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Indigenous knowledge based identification of medicinal plants in Central Zone of Tigray, North Ethiopia

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There are many traditional medicine practitioners in every corner of the world, which can be grouped into spiritual healers and herbalists. Both groups do not tell to others about medicinal plants sometimes even to their descendants. This may have many different reasons, some say the medicine becomes functional if it is used in secret and some do not tell others fearing for competition of market as well as the medicinal plants because their abundance is mostly limited due to over exploitation. This study was conducted in the central zone of Tigray in specific sites called Tanqua-Abergelle, Kola-Tembien and Weri-Leke with the objective of identifying of medicinal plants based on indigenous knowledge. Purposive sampling was used for respondent selection and semi-structured interviews were employed. Then, the collected data were subjected to descriptive statistical method such as percentage and frequency which was employed to analyze and summarize the data on medicinal plants. From the identified medicinal plants, 92 plant species were used to cure human disease and 29 species for animal diseases and another 8 species were used to treat both human and livestock diseases. Even though medicinal plants are very crucial particularly for the people who dwell in remote and rural areas, some medicinal plants are being endangered due to low awareness on management of these plants. Hence, policy makers and other concerned bodies should give emphasis on conservation of medicinal plants.

Key words: Herbalists, medicinal plants, indigenous knowledge, spiritual healers.

INTRODUCTION

Ethiopia is a country bordered by five countries in East Africa (Djibouti, Eritrea, Kenya, Somalia, and Sudan), and has the second-largest population in sub-Saharan Africa after Nigeria. Most of its population lives in country side and depends on natural resources for their livelihoods, economic development, and food security (Biodiversity, 2008).

The country is endowed with a wide range of climatic and environmental conditions holding vast diversity of flora and fauna (Pankhurst, 2001; Yirga, 2010), including wide range of potentially valuable medicinal plants. The use of medicinal plants is as old as human civilization.

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Medicinal plants and traditional medicine play an important role in the health care system of most developing countries.

Medicinal plants are the base for the development of new drugs and the survival of human kind as well as other livestock. Ethiopia has a glorious traditional health care system based on plants, which dates back to several millennia. Traditional medicinal practices are common in Ethiopia in which about 80% of the population in the country use plant-based traditional medicine as their major primary health care system (Dawit, 2001). The majority of Ethiopians rely on indigenous remedies for numerous socio-cultural and economic reasons (Mesfin et al., 2009). Abebe et al. (2001) also reported that 95% of traditional medical preparations in Ethiopia are of plant origin.

Though, the traditional medicine practitioners are the best sources of information about the knowledge of the medicinal plants, it was found very difficult to obtain their traditional medicinal information as they considered their indigenous knowledge as a professional secret, only to be passed orally to their older son, at their oldest age (Jansen, 1981). Moreover, the local indigenous knowledge on medicinal plants is being lost at a faster rate with the increase of modern education, which has made the younger generation to underestimate its traditional values.

The dominant means of acquiring and transferring traditional knowledge is through non formal education and local communication networks. The vast knowledge on traditional uses of plants is not fully documented and most of the knowledge is conveyed from generation to generation by word of mouth (Fassil, 2001; Yirga, 2010).

According to Moravec et al. (2014), local experiences which have been gained through generation to solve indigenous problems are disappearing due to lack of written documents, death of elders, migration of people due to drought and social problems, urbanization, influence of modern veterinary medicine and exotic cultures.

Moreover, environmental degradation, deforestation, agricultural encroachment, over harvesting and/or indiscriminate harvesting and alarming population growth with increasing demand and consumption are also the principal problems which aggravate the rate of extinction of medicinal plants from their habitat and consequently the loss of important resources of globally significant plant species (Tesfaye, 2006).

Hence, documenting traditional medicinal knowledge is important to facilitate discovery of new sources of drugs and promote sustainable use of natural resources. The main aim of this study was then, to identify and document medicinal plants which are traditionally used to cure human as well as animal diseases and recommend an appropriate conservation measure for threatened medicinal plants and maintain the associated knowledge. Furthermore, the part of the tree, shrub or herb that is used for medicinal purpose was assessed with its expected consequence on their regeneration.

MATERIALS AND METHODS

Area descriptions

The study was conducted in the central zone of Tigray, Northern Ethiopia at selected three Wereda, which were Tanqua-Abergelle, Kola-Tembien and Werie-Lekhe (Figure 1). The area agro-ecological setting was lowland, and receives a bimodal type of rainfall with a short rainy season, that often runs from June to September. The study area receives 350 to 650 mm annual rainfall and temperature with 15 to 35°C (Feleke et al., 2016).

Methods

The data were collected in the whole year 2016 in close contact with the community in the study area. Semi-structured questionnaire was prepared to capture the indigenous knowledge of the local people on medicinal plants by following the scientific approach of Yirga (2010). Accordingly, a total of 75 respondents (67 male and 8 female), individuals in the age range of 24 to 81, were purposively selected being as potential informants from the aforementioned three Wereda. These respondents were selected according to the information obtained from local administrators and elderly people of the districts considering factors such as reputable thorough knowledge of wild plants, time availability and willingness to participate. The informants selected from each sampled Peasant association were the most knowledgeable ones as suggested by respective elders and administrators who participated in the selection process. Samples of all medicinal plant species encountered in the study were collected and recorded in their local names and later converted into the scientific name based on researcher own experience, referring to 'Useful Trees and Shrubs for Eritrea" (Bein *et al*., 1996) and useful trees and shrubs for Ethiopia and Flora of Ethiopia (Bekele et al., 1993; Azene, 2007).

Data analysis

The collected data were analyzed using Microsoft Office Excel spreadsheet 2007. This Excel was used to calculate sum, percentages, frequency, tabulate data and draw graphs. The most useful information gathered on medicinal plants reported from local people such as medicinal value, disease treated, part and management used were analyzed.

RESULT AND DISCUSSION

Demographic characteristics of respondents

During the study, sixty-seven (89.3%) male and eight (10.6%) female informants were part of the study. From the total respondents (75 respondents), 52% were found between the age ranges of 46 to 81, followed by 38.7% of the age ranges of 35 to 45 years, while the remaining, 24 to 34 years involvement was 9.3%, which was the least compared to the other age groups (Table 1). The level of illiteracy was high between the age group of 46 to 81 years (Table 1), which can be attributed to lack of access

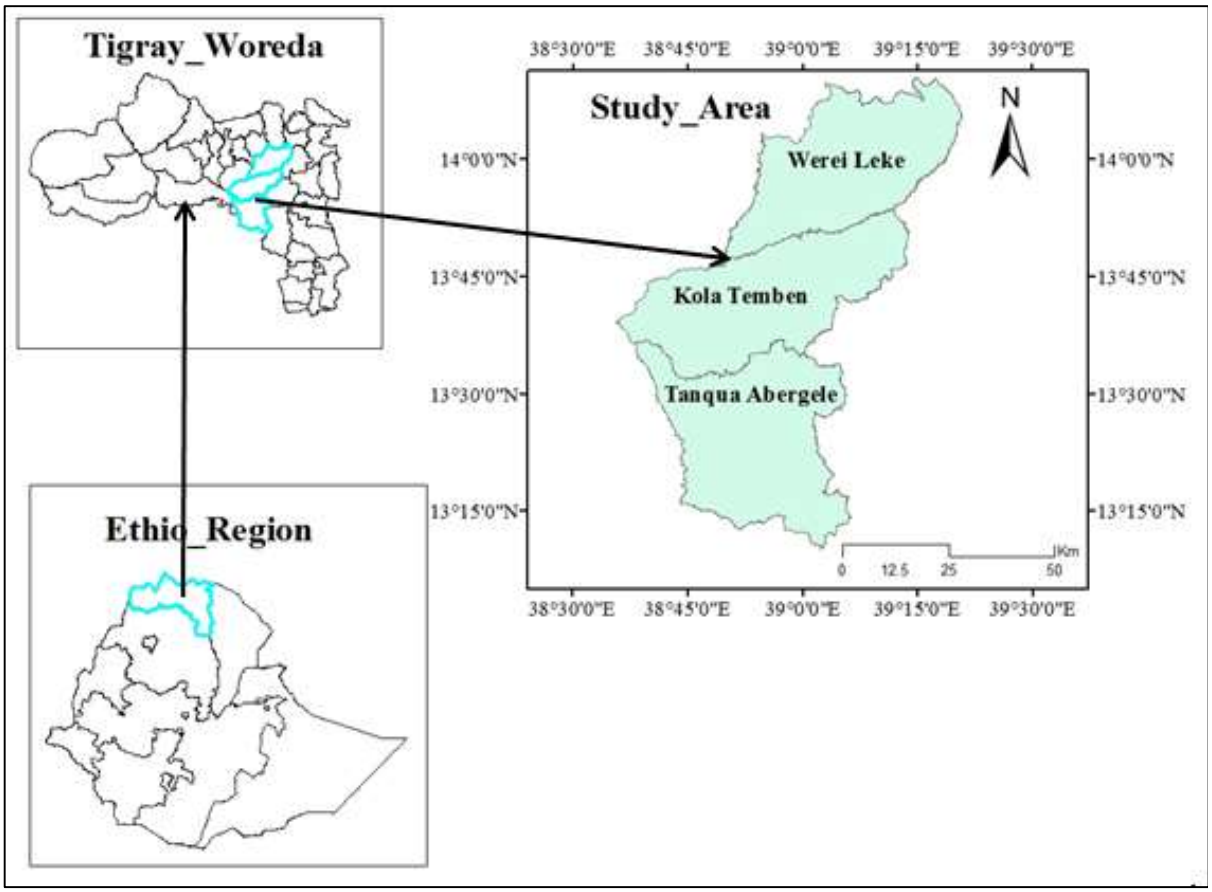

Figure 1. Study area map (Clipped from Ethio-map, 2012).

Table 1. Demographic characteristics of the respondents (N = 75).

Age group	Sex			Educational status		
	M	F	Total	Illiterates	Religious education	Modern education
24-34	6	1	**7**	4	-	3
35-45	26	3	**29**	9	1	19
46-81	35	4	**39**	21	5	13
Total	**67**	**8**	**75**	**34**	**6**	**35**

to education during that time. On the other hand, 65.5% of the age group 35 to 45 years has attained a modern education followed by the 24 to 34 age groups (42.8%). The elder people have higher involvement in religious education than the young age group. The involvement of females in practicing medicinal plants was low compared to males, and hence most of the medicinal plants were mentioned by males. In fact the knowledge of traditional medicinal plants was in the hand of male elders. This was evidenced that informants between the age ranges of 46 to 81 were 52% and of which 89.7% were males (Table 1).

Growth forms and parts of Medicinal plants

Through the interview undertaken at the aforementioned sites, about 129 medicinal plants were identified. This study recorded higher number of medicinal plants than the study of Yirga (2010) or Zerabruk and Yirga (2012). The growth form of the medicinal plants was 41% herbs followed by 33.3% trees, 22% shrubs, and 3.7% both epiphytes and climbers (Figure 2). Nearly half of the identified medicinal plants were herbs and Kandari et al. (2015) also found that herbs are the most dominant medicinal plants in East Hararghe, Eastern Ethiopia.

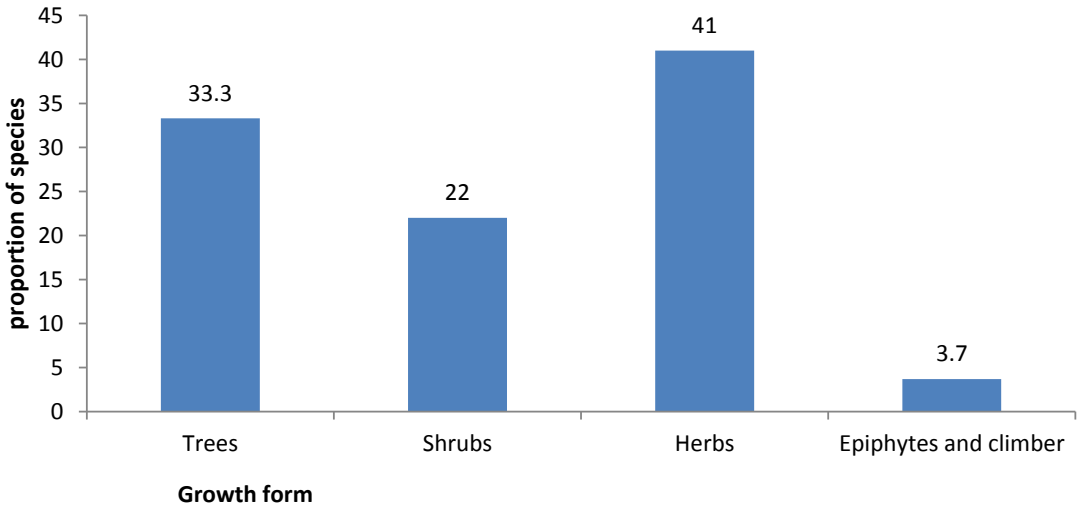

Figure 2. Growth form of the reported medicinal plants used in the area.

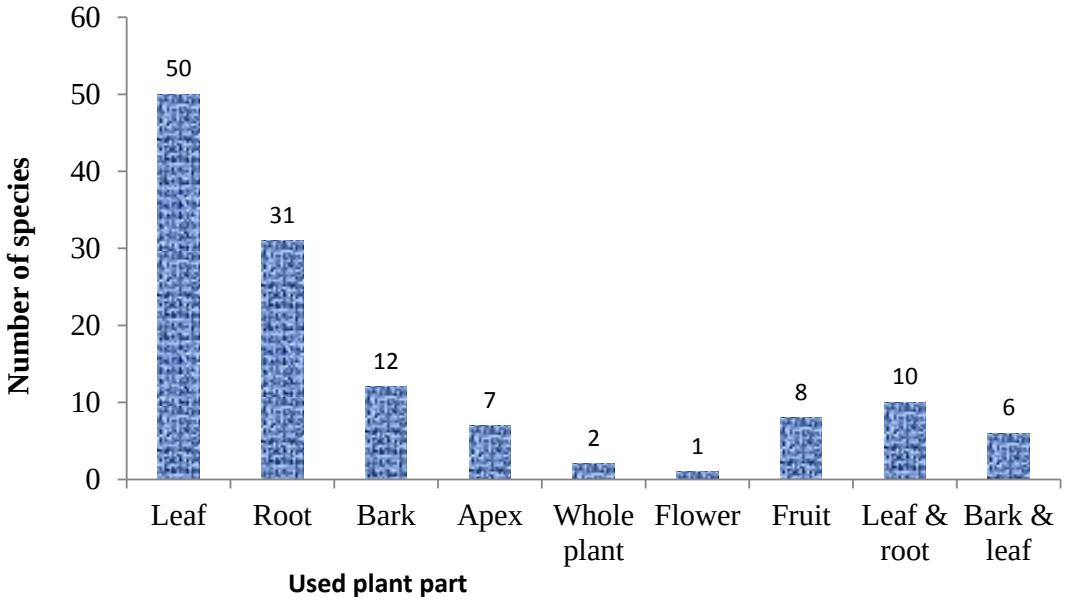

Figure 3. Parts of plants used as medicinal value for both human and livestock purposes.

Currently, their access was limited and found in long distance from their destination. Yirga (2010) and Chekole et al. (2015) indicated that the availability of the medicinal plant in Ethiopia was as wild. From the identified medicinal plants 92 of them were used to cure human disease and 29 species only used for animal disease treatments. There are also 8 plant species used for both animal & human disease treatments. The herbaceous plant forms cannot withstand drought and, in most cases, they are likely being over-utilized (including the whole plants). Contrary to this, other studies undertaken in central eastern Ethiopia (Hunde et al., 2006), in Gimbi district, western Ethiopia (Tolassa, 2007), in Wonago district, southern Ethiopia (Mesfin et al., 2009), and in Mana Angetu district, southeastern Ethiopia (Lulekal et al., 2008) showed that shrubs, followed by herbs and trees are the most frequently used growth forms.

However, this variation could be attributed to the agro-ecological diversity of the study areas that favors different plant forms, and socio-cultural factors which determine specific knowledge in different communities (Reta et al., 2015). For both livestock and human medicinal purposes the leaf, root and bark parts of the plants were mainly used (Figure 3). According to this result, leaf was the

most commonly used plant part accounting for 50 species of the total reported medicinal plants, followed by roots 31 and bark 12 species.

Additionally, there are combined parts used for treatment like 10 species were used for their leaf and root, while bark and leaf for 6 species. Consistent with other studies (Bayafers, 2000; Yineger et al., 2008; Yirga et al., 2011; Chekole et al., 2015), leaves were the most commonly used plant parts for herbal medicine preparations for both livestock and human beings. This mode of traditional medicinal plant practice was important for conservation of medicinal plants because harvesting leaves do not have great pressure to the survival of individual plants as compared to the whole plant collections.

Previous works carried out elsewhere in Ethiopia also revealed that leaves followed by roots were the most common parts (Amenu 2007, Bekalo et al., 2009, Ragunathan and Solomon, 2009). In contrary, other reports showed roots to be the most widely used plant parts (Hunde et al., 2006; Lulekal et al., 2008; Mesfin et al., 2009). Scholars had shown that removal of up to half of tree leaves does not significantly affect plant growth (Yirga, 2011). However, medicinal plant harvest involving roots, rhizomes, bulbs, bark, stems or whole parts have significant consequences both from an ecological point of view and for the survival of the plants (Abebe and Ayehu, 1993; Giday et al., 2003; Hunde et al., 2006).

Medicinal plants and diseases treatments

The local community of the study area had an experience of using medicinal plant on day to day life moment and the most commonly and widely used plants were presented in Table 2 and Table 3.

Human and livestock diseases treated by medicinal plants

The local community was getting vast advantage for their animals and humans health medication from the local available plants. In the present study, a total of 43 human disease and 17 livestock diseases and parasite were identified that can be potentially treated using medicinal plants (Tables 2 and 3). With regard to human diseases, snake bite and abdominal pain were the one which had a high number of medicinal plants used to treat, followed by anthrax, swelling, bone fracture and tonsillitis. However, for most of the human diseases one medicinal plant was used to treat one disease. Hence, if their natural regeneration status is poor there will be a probability of over exploitation of the plants. To some extent, diseases that have many alternative medicinal plants could indicate the frequency of occurrence and importance of the diseases in the area. Despite the large scale environmental degradation and recurrent droughts, there was still rich knowledge on the use of medicinal plants in the districts. As compared to human diseases, diseases of domestic animals in the districts were treated with a relatively fewer number of plant species, which could be due to the less number of diseases affecting the animals. Similar findings were reported by studies conducted in southeast Ethiopia (Wondimu et al., 2007). High number of medicinal plants is used in the treatment of anthrax followed by swelling and this may suggest the high importance or prevalence of the disease in the study districts. The fact that a single plant is most frequently used plant to treat a single or multiple diseases could indicate better efficacy of the plant or its higher abundance in the study area. Most of the plant species reported was also mentioned by authors in studies conducted in Ethiopia (Mesfin et al., 2013; Tekle, 2014, 2015).

Management and use of medicinal plants

In the study, districts marketing medicinal plant was not a common practice in local markets, however in southeast Ethiopia selling of medicinal plants was common (Wondimu et al., 2007). The majority of the medicinal plants was obtained from wild and hence, exposed to various anthropogenic and natural factors.

According to the respondents, 86.7% of them undertake plantation activity; however, only 25% of them were specifically undertaking plantation of medicinal plants around their homestead. Beyond plantation of trees, there is no concerned body that gives training on how to use and conserve the medicinal plants sustainably. Some medicinal plants are rare and endangered this could be explained by the lack of knowledge among ordinary people about the importance of medicinal plants as most of them are only known by few knowledgeable people. Most of the respondents (70.7%) indicate that they have awareness on those problems. If over used, the medicinal plants could have their own impact on health and people understand this fact. The respondents equally (44%) explained that both the traditional and modern medicines are effective in treating ailments (Figure 4). However, 12% of the respondents indicate that both the traditional and modern medicines are effective in treating diseases. This indicates that there are a number of peoples who are dependent on traditional medicinal plants to cure diseases and coincided with other study in Ethiopia (Yirga, 2010; Limenih et al., 2015).

Hence, it is easy to understand that there is a pressure on medicinal plants due to over utilization. From the survey 37.3% of the respondents believe that the abundance of medicinal plants is increasing while 34.7% say the medicinal plants was decreasing due to land degradation, over utilization and less managements. The

Table 2. Medicinal plant species used for human disease in Tigray, their vernacular names in Tigrigna and part of plant utilized.

Treated human diseases	Vernacular name (Tigrigna names)	Scientific name	Plant parts
Scorpio bite	Abetere	*Ziziphus jijube Mill.*	Root
	Hareg Bayta	*Clematis hirsute var. Hirsuta*	Root
	Elam Bikaurya	*Indigofera arrecta Hochst. ex A. Rich.*	Root
Anthrax	Ades	*Myrtus communis L.*	Leaf
	Aftuh	*Plumbago zeylanica L.*	Root
	Engule	*Solanum incanum L.*	Leaf
	Falsha	*Salvadora persica*	Leaf
	Hafaflo	*Zehneria scabra (L.f.)*	Leaf
	Simieza	*Justicia schimperiana*	Leaf
Pneumonia	Aftuh	*Plumbago zeylanica L.*	Root
	Agol	*Withania somnifera (L.) Dunal*	Leaf
	Awhi	*Cordia africana Lam.*	Leaf
	Buna	*Coffea arabica L.*	Fruit
	Teneg	*Medicago polymorpha L.*	Leaf
Dislocated bone	Aftuh	*Plumbago zeylanica L.*	Root
	Gonok	*Dichrostachys cinerea Wight et Arn.*	Epiphytes
	Seraw	*Acacia etbaica Schweinf.*	Epiphytes
Snake bite	Alke	*Cissus petiolata Hook. f.*	Leaf
	Etse Zewye	*Cyphostemma junceum (Webb)*	Root
	Hambhambo bayta	*Cassia arereh Delile*	Root
	Ziwawie	*Erythrina abyssinica Lam.*	Root
	Righe (grass type) + Ziwawie	*Erythrina abyssinica Lam.*	Whole part + Root
Swelling	Amam Gimel	*Heliotropium cinerascens*	Leaf
	Muchele	*Achyranthes aspera*	Leaf
	Tiktiko Ef	-	Leaf
	Tirnakiya	*Verbascum sinaiticum Benth.*	Root
Eye pain	Agol	*Withania somnifera (L.) Dunal*	Leaf
	Hafaflo	*Zehneria scabra (L.f.)*	Leaf
Tonsillitis	Argudi	*Maytenus senegalensis*	Leaf
	Melhas Bieray (Mechelo)	*Achyranthes aspera L.*	Root & Leaf
	Gesho	*Rhamnus prinoides L'Herit.*	Leaf
	Gesho + Geba	*Rhamnus prinoides L'Herit. + Ziziphus spina-christi (L.) Def.*	Leaf Apex & Root
Malaria	Avekado	*Persea americana*	Fruit
	Ere	*Aloe vera*	Leaf
Abdominal pain	Awhi	*Cordia africana Lam.*	Leaf and fruit
	Elam Bikaurya	*Indigofera arrecta Hochst. ex A. Rich.*	Root
	Engule	*Solanum incanum L.*	Root
	Ere	*Aloe vera*	Root
	Hohot	*Rumex nervosus*	Leaf
	Lomin Bayta	*Cucumis pustulatus*	Root

Table 2. Contd.

Amoebae	Awhi	*Cordia africana Lam.*	fruit
Gastritis	Awhi	*Cordia africana Lam.*	fruit
Common cold	Tsaeda Bahrzaf	*Eucalyptus globulus*	Leaf
Skin diseases	Tsaeda Bahrzaf	*Eucalyptus globulus*	Leaf
Evil eye	Chena Barya	*Artemisia abyssinica*	Leaf
Skin wound	Dander	*Argemone mexicana*	Leaf
	Tambuk	*Croton macrostachyus Del.*	Leaf
Tapeworms	Duba	*Cucurbita pepo*	Fruit
	Habo Tselim	*Jasminu gratissimum*	Leaf
Bone fracture	Ere	*Aloe vera*	Root
	Seraw	*Acacia etbaica Schweinf.*	Bark
	Tahsos	*Dodonaea angustifolia*	Leaf
	Lomin Bayta	*Cucumis pustulatus*	Root
	Kasta Anisti	*Asparagus africanus*	Root
	Gonok	*Dichrostachys cinerea Wight et Arn.*	Root
	Girbiya	*Haypoests forskaolii*	Root
Herpes zoster	Ere	*Aloe vera*	Flower
Asthma	Tahsos	*Dodonaea angustifolia*	Leaf
	Gesho	*Rhamnus prinoides L'Herit.*	Leaf
Tinea capitis	Gaba	*Ziziphus spina-christi (L.) Def.*	Leaf
Abdominal pain	Gindae	*Calotropis procera (Ait.)*	Leaf
	Tahsos	*Dodonaea angustifolia*	Epiphytes
Headache	Gonok	*Dichrostachys cinerea Wight et Arn.*	Epiphytes
	Teneg	*Medicago polymorpha L.*	Leaf
Hepatitis	Hohot	*Rumex nervosus*	Leaf Apex
	Weyba	*Terminalia brownii*	Bark, leaf
	Simieza	*Justicia schimperiana*	Leaf
Head ach and depression	Liham	*Syzygium guinensis*	Epiphytes
Bleeding	Lomin	*Citrus limon*	Fruit
	Tirnakiya	*Verbascum sinaiticum Benth.*	Root, Leaf
Pneumonia	Lomin Bayta	*Cucumis pustulatus*	Root
Termite	Nim Kola	*Azadirachta indica A.*	Leaf
Weevils	Nim Kola	*Azadirachta indica A.*	Leaf
Bed Bugs	Nim Kola	*Azadirachta indica A.*	Leaf
toothache	Seti Semhal	*Schoenoplectus corymbosus*	Leaf
Hemorrhoids	Shinfae	*Lepidium sativum*	Bark
Tewsas (Skin disease)	Tambuk	*Croton macrostachyus Del.*	Leaf
Dermatitis	Shetora	*Securidaca longepedunculata*	Leaf
	Teneg	*Medicago polymorpha L.*	Root

Table 2. Contd.

Rabies	Tambuk	*Croton macrostachyus Del.*	Leaf apex
Tiemto	Awhi + ziwawie + mechelo/Tirnaka + Gonok	*Cordia africana+ Erythrina abyssinica Lam.+ Verbascum sinaiticum Benth. + Dichrostachys cinerea*	Leaf
Tinea versicolor	Berbere	-	Leaf
	Se'aa + Ater bahri + Amie	-	Leaf
Paralysis	Komoro + Andel	*Maerua angolensis+ Capparis tomentosa Lam.*	Root, Leaf, Bark
Spheeno megaly	Sur betri + mekan shimti	*Euphorbia candelabrum Kotschy.+Phytolacca dodecandra L 'Herit.*	Root
Himam hirsi (pain during giving a birth)	Kolkual	*Euphorbia abyssinica Gmel.*	Liquid

Table 3. Medicinal plant species used for livestock disease in Tigray, their vernacular names in Tigrigna and part of plant utilized.

Local name	Tigringa name	Scientific name	Plant parts
Anthrax	Ades	*Myrtus communis L.*	Leaf
	Kolkual	*Euphorbia abyssinica Gmel.*	Liquid/mucilage
	Shembewaeta	*Datura stramonium L.*	Root, Leaf
	Shinfae	*Lepidium sativum*	Root
	Hafaflo	*Zehneria scabra (L.f.)*	Root
	Daero	*Ficus vasta*	Bark
	Aftuh	*Plumbago zeylanica L.*	Root
Scabies (skin diseases)	Alendiya	*Ormocarpum pubescens*	Bark
	Tambuk	*Croton macrostachyus Del.*	Leaf
Swelling	Alendiya	*Ormocarpum pubescens*	Leaf
	Kolkual	*Euphorbia candelabrum*	Bark
	Kolkual + Gindae + Kinchib	*Euphorbia candelabrum + Callotropis procera+ Euphorbia tirucalli L.*	Leaf
	Dekuaeta	*Cucumis dipsaceus Ehrenb. ex Spach*	Root
	Alke	*Cissus petiolata Hook. f.*	Leaf
Cataract	Argudi	*Maytenus senegalensis*	Apex part
	Mekan Shibti	*Phytolacca dodecandra*	Root, leaf
Wound	Aserkuka	*Cyphostemma adenocaule*	Root
Bloating	Awhi	*Cordia africana Lam.*	Leaf
	Melhas Bieray	*Achyranthes aspera L.*	Apex part
	Nim Kola	*Azadirachta indica A.*	Leaf
	Gesho	*Rhamnus prinoides L'Herit.*	Leaf
Lice and fleas	Hitsawts	*Calpurnia aurea (Ait.) Benth.*	Leaf
Dislocated bone	Dekuaeta	*Cucumis dipsaceus Ehrenb. ex Spach*	Root
	Tifrarya	*Sida schimperiana Hochst. exA. Rich.*	Root, Bark

Table 3. Contd.

	Kolkual	*Euphorbia abyssinica Gmel.*	Root
	Metselem	*Striga hermonthica*	Leaf
	Elam Bikaurya	*Indigofera arrecta Hochst. ex A. Rich.*	Root
Syneresis cerebral	Simieza	*Justicia schimperiana (Hochst. ex Nees) T. Anders*	Leaf
	Sererit + Bierir + Moder	-	Leaf
Leeches	Nim Kola	*Azadirachta indica A.*	Leaf
	Shembewaeta	*Datura stramonium L.*	Leaf
Affefita (Black leg)	Bierir + Sererit	-	Bark, Leaf
	Tambuk	*Croton macrostachyus Del.*	Apex part
Tapeworms	Tambuk	*Croton macrostachyus Del.*	Bark
Rabies	Tambuk	*Croton macrostachyus Del.*	Fruit
Abortion	Tifrarya	*Sida schimperiana Hochst. exA. Rich.*	Root, Bark
Pasturulosis	Tikur Berbere	*Schinus mole*	Leaf
To reduce aggressiveness of oxen	Tambuk + Metere	*Croton macrostachyus Del. + Buddleia polystachya*	Leaf
Nefregna	Sur betri + kolkual/kinchib	*Euphorbia candelabrum Kotschy and Euphorbia tirucalli L.*	Apex/latex part

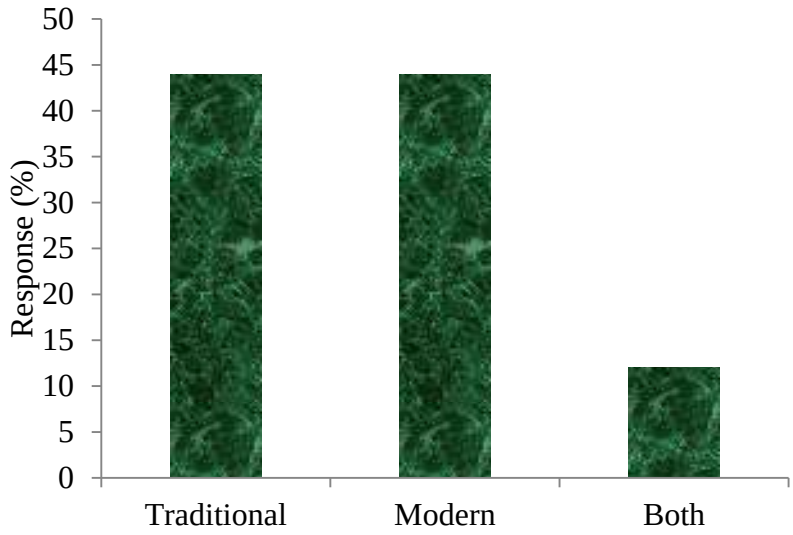

Figure 4. Effectiveness of traditional compared to modern medical treatments from the respondent.

remaining 28% of the respondents stated that the medicinal plants are neither decreasing nor increasing (constant). Local people's perceptions of factors threatening the medicinal plants were pressures from agricultural expansion, over grazing, fuel wood, and seasonal drought have been reported as main factors for environmental degradation as well as the depletion of medicinal plants.

Assefa and Abebe (2014) also stated that expansion of forest area for crop production was found as the dominant factor for the existence and sustainability of wild medicinal plants in southern Ethiopia. As for

conservation status, most of the medicinal plants in the study area have no protection since they are harvested from wild with no evident conservation practices. The few cultivated medicinal plants are being conserved near homes. This urges the need for participation of local people and awareness creation through training or education on sustainable utilization and management of plant resources in general and the medicinal plants in particular.

CONCLUSION AND RECOMMENDATION

Central zone of Tigray owns a high number of medicinal plants treating human and animal diseases and parasites. Herbs took the higher proportion of the reported medicinal plants, which could be an indication of their relatively better abundance as compared to other life forms. Most of the medicinal plants are growing (regenerating) naturally, not supported by plantation. Some respondents were cultivating the medicinal plants in their home, because currently the plants are decreasing their population number and their access becoming limited in some areas. Despite the large scale environmental degradation and recurrent drought, medicinal plants are still playing a significant role in the management of various human and livestock diseases in the study areas. In this case, wise utilization is necessary for sustainability of the plant species. Recurrent drought was reported to have seriously threatened medicinal plant resources in the study area. Despite this fact, there is little effort in the District to cultivate or manage medicinal plants. Thus, awareness is needed to be raised among local people on sustainable utilization and management of the plant resources. *Ex situ* and *in situ* conservation measures should be taken to protect the medicinal plants of the district from further destruction and special attention should be given to the medicinal plants which are the most threatened ones.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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