pounded with water, filtered and drunk until recovery in the evening	Human
<i>Maesalanceolata</i> Forssk.	Myrsinaceae	Gowacho	Br36	Sh	W	Muscle contraction	Fresh stem crushed, pounded, boiled then infusion and decoction drunk in the evening	Human
<i>Meliaazedarach</i> Forssk.	Meliaceae	Nim	Br42	Sh	Hg	Typhoid	Dry leaves crushed, pounded and then mixed with water, finally by filtering taken orally	Human
<i>Momordicaboivini</i> Baill	Cucurbitaceae	Hare	Br02	H	W	Skin infection; Shortage of Milk production; Glandular swelling	Fresh leaves chewed and sprayed on the infected skin on sun light for skin infection or fresh root crushed and pounded with water, filtered and taken orally for milk production and gland swelling until recovery	Human /veterinary
<i>Nicotianatabacum</i> L.	Solanaceae	Arado	Br24	Sh	Hg	Stomach problem	Dry leaf crushed and pounded, finally by mixing with water and taken nasally	Human and veterinary
<i>Ocimumjamesii</i> Sebald	Lamiaceae	Ambibisha	Br19	Sh	W	Febrile illness and headache	Fresh leaves rubbed by hand and droplets are drunk and leaves painted on the body and sniffed	Human
<i>Ocimumurticifolium</i> L.	Lamiaceae	Michete Xagicho	Br07	Sh	Hg	Sudden sickness; febrile illness in human; eye problem in animals	Fresh leaf crushed and pounded with water and filtered and drunk against sudden sickness and febrile conditions in human or droplet is used for eye problems in animals	Human/veterinary
<i>Pittosporum abyssinicum</i> Del., <i>Rhusglutinosa</i> A. Rich and <i>Ehretiacymosa</i> . (Thonn.)	Pittosporaceae	Bobanticho	Br32/	T	W	Urination problem, glandular swelling; sudden cough , fattening of animals and febrile illness	Fresh stem/leaves from three plant species mixed crushed and pounded and boiled then infusion and decoction taken orally	Human /livestock
	Anacardiaceae	Oloncho	Br33	T	H			
	Boraginaceae	Gidicho	B34	T	W			
<i>Phytolaccadodecandra</i> L'Herit.	Phytolaccaceae	Haranjicho	Br15	Sh	Hg	Stomach problem and sudden sickness	Fresh leaf crushed and pounded, and then mixed with water and taken orally fresh root crushed, boiled, filtered and taken orally	Livestock
<i>Rhamnusprinoides</i> L'Herit. & <i>Cupressuslusitanica</i> Mill. var. <i>lusitanica</i>	Rhamnaceae Cupressaceae	XaddoFaranjete & Honcho	Br10 &11	Sh & T	Hg	Ecto-parasite	Fresh stem from both plant species are mixed, and then crushed and rubbed on the infected skin	Livestock

<i>Rothecamyricoides</i> (Hochst.) Steane	Lamiaceae	Madhisisa	Br03	Sh	W	Glandular swelling; gonorrhea; cough; intestinal parasite	cancer;	Flesh/dry leaves crushed and pounded, boiled, filtered and drunk or fresh leaves of <i>Ocimumurticifolium</i> and <i>Clusia abyssinica</i> mixed, crushed, pounded, then infusion and decoction drunk in the evening	Human/ livestock
<i>Rhamnusprinoidea</i> L'Herit.	Rhamnaceae	Xaddo	Br10	Sh	Hg	Skin infection		Fresh leaves rubbed on the infected skin	Human
<i>Rhusglutinosa</i> A. Rich	Anacardiaceae	Oloncho	Br21	T	W	Fattening of animals		Fresh stem pounded, mixed with water, filtered and taken orally	Livestock
<i>Ruta chalepensis</i> L.	Rutaceae	Sunkurtaa	Br18	H	Hg	Cough/lung infection		Fresh leaf crushed, pounded and then mixed and boiled, finally filtered decoction taken orally	Human
<i>Sidaovata</i> forsk.	Malvaceae	Qirqixxe	Br14	Sh	W	Eye infection		Fresh leaf crushed and rubbed, and then droplets added on the eye	Human
<i>Solanumincanum</i> L.	Solanaceae	Borbodho	Br25	Sh	W	Sudden stomach sickness		Fresh root washed and chewed and extracts swallowed	Human
<i>Solanumnigrum</i> L.	Solanaceae	Xunaye	Br04	H	W	Snake bite		Fresh leaf immediately after bit chewed and swallowing	Human and livestock
<i>Stephania abyssinica</i> Dillon and A. Rich.	Menispermaceae	Kalaalaa	Br29	H	W	Jaundice		Fresh and whole parts crushed, pounded, then infusion and decoction forms are taken orally at evening time	Human
<i>Schinusmolle</i> var. areira	Anacardiaceae	Kondo	Br40	T	Hg	Tooth ache/illness		Young stem used as teeth brush and secret sucked	Human
<i>Toddaliaasiatica</i> (L.) Lam.	Rutaceae	Harangama	Br28	Sh	W	Shortage of food		Fresh leaves washed, crushed and boiled and taken orally as food	Human
<i>Urticadioica</i> L.	Urticaceae	Sonicho	Br39	Sh	W	Severe diarrhea and skin infection		Fresh leaf and flower together crushed, pounded and then mixed with water, taken orally	Human and livestock
<i>Vernoniaamygdalina</i> Del.	Asteraceae	Hecho	Br38	Sh	Hg	Diarrhea		Fresh leaves crushed, pounded and then mixed with water, taken orally	Livestock
<i>Withaniasomnifera</i> (L.) Dunal.	Asteraceae	Gizawa	Br37	T	W	Diarrhea & Febrile illness		Fresh leaves crushed, pounded and then mixed with water, finally by filtering taken orally	Human and livestock
<i>Zanthoxylumamericanum</i> Mill.	Rutaceae	Gaadda	Br01	T	W	Abdominal pain		Fresh leaves/stem barks crushed and pounded with water, filtered and taken orally until recovery	Human and livestock

T = Tree, SH = Shrub, H = Herb, Hg = Home garden, W = Wild and Clim = Climber.