

## Research Article

# Threats and Ethnobotanical use of Plants in the Weredas of Afar Region, Ethiopia

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- Biodiversity
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## Abstract

Biodiversity conservation assured through proper timely set study of their status and conservation measure that depends on the type of species at a given time and place of existence. A study to identify the current use and conservation status of plant by the people in afar region was carried out in November 2019 in the systematically selected weredas of the region. A total of 41 respondents were participated from the three study weredas and 39 ethnobotanically useful plants that taxonomically belong to 23 family and 28 genera were identified. The three dominant family of the identified plant species were 22% Fabaceae and Capparidaceae, and 17% Solanaceae. The growth form diversity of the plants was 68% shrubs, 15 % herbs and 6% each climbers and trees. The most used part of the plants and administration method were the leaf part and oral methods respectively. The main challenge of the plant biodiversity in the surveyed weredas were; the existence of rapid invasion of invasive species particularly, *prosopis juliflora*, Highly pronounced drought and climate change, The nomadic nature of the people in the studied wereda, Low regeneration status of some plant species were the primary threat of the plant in the wereda. Priorities should give for the most threatened plant species used by the local community of the surveyed sites in either of in situ and ex situ conservation sites for their sustainability

## INTRODUCTION

Human beings around the globe have depended on the resource of plant biodiversity for their simple basic need requirements such as a source of medicines, housings, food, perfumes, clothing, aromas, fertilizers, and other means of their lives. The uses of Plants for medicinal purposes were started long before the prehistoric period of time [1]. The WHO estimated recently that 80% of people worldwide now days depend on herbal medicines for some aspects of their primary healthcare requirements and around 21,000 plant species can potentially be used as medicinal plants [2]. Most of plant species used for medicinal purpose is found in wild forests habitats [3] and have enormous socio-economic value in Ethiopia, and these require further studies [4]. The primary step in preservation and sustainable ethnobotanical usage plants is to document material conventionally used to treat a sickness [5,6]. The world health organization [7] planed a strategy (Traditional Medicine Strategy, 2014-2023) to support the advancement of an innocuous and effective use of traditional and complementary medicine.

A larger number of plants biodiversity and local community uses knowledge have not yet been fully documented. The opulent history of African cultures and their pioneering utilization of plants as a basis of medications have been transmitted through generations fundamentally by oral tradition [8]. This local community knowledge is steadily being vanished [9] as the

upholders die before passing on information to their younger generations. Besides, the continuing loss of ethnobotanical knowledge due to lack of documentation, overharvesting of medicinal materials from their natural habitat and devastation of the habitats have been two of the major threats to local community based traditional medicine. In order to conserve wild plant species, there is need for reliable data on their distribution and level of use [10]. Munthu et al. [11], pin pointed that the documentation of local communities' knowledge through ethnobotanical studies is therefore important in upkeep and use of biodiversity resources.

These days, many Ethiopian medicinal plants are pebbledash extinction or austere genetic erosion principally due to agricultural expansion, deforestation, over exploitation, climate change and destructive harvesting [12]. More ever, much of the knowledge on the uses of medicinal plants in the country is motionless held only by local societies which lack the ability of writing and reading and is usually transmitted orally [13].

A number of ethnobotanical studies have previously been conducted in different parts of Afar to document the use of medicinal plants. However, there is no record that indicates the documentation of medicinal plants used by the people of Teru, Abala and berahle weredas of the afar national regional states. The purpose of this study was, consequently, to document and evaluate traditional knowledge of plants biodiversity used to

manage human and animal health problems in Teru, Abala and Berahle districts of the Afar national regional state, Ethiopia. Therefore, the main objective of this survey is to assess an ethnobotanical use, threats and management practice of plants biodiversity and the associated local knowledge in afar regional state. Specifically aims to; identify types of plant species used for different use by community of the assessed weredas of the region, pinpoint indigenous plant species for insitu and exsitu conservation priorities from the region and recognize threats to plants biodiversity and threatened plants species in the study weredas.

## MATERIAL AND METHOD

### Study area description

The Afar people are one of the major pastoral communities in Ethiopia and reside in the Afar Regional State, northeastern of the country. It shares precincts with Eritrea in the north, Djibouti and Somali region in the east, Tigray and Amhara regions in the west and Oromiya Region in the south. Semera is the administrative center of the Region and is located in the northeast of Addis Ababa, the capital city of Ethiopia. The altitude of the Region ranges from 1500 m a.s.l. to 126 m below sea level, and receives annual rainfall with a precipitation of 150–500 mm per annum and the annual temperature varies from 20 to 48°C [14].

### Population and socioeconomic characters of the study districts

The total population of the Afar region 2,276,867 people in Ethiopia (or 2.73% of the total population), of whom 105,551 are urban inhabitants, according to the most recent census [15]. The Afar peoples are one of the nine recognized ethnic divisions of Ethiopia. The Afar speaks the Afar language, which is closely related to other Cushitic languages such as the Oromo, Saho, and Somali. Most of them are Muslims and base their traditions and practices around the Islamic faith.

In terms of cultural practice, they predominantly based on nomadic way of lives around livestock including camels, goats, sheep, and sometimes cattle. Like in most nomadic communities, the size of cattle is a direct indicator of a man's wealth and social status. The movement of the Afar is related to the seasonal changes in weather patterns and availability of water and pasture. During movement, the Afar carries their houses and reassembles them at their new settlement.

The social, political and economic organization of, the Afar are a patriarchal community with most men taking leadership roles. Within the family, women have the responsibility of running the home, setting up houses, and milking goats and women lead in songs during their ceremonies. While most of them are nomadic herders, others have developed other economic professions based on their location and modern developments in their respective residents. Nomads are also known to trade animal products including milk, meat, butter, and hides, a trend that developed during the 20th century [16]. The common economic development of nomadic people is their dependency in natural resources. Likewise the afar people in Ethiopia depend on natural resource particularly with plant role to lead their life. Based on the objective of this survey, simple assessment study

were carried out about ethnobotanical use and the treats to plant biodiversity in three weredas (Teru, Abala and Berahle) from Afar regional state as shown in the figure 1 below.

### Selection of informants and study area

Like other regions in the country, the administrative hierarchy of the region divides in to zonal and wereda. The number of zone that should be included in this survey study was based on the recommendation given by the biodiversity directorate of the region. The choice of wereda, kebele and informants were also done by biodiversity or related experts at regional, zonal and wereda levels through objective based hot discussion as shown in the following figure 2 below. Accordingly, an assessment was carried out in three weredas (Teru, Abala and Berahle). A snowball sapling method was also used to select key informants from the general informants [17].

## RESULT AND DISCUSSION

### Demography characteristics of the informants

Most of the respondents were males in gender 67% and the highest respondents, 41%, were from Ab Ala wereda. Highest numbers of female respondents were also from the Ab Ala and Berahle wereda respectively while the smallest numbers of female respondent were from Teru wereda as shown in the following figure below. This variation of respondents were due the absence of proper informants and other cultural and anthropological factors that makes for them to be involuntary to convey what they know about and the ethnobotanical use of plants as the indicated in the following Figure 2.

### Respondents' knowledge and conservation status of plants in the study districts

In order to observe the relation between plant use knowledge and status a Pearson correlation coefficient were tested between Gender, Marital status, educational level and age of the informants.

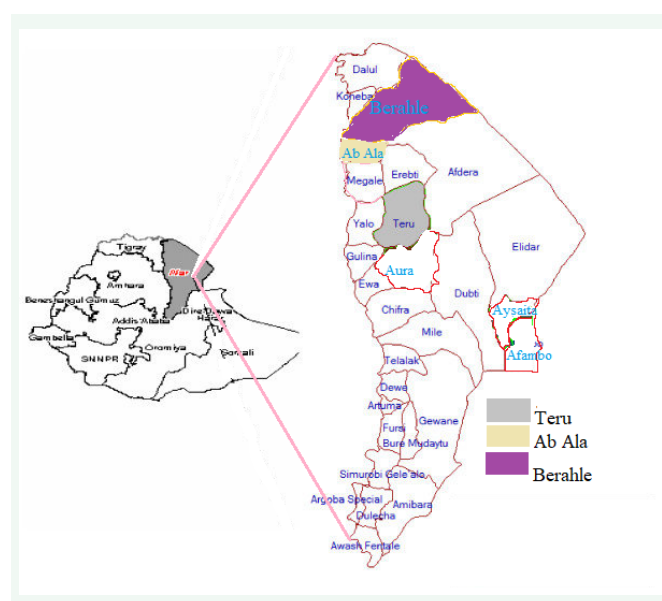
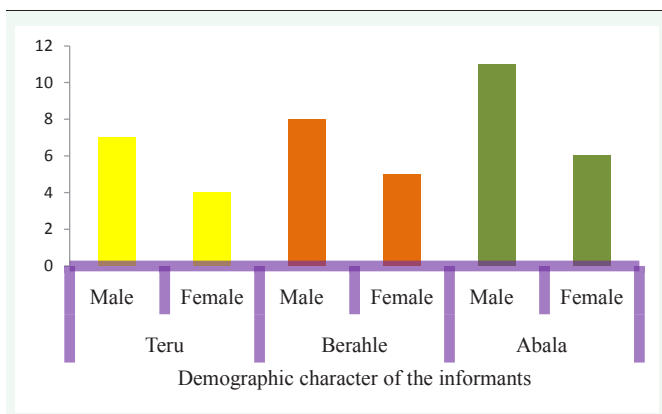


Figure 1 Map of the study weredas of the Afar region.



**Figure 2** Demographic characteristics of informants.

Accordingly, a positively significantly correlation were observed between gender and knowledge of plant use knowledge in the three weredas (Ab Ala ( $p < 0.05$ ), Berahle ( $p < 0.05$ ), and Teru ( $P < 0.01$ )) of the study. This is a good indicator of men were more familiar than females. The marital status of the informant indicates a positively significantly correlates the knowledge of plant use in Teru ( $p < 0.01$ ) wereda which convey about divorced female respondents were able to mention more medicinal plants than single and married females while a negative significant correlation between the educational level and knowledge of plants use in the Ab ala ( $p < 0.05$ ) wereda. The most knowledgably respondents about the use of plants were with lower educational level and vice versa. A positively correlation ( $p < 0.05$  and  $p < 0.01$ ) was observed between age and plant use knowledge in the weredas of Ab ala and Berahle respectively. Respondents with higher age level were more knowledgeable the respondents at lower age class as describes in table 1 below. Study carried out in Nigeria [18] stated that the highest percentage of younger generation had no any knowledge of traditional medicine practice due to more exposure acculturation.

## The floristic diversity of plants in the afar people

Based on the objective of the survey type of medicinal plants, scientific and local name, habit, use part, type of diseases treated and method of administration were discussed on the given time with the local community and wereda experts. A total of 36 plant species that belong to 23 family and 28 genera used for different use value that should give a priority in conservation were identified from the study weredas of the afar regional state. Accordingly, the name of the mentioned plant species by the local community for different health problem of human and animal health care system and other use are listed in the following table 2 below. Most of the mentioned plant species by the informants were used for the treatment of domestic animal diseases. This study agrees with the finding of [19,20] in which most species were used to treat human ailments than livestock ailments. The outcome of this study indicated that the local communities mostly used medicinal plants to treat human ailments than livestock ailments. The taxonomic diversity of the identified plant species were 22% Fabaceae and Capparidaceae, and 17% solanaceae. Similarly, various studies conducted somewhere in Ethiopia [21-24] have reported Fabaceae as the most dominant medicinal plant family. In contrast, other studies found that Asteraceae [25,26], Lamiaceae [27] and Euphorbiaceae [28] were dominant over others.

## Growth form diversity of the plant species in the study districts

The study also showed that people in the study districts use a relatively high number of shrubs, which is in agreement with studies conducted elsewhere in the country [29]. However, [30] showed that herbs and trees were the most frequently used growth forms. The most used part of the plant in the study weredas were 44% leaf, 24 % root part 7% stem, and bark and fruit part equally. Many ethnobotanical studies conducted in different parts of Ethiopia and the world also showed that leaves are used more frequently used than any other parts [31-35]. However, other studies reported that the use of the root [36] part

**Table 1:** correlation of the demographic character of respondents with knowledge.

Variables		Respondents knowledge by each wereda		
		Ab ala	Berahle	Teru
Gender of the informants	P. Correlation	.734**	.885**	.664*
	Sig. (2-tailed)	.001	.000	.026
	N	17	13	11
Marrital status of respondents	P. Correlation	.207	.245	.653*
	Sig. (2-tailed)	.425	.420	.029
	N	17	13	11
Educational level	P. Correlation	-.620**	.521	.267
	Sig. (2-tailed)	.008	.068	.428
	N	17	13	11
Respondents age	P. Correlation	.973**	.571*	.245
	Sig. (2-tailed)	.000	.042	.468
	N	17	13	11

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*.. Correlation is significant at the 0.05 level (2-tailed).

**Table 2:** diversity and the use value of plants in the Afar people of the study district.

Scientific name	Family	Local name	Habit	Part used	disease name	Treated disease	Administration route
<i>Acacia mellifera</i> (Vahl) Benth.	Fabaceae	Marka ato	Tree	Bark, Stem	Wound healing	Human	Dermal
<i>Acacia nilotica</i> (L.) Willd. ex Del.	Fabaceae	Kenselto	Tree	Fruit	Contagious diseases	goat	Oral
<i>Acacia oerfota</i> (Forssk.) Schweinf.	Fabaceae	Goronto	Shrub	Bark	sudden sickness	cattle	Oral, nasal
<i>Acalypha fruticosa</i> Forssk.	Euphorbiaceae	Subahi	Shrub	Leaf	Contagious diseases	sheep	oral
<i>Acalypha indica</i> L.	Euphorbiaceae	Baro	Herb	Whole	anthrax	cattle, human	oral
<i>Aerva javanica</i> (Burm.f) Schultes	Amaranthaceae	alyaito	shrub	Root	ophthalmic infection	Goat, human	ophthalmic
<i>Aloe trichosantha</i> Berger	Aloaceae	ureita	shrub	Leaf	anthrax	goat	oral, nasal
<i>Argemone mexicana</i> L.	Solanaceae	baro bangi	herb	Leafy part	foot and mouth diseas	Human	oral
<i>Balanites aegyptiaca</i> (L.) Del.	Balanitaceae	uda	tree	Root Root	Bloat/swelling diarrhea	Animals cattle	oral oral, nasal
<i>Balanites rotundifolia</i> (van Tieghem) Blatter	Balanitaceae	uda	shrub	root bark	pneumonia	camel	nasal
<i>Barleria acanthoides</i> Vahl	Acanthaceae	ganselto	shrub	Root	blackleg	Sheep, goat	oral, nasal,
<i>Boscia coriacea</i> Pax	Capparidaceae	urma	shrub	Leaf leaf	Babesia Black leg	Cattle cattle	Nasal, oral/nasal
<i>Boscia senegalensis</i> Lam. ex Poirlet	Capparidaceae	aitineba	Shrub	leaf & fruit	tympanic bloat	cattle	oral
<i>Bourreria orbicularis</i> (Hutch. & E.A. Bruce) Thulin	Boraginaceae	ulageita	Shrub	leaf, bark	wound	animals	local on wound, oral
<i>Cadaba farinosa</i> Forssk.	Capparidaceae	dinibayto	Shrub	root	pastereulosis	cattle	Oral, nasal, auricular
<i>Cadaba glandulosa</i> Forssk.	Capparidaceae	udodoita	Shrub	leaf leaf	pneumonia diarrhea	human cattle	oral, nasal oral, nasal
<i>Cadaba rotundifolia</i> Forssk.	Capparidaceae	angelita	Shrub	leaf	blackleg	cattle	oral, nasal
<i>Calotropis procera</i> (Ait.) Aitf.	Asclepiadaceae	Ghulaento	Herb	latex	prophylaxis for different diseases	cattle	local on skin
<i>Cissus quadrangularis</i> L.	Vitaceae	yaey'eto	Climber	Stem	sprain	cattle	Oral
<i>Citrullus colocynthis</i> (L.) Schrad.	Cucurbitaceae	yaey'eto	Shrub	leaf,	Black leg	cattle	oral, nasal,
<i>Cocculus pendulus</i> (J.R. & G. Forst) Diels	Menspermeaceae	hayofto	climber	root	bloat	Cattle, human	Oral
<i>Commicarpus helenae</i> (J.A. Schultes) Meikle	Nyctaginaceae	Seati	herb	root	Teeth infection	Human	Oral
<i>Dobera glabra</i> (Forssk.) Pair.	Salvadoraceae	garsaito	herb	leaf	sudden sickness	Cattle, sheep	oral
<i>Dracaena ombet</i> Heuglin ex Kotschy & Peyr	Asparagaceae	Asae'rto	Tree	Bark Leaf	Forage Headache	Bee Human	Oral , dermal
<i>Lantana camara</i> L.	Verbenaceae	dat'hara	shrub	leaf	Foot and mouth diseases	cattle	oral
<i>Pergularia tomentosa</i> L.	Asclepiadaceae	ageraboya	shrub	exudate	babesia	goat	oral
<i>Salvadora persica</i> L.	Salvadoraceae	ada'ito	shrub	leaf	Wound	cattle,	local on skin
<i>Seddera bagshawei</i> Rendle	Convolvulacea	Buran Hira	shrub	Leaf	Scorpion bite	Human	Dermal
<i>Seddera bagshawei</i> Rendle	Convolvulacea	bekil tefere	shrub	whole	bloat	cattle,	oral
<i>Senna alexandrina</i> Mill.	Fabaceae	airogit,	shurb	Leaf	blackleg	cattle	oral
<i>Sericocomopsis pallida</i> (S. Moore) Schinz	Amaranthaceae	admegarto	shrub	Root	Contagious disease	Cattle	oral, local on skin
<i>Solanum incanum</i> L.	Solanaceae	kolodo'ita,	shrub	Fruit	pneumonia	Camel	oral
<i>Solanum hastifolium</i> Hochst. ex Dunal in DC.	Solanaceae	askena	shrub	Root	babesia	Goat	oral, nasal, auricular
<i>Trianthema portulacastrum</i> L.	Aizoaceae	abure	Herb	Leaf	Ophthalmic infection	animals	ophthalmic
<i>Withania somnifera</i> (L.) Dunal	Solanaceae	kokerabito, ubalto	Shrub	Leaf	listeriosis	Cattle	oral, nasal
<i>Ziziphus spina-christi</i> (L.)	Rhamnaceae	kusra	Shrub	Leaf	Delayed	Camel	oral



**Table 3:** List of threats and Threatened medicinal plants.

Threats	Cu.Av	Rank	Threatened plants	Cu. Av.	Rank
Drought	5.	4	<i>Dracaena ombet</i>	7	1
Overgrazing	6.7	3	<i>Balanites aegyptiaca</i>	6.2	2
over browsing	6.8	2	<i>Ziziphus spina-christi</i>	6	3
House construction	3.2	7			
Agricultural expansion	4.5	5			
Over harvesting	1.6	10			
Climate change	2.4	9			
Invasion of invasive species	6.9	1			

Where, Cu. Av= cumulative average of the respondents

were dominantly used which didn't assure the sustainability of the plant.

The major routs of administration by the peoples under study area were; oral, dermal, nasal, and oracular. Informants in the districts reported that, they were taken internally/orally followed by smearing on the skin. Several studies conducted in different parts of the county [37] also revealed that oral followed by dermal were the principal routes of remedy administration

### Threats and threatened plant species in the study wereda

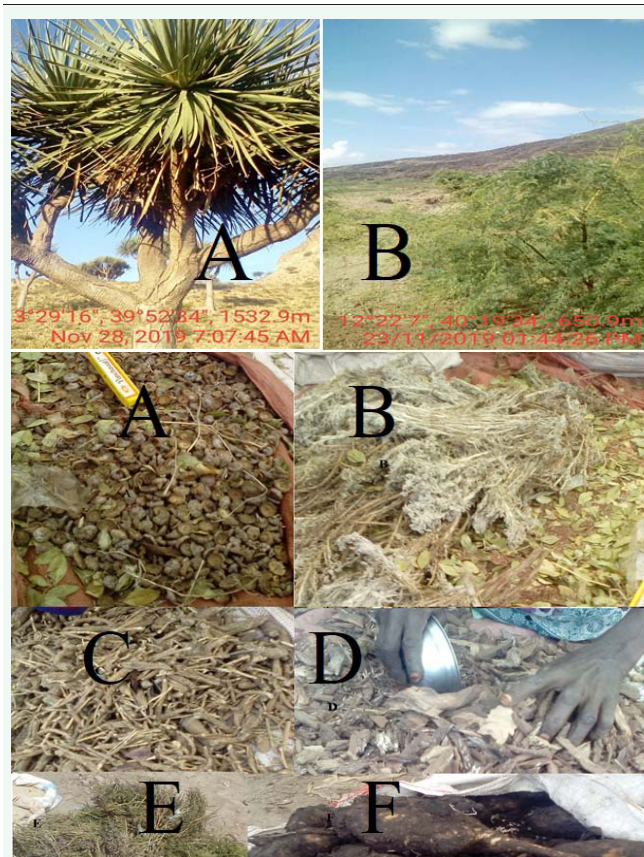
The status of plant biodiversity in the region ranges from highly degraded to diversified situation of plant role. During assessment to identify the threats to plant diversity and threatened plant species were carried out in selected wereda of the afar regional state, Ethiopia. The need for such a survey was in order to prioritize for severely threatened plants in insitu and exsitu conservation scenarios, and finally, to take a measure for the pronounced threats to plant species as listed in the following table below. Accordingly, the existence of rapid invasion of invasive species, *prosopis juliflora* figure3 (B), and table 3 in the region is a primary threat of plant species as the respondents inform during the discussion in the study districts.

Their harmful nature of the invasive is due to their rapid propagating capacity and dominance which enables them to alter or modify the existing ecosystem where they are introduced. The introduction of such species capable of out-competing local species seriously upsets the natural balance, risking the extinction of the local species [38]. This has become one of the major factors contributing to the depletion of nature.

The browsing is also a second threat of the plant species in the study districts as ranked by the informants. The possible suggestion that informants in the districts ranked for browsing as a secondary threat of plant species were due to the existence of huge browser animals particularly goats that feed up on it. The third and fourth next threats to plants were overgrazing and drought respectively. As the agro climatic zone representation of the afar region is dry land and due to the existence of considerable amount of grazing animals in the surveyed wereda of the districts as shown the following figure 3 (B) below.

### Cultivation of plants in the districts

The nomadic society didn't develop the culture of cultivation of for treating ailments of both human and livestock. This is due



**Figure 3** "A" dragon tree species from Abala to berahle wereda main way, "B" *prosopis juliflora*.

A= *Eucalyptus globulus* (seed coat), B=Hibaeto (local name), C= *Silene macrosolen*, D=Quni(local name) E= *Ruta chalepensis*, F= *Impatiens rothii*

to the fact that they didn't want to know their knowledge by others. The lack or unreachability of contemporary healthcare services and other reasons such as skyrocketed cost of modern drugs and services and better remedial of herbal medicines against diseases has caused a huge number of the Population to depend on traditional medicine, and mostly on herbal remedies [39,40,12], for its primary health-care needs. In Africa, up to 80% of the population relies on traditional medicine to help sustain its health care needs [41].

## Types of marketable plants in the study districts

In order to identify the type of medicinal plants sold in the market an assessment was carried out at the market of in Abala market goods only. The other market places i.e. Teru and Berahle were not assessed due to unsuitability of the market day and survey days carried out. Accordingly most of the types of medicinal plants sold at the market of Ab Ala by marketers were gathered from Tigray region, not from afar regional state. More ever, the marketer gathers plants and parts of it for medicinal, spice and other goods. As shown in the following photo from A-F below. All the marketers of the plants parts are females in gender. The reason why these marketers use these plant species only were due to the availability and the need of the local community demand to use these remedies for different use values.

## CONCLUSION

A total of 39 medicinal plants were reported by informants from the study district. As most of the people in the region lead nomadic life, highest portion of medicinal plants were used for livestock aliments. As the highest percent of knowledge observed from the old generation, proper conservation measures are required to ensure sustainable plant biodiversity use knowledge. Further efforts of awareness creation among the community by concerned bodies regarding the usefulness of the medical plants are important. Priority should be given to medicinal plants with the highest informant percent of threatened in ex situ and in situ conservation sites.

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