Ethnobotanical study of edible wild plants in Ensaro district, Amhara regional state, Ethiopia

Asaye Asfaw Woldemedhin (leulasaye@yahoo.com)
Debre Berhan University
Ermias Lulekal
Addis Ababa University
Tamrat Bekele
Addis Ababa University
Asfaw Debella
Ethiopian Public Health Institute
Eyob Debebe
Ethiopian public health institute
Samuel Tessema
Ethiopian Public Health Institute

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Abstract

Background: Ethiopia is one of the biodiversity-rich countries in Africa. Most rural communities are highly dependent on forest products including edible wild plants. Thus, many plant taxa are under greater threats before they are documented and their nutritional values are evaluated. This study was carried out to document edible wild plants and associated indigenous practices, and the correlations with socio-demographic variables on edible wild plants in Ensaro district, North Shewa Zone, Amhara Regional State, Ethiopia. It also examined the habitats and major threatening factors of edible wild plants.

Methods: The study was conducted from September to December 2020 in Ensaro district, Amhara Regional State, Ethiopia. Semi-structured interviews was made with 98 community members regarding edible wild plant species, parts used, harvesting and consumption time, preparation methods, supplementary uses, life forms, habitats and threatening factors. The socioeconomics characteristics of the study participants was also documented. Excel and R-package were employed for statistical analysis. Analysis of Variance ($P < 0.05$) was used to observe the correlation of socio-demographic and socioeconomic characteristics with indigenous knowledge of respondents on edible wild plants.

Results: Forty-three edible wild plants recorded in this study area. Fabaceae and Moraceae families were the most popular edible wild plant species in the study area. Shrubs were the dominant life forms of recorded plants (37%). Ripe fruits (72%) were the most commonly used plant parts. Indigenous knowledge of respondent on edible wild plants positively correlated with socio-demographic and socioeconomic characteristics of the respondents. There was no knowledge difference between genders. The number of species, genera and families of edible wild plants were higher in mid-land agro-ecology than in lowland and highland agro-ecologies of the study area. The distribution of edible wild plants found to be less in the highland agroecology. Edible wild plants in the study mainly found in shrub land areas which are highly threatened by fuelwood collection.

Conclusion: Forty-three edible wild plants recorded in the study area. The community consumes edible wild plants during normal and famine periods. Edible wild plants such as *Snowdenia polystachya (*Muja*), Eleusine coracana (*Degelie or wanga*), Urtica simensis(*Sama*)* and *Medicago polymorpha* (Amaqito) *are* not used during normal period and young people do not know them even how to use them. In addition, edible wild plants are under greater pressure due to farmland expansion in the study area. This has led to the reduction of edible wild plants and associated indigenous knowledge.

1. Background

About 390,900 plant species are estimated to exist on our planet (Royal botanic gardens Kew, 2016, May 9). however, only around 31,000 plant species are used by humans for different purposes such as food, medicine, fodder, construction materials (Mongabay, 2016, May 12). This indicates only about 7.9% of land plants are used by human. the remaining are underutilized plants that may help humans to ensure food security and to live through famines (Assefa & Abebe, 2011). They may have better nutritional compositions for proper growth and health improvements (Feyssa et al., 2011). However, EWPs and associated indigenous knowledge are currently declining due to different environmental factors. A recent investigation by Sujata and Rajasab (2015) concluded that EWPs are declining due to intense habitat destruction and over-exploitation.

Ethiopia due to its different agro-ecologies that favoured high biodiversity and possess 6027 plant taxa (Kelbessa & Demissew, 2014). However, nowadays, the biodiversity of the country face many different threats. The leading threats are such as farmland expansion, climate change, the introduction of exotic species and overexploitation (Husen et al., 2012; Gebretsadik, 2016). Currently, 135 woody plant taxa are threatened and are under the red list (Kelbessa & Demissew, 1998). This implies that many plant taxa are under greater threats before they are documented and their nutritional values are evaluated.

The livelihood of almost all Ethiopians dependent on agriculture which at the moment is facing different challenges including drought, climate change and land degradation (Hamza & Iyela, 2012; Temesgen et al., 2014). These factors cause food insecurity in most rural communities (Sabates-Wheeler et al., 2012). As the result, most of these communities are dependent on edible wild plants found in their environment (Feyssa et al., 2011; Tebkew et al., 2014). However, since there many ethnic groups with different cultures the types of edible wild plants and parts consumed are also different (Teklehaymanot & Giday, 2010). Hence, knowing this indigenous knowledge variation on edible wild plants and the plant taxa is very important to take appropriate conservation actions. Furthermore, it serves to select potentially valuable edible wild plants and integrate them with crops.

Although, numerous studies on ethnobotanical and edible plants have been conducted in various regions of Ethiopia (Regassa et al., 2015; Seyoum et al., 2015; Tebkew, 2015; Ashagre et al., 2016; Berihun & Molla, 2017; Tebkew et al., 2018; Eticha et al., 2019; Dejene et al., 2020), no ethnobotanical studies have previously been reported from Ensaro district where the present research had been conducted. But, ethnobotanical studies concerning edible wild plants had been conducted in the nearby area by Alemayehu et al. (2015) in Berehet District.

Therefore, the present investigation was designed and carried out in Ensaro district, Amhara Regional State, Ethiopia to identify edible wild plants and associated indigenous knowledge, edible parts, time of harvesting, mode of consumption, habitats and major threatening factors. The general objective of the study was to document edible wild plants and associated indigenous knowledge and to assess its correlation with age, gender, family size and household income. The specific objectives of the study were to:

1. document edible wild plants and associated indigenous practices
2. investigate relationships of indigenous knowledge on edible wild plants with age, gender, family size and household income
3. determine contributions of edible wild plants other than food
4. compare the distribution of edible wild plants species, families and genera among different agro-ecologies
5. describe major factors threatening sustainable utilization of edible wild plants

2. Materials And Methods

2.1 Description of The Study Area

The study was conducted in Ensaro district of North Shewa Zone Amhara Regional State (Fig. 1). The study site altitude ranges from 1200m-2700m above sea level. The area is highly deforested except for some unsuitable places for agriculture. The climate is wet and dry tropical, with an average annual rainfall of 1174mm (Harris et al., 2020). The District shows a unimodal rainfall from late June to September with a peak in August. The mean annual temperature of Ensaro district is 17.7^0c (Fig. 1).

The administrative centre of Ensaro is Lemi town found 130km North of Addis Ababa, the capital of Ethiopia. Geographically the district is located between 9º 35′- 9º 55′N and 38º 50' – 39º 5′E. the estimated total area of the district is about 44,217.6 ha (Fig. 2). The elevation of the study area ranges from1200m to 2700m above sea level and the district falls within three major agro-climatic zones, high lands, midlands and lowlands. Diverse geomorphological features characterize the topography of the woreda lands. Unpublished data from the woreda agricultural office indicate that 20% of the land area is mountainous, followed by plain (50%), flat plains (40%), gorge and other topographic features (10%) (Personal communication). The woreda has 1 urban kebele and 13 rural kebele's.

Based on the 2007 national census conducted by the central statistical agency of Ethiopia, the woreda has a total population of 72801, of whom 38838 are men and 33963 are women; 3,164 (5.44%) are urban inhabitants (CSA, 2013). Ensaro is bordered in the south and west by the Oromia region, in the north by Jemma River that separates it from Merhabiete woreda, in the northeast by Moretna Jiru, and in the east by Siyadebrina Wayu woreda. The absence of any ethnobotanical study in this district has led this study to begin to gather traditional local knowledge about useful plants, particularly edible ones.

2.2. Sampling Procedure and Sample Size Determination

2.2.1 Sampling Procedure

Multistage sampling technique was used for this particular study. In the first stage, Ensaro district was selected purposively for this study. This district is one of the drought-affected districts in North Shewa Zone of Amhara Regional State. As reported by Abirham Cherinet and Zenebe Mekonnen (2019), in the district there is a trend of increasing mean annual temperature and decreasing of mean annual rainfall for the three decades. This has negative impact on the vegetation of the area and initiates this research to check the status of cultural knowledge regarding to edible wild plants and the plant taxa in the district.

In the second stage, the study kebeles were stratified into three different strata to cover varying agro-climate due to time shortage and to have a representative sample. In the third stage, the six Kebeles were randomly selected from each agro-climate. In the fourth stage, sample HHs were selected from each Kebeles. To select sample HHs, a systematic sampling method was applied by taking the nth element of the sample frame. To select study HHs, a systematic random sampling method was applied by taking the nth

element of the sample frame. There are 6535 households in six selected Kebeles. The list of households was obtained from Woreda agricultural office in the study area. Three thousand (6535) was divided by sample size (98) and it gave 67. So that the nth value is 67. One number was obtained randomly between 1 and 67. The number was three. So that every 67th number was selected to get sampled household. It also assures that the community will be evenly sampled (Johnson et al., 2007)(Table 1).

Table 1
Selected kebeles, agro-ecology, distance from town in kilometer, total households and sample households

Kebele	Agroecology	Altitude a.s. l	Distance	Total HHs	Sample HHs
Yidno	Low land	Below 1500m	4	951	15
Beresa	Low land	Below 1500m	7	608	9
Lamgeno	Mid-land	1500m-2000m	2	750	11
Gezawasha dalota	Mid-land	1500m-2000m	3	1952	29
Diremu	High -land	Above 2000m	1	1047	16
Denbina girarge	High-land	Above 2000m	3	1227	18
			Total	6535	98

2.2.2 Sample size determination

To decide sample size, a quantitative model suggested by Cochran (1963) and indicated by Yamane (1967) was adopted as shown below:

$$n = \frac{N}{1 + N(e)}2$$

Where n is the sample size, N is a total number of households in the selected kebeles [the sample size (n) in each Kebele was picked based on its proportion to N because the number of households in each Kebele is different], e maximum variability or margin of error 10% (0.1), 1 = probability of the event occurring. Based on the above technique, 98 sample households were selected. Therefore, the total sample size was 100.**2.3 Data Collection**

Ethnobotanical data were collected using the method and protocol proposed by Martin (1995) and Alexiades (1996). Semi-structured interviews, group discussion, free listing and guided field walk with informed consent local informants. Before starting the interviews and plant collection, a meeting was organized with the help of kebele (local) administrators to highlight the objective of the study and its values for the communities. Oral consent was obtained before the interviews. Data collection was carried out from October 2019 to December 2019.

Questions about age, gender, income level, family size, list and name of edible wild plants, edible parts, harvesting season and method of preparation were prepared in English but translated into the local language (Amharic) during the interview. Plants listed during the interview were gathered for identification. Plants mentioned during the interview collected and deposited in the national herbarium of Ethiopia at Addis Ababa University.

The age ranged from 20 to 80 years, with an average age of 43. Women are mostly housewife in the study district. Some help their husbands in the outside home activities. The main activities of men are farming and livestock. Men perform often most of the activities outside the home.

2.4 Data Analysis

Data were entered into Minitab 18 software. Descriptive analysis was carried out for qualitative data such as edible parts, life forms, seasonal availability and habitats where edible wild plants are mainly found. The results were summarized as chart and tables, figures and tables for qualitative and quantitative data, respectively. Direct matrix ranking exercise was used to compare the use

diversity of a given plant species using the methods proposed by Martin (1995); Cotton (1996). The multipurpose uses of edible wild plant species were selected out of the total edible wild plants. Twelve Key informants were allowed to list the uses of these species. These key informants were asked to assign use values to each species as follows (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used and 0 = not used). The average values (scores) given to each edible wild plant species were summed up and ranked. Moreover, the ten key informants were also involved in a priority ranking exercise that was focusing on perceived threatening factors of the edible wild plant species.

2.5 Study Variables

The dependent variable was indigenous knowledge of the community that was measured by the information obtained on the number of edible wild plants while gender, age, household income and family size were considered as independent variables.

Ethical considerations

Data collection was carried out with special care of cultural views of the study local communities. Participants of this research were also informed about the objectives and roles of the research. Since, indigenous knowledge is the property of the community so any values that can be obtained as the result of this investigation should benefit the community. According to ethnobiology code of ethics indigenous knowledge should be protected and a part of the value generated should be transferred back to the authors of the knowledge. Finally, informants were accepted the idea and came to reach an agreement

3. Result And Discussion

3.1 Taxonomic diversity of edible wild plants

Forty-three (43) edible wild plant species distributed to 34 genera and 27 families reported by the study participants as sources of wild foods by this study in Ensaro district (Table 5). It was found that the plant family Moraceae was very popular and represented by five species. Fabaceae was the second widely used edible wild plants family represented by four species. Tiliaceae represented by three species; Ebenaceae, Polygonaceae, Boraginaceae, Solanaceae, Myrtaceae and Olacaceae had two species. The remaining families had one species each. Therefore, about 56% of the families represented by more than one species (Table 2). Among the identified species, *Urtica simensis* Hochst. ex A. Rich and *Aloe berhana* Reynolds are endemic to Ethiopia. Most of the reported edible wild plants used as fuelwood and medicines in the study area. The species identified might have two or more additional uses. For example, *Carissa spinarum* L used as a fence and medicine, Snowdenia *polystachya* (Fresen.) Pilg is used as, medicine and fodder.

Table 2
Diversity of edible wild plants in each plant family

No	Families	Number of species	Percentage
1	Moraceae	5	11.6
2	Fabaceae	4	9.3
3	Tiliaceae	3	7
4	Boraginaceae	2	4.7
5	Ebenaceae	2	4.7
6	Myrtaceae	2	4.7
7	Polygonaceae	2	4.7
8	Olacaceae	2	4.7
9	Solanaceae	2	4.7
10	Others	19	44.2

It also shows a relatively high diversity of edible wild plants, which might be due to the existence of different agro-ecologies. This result indicates that the collection and consumption of edible wild plants in the study area are still alive and it is an important local

activity. In most of Ethiopia, edible wild plants are essential components of daily food intakes (Balemie & Kebebew, 2006). These plants are important means to get a balanced diet and proper health for poor people who are depending on them for their daily foods (Teketay et al., 2010). Some reported species are edible during a food crisis.

This study was not aimed to evaluate the contributions of edible wild plants for the livelihood of people. However, about 30% of the respondents were indicated that they are getting some income from the sales of these plants, like Ximenia *americana*, *Ziziphus spina-christi* and, *tamarindus indica* are commonly traded in local markets.

In this study it was noted that the local name of three edible wild plant species varies in different kebeles- for example, *Tamarindus indica* is known by Roema in Yidnoberessa, Doqma in Gezawasha dalota kebeles; *Grewia occidentalis* in known by chirnchir in Yidnoberessa, Betremusie in Gezawasha dalota, and *Eleusine coracana (L.)* Wanga in Yidnoberessa, *Degelie* in Gezawasha dalota.

The number of edible wild plants species recorded in this study is comparable with the 46 species reported in the Southern part of Ethiopia (Ashagre et al., 2016). however, it is higher than the 22 species reported in the eastern part of Ethiopia (Kebede et al., 2017) and 27 species in Uganda (Nyakoojo & Tugume, 2020). But it is also lower than 154 edible wild plants species documented in Turkey (Cakir, 2017) and 354 species reported in Burkina Faso by Hahn et al. (2018). This difference in the number of reported edible wild plants might be due to variations in culture, vegetation cover of the area or climatic variation of the location (Bortolotto et al., 2015). It also perhaps shows declining of edible wild plants species together with associated indigenous knowledge of the communities.

In line with the current the present finding, Fabaceae and Moraceae have also been reported to be major edible wild plant families that frequently used in Ethiopia and elsewhere (Regassa et al., 2015; Meragiaw, 2016; Kebebew & Mohamed, 2017). This probably because most of *Ficus species* belong to the family Moraceae are edible plants in Ethiopia and elsewhere (Regassa et al., 2015; Ojelel et al., 2019) and the family Fabaceae is the most diverse in Ethiopia including other African countries (Hahn et al., 2018; Tebkew et al., 2018; Mutie et al., 2020) and hence there is a high chance of getting edible species for these two families. However, some previous studies in Ethiopia (Balemie & Kebebew, 2006; Ashagre et al., 2016; Berihun & Molla, 2017) reported that most of the edible wild plants were found in Anacardiaceae and Tiliaceae families. While others (Seyoum et al., 2015) reported that Rosaceae family is a popularly known family in having the highest diversity of edible wild plants in Ethiopia. These differences in the most common uses of edible wild plant families show the intensity and importance of this information. Moreover, the list of species in the present study is aligned with the list of common edible wild plants in the country with a published in a book (Teketay et al., 2010) and a comprehensive review by Molla et al. (2011).

The data obtained in this study reveal that not only food but also other varies supplementary uses were also reported, like medicinal values, fuelwood, fence, timber, farm implements and fodder which are also reported by other studies in Ethiopia (Seyoum et al., 2015; Berihun & Molla, 2017; Tebkew et al., 2018). The stem bark of the *Ziziphus spina-christi* used to treat snakebite. The stem of *Grewia occidentalis is* to make Mequamiya. *Cordia africana* used to prepare timber for different purposes.

Distributions of Edible Wild Plants along Different Agro-Ecologies

The number of species, genera and families of edible wild plants were higher in mid-land agro-ecology than in lowland and highland agro-ecologies of the study area. High land was the least agro-ecology in the distribution of edible wild plants in Ensaro district (see Fig. 3). The distribution of different edible wild plants in different agro-ecologies indicates the adaptation of these species in different environmental conditions. This indicates that plants adapted to variable climate are generally drought tolerant.

3.2 Life Forms and Edible Parts of Edible Wild Plants

3.2.1 Life Forms of Edible Wild Plants

The edible wild plant species belong to four life forms namely shrubs, trees, herbs and climbers. Shrub contributed 37% while climbers (lianas) contributed only 2% of all identified edible wild plant species (Fig. 4).

The life forms of edible wild plants in this study were diverse and accordingly the largest number of edible wild plant species found to be shrubs followed by trees, herbs and climbers (Fig. 4). The least diverse edible wild plants in terms of life forms were lianas. This result is also seen in a study conducted nearby area by Alemayehu et al. (2015) and in the western part of Ethiopia by Amente (2017). However, this result is different from a result reported by Tebkew et al. (2018) in the Northern part of Ethiopia where trees are

dominant life forms of edible wild plants followed by shrubs. This shows the variation of the life forms of edible wild plants from place to place that might be due to variations in type edible wild plant species and culture of the communities.

3.2.2 Edible Parts

Eight edible parts of edible wild plants recorded in Ensaro district. These are fruits, seeds, leaves, saps, latex, root, shoot and rhizome (Fig. 5). Fruits comprise 72% of edible parts whereas latex, shoot, rhizome, sap and root provided by 2% of each. This means fruits are the major parts consumed followed by seeds and leaves. Sap, root, shoot, rhizome and latex are the least. Most fruits consumed in raw.

Regarding edible parts consumed, seven edible parts were documented namely fruits, stem, leaves, sap, seeds, root and rhizome. This indicates the edible parts of reported edible wild plants in Ensaro district is also highly diverse. The most widely consumed parts are fruits (73%) that eaten raw (Fig. 5). The preference of fruits to other parts might be low energy investment. Fruits are harvested and consumed in the field or outdoor when they ripe by children while collecting fuelwood or herding cattle. The result of this research is in agreement with current study results (Tebkew et al., 2014; Regassa et al., 2015; Betti et al., 2020; Mutie et al., 2020). In other studies, leaves are the main consumable part of edible wild plants in a different part of the world (Ali-Shtayeh et al., 2008). This implies the types of edible parts and culture of the communities vary from location to location.

3.3 Harvesting Seasons

Many of the reported edible wild plants were abundantly available spring and summer seasons. Few edible wild plants harvested and consumed during the winter season. In Ethiopia, there are four seasons namely, summer, spring, winter and autumn based on the climate of the country. The edible parts of edible wild plants gathered from the wild at different times of the year (Fig. 6) and the majority gathered from shrublands. Edible wild plants are available throughout the year in Ensaro district. Particularly, spring and summer were the major seasons in the study area when most of the plants produce flower and fruits. Summer and some part of spring is the period of food shortage in the study area. Thus, the availability of these plants during this period used as substitutes and fill the gap of food shortage that happened until the harvesting season of domesticated crops. *Ximenia Americana*, *Ziziphus spina-christi*, *Opuntia ficus-indica*, and *Syzygium guineense* consumed in the presence of enough staple foods in the home.

3.4 Correlation of Age Groups, Gender, Family Size, Household Income and Distance from Town with Indigenous Knowledge of People on Edible Wild Plants

Indigenous knowledge of respondent on edible wild plants positively correlated with age, gender and family size, and negatively correlated with an annual household income of respondents. Indigenous knowledge of respondents in the study area significantly correlated with age, family size and annual household income ($p < 0.05$) and it is more strongly correlated with family size and age. There was no knowledge difference between genders (Table 3). However, family size and age have a direct proportion with indigenous knowledge of respondents on edible wild plants. This might be people having large family member are more dependent on edible wild plants. On the other hand, the number of edible wild plants listed by youths is smaller than mentioned by older persons that might be by fast westernization and lack of interest for their culture as noted by (Wiryono et al. (2017)) in Central Bengkulu District, Bengkulu Province, Indonesia.

Species that were used especially in the past famine periods such as *Medicago polymorpha*., *Eleusine coracana, Snowdenia polystachya, Embelia schimperi and Urtica simensis* are not known by the younger generation particularly their preparation method in the study area. It is necessary to preserve these species as they have also medicinal values.

Table 3
Pearson's correlations of gender, age, family size and household income with indigenous knowledge of respondents

Sociodemographic and socio-economic characteristics	Indigenous knowledge
Age	P value < 0.001
Gender	P value = 0.747
Family size	P value < 0.001
Annual household income	P value < 0.001

3.5 Habitats and Major Threatening Factors

3.5.1 Habitats

Many of the reported edible wild plants were found in shrubland areas (45%) followed by woodland areas. The least number of edible wild plant species reported from grazing land. Deforestation and drought are major threats for reported edible wild plants (Fig. 9). About 73% of the respondents reported that deforestation for several reasons is the major threatening factor followed by persistent drought in the study area.

These edible wild plants have several supplementary roles other than food that may pose overexploitation and loss of the species. Most of the reported edible wild plants (76.2%) in two habitats. Shrubland (45.2%) is the main reservoir of edible wild plants followed by woodland (31%) and the rest edge of farms and grazing lands together contributed (29%). This shows the importance of in-situ conserving particularly woodlands and shrublands to conserve and ensure sustainable uses of these edible wild plants together with associated indigenous knowledge of the community. It is also necessary for further study of the quality of their primary and secondary metabolites. The most threatened species found in this research are *Grewia tenax* and *Cordia monoica* found in shrubland.

3.5.2 Direct matrix ranking

In addition to food values, the local people used the plants for other different purposes such as fuelwood, fence, house construction, medicine, farm implements, and furniture. The result of direct matrix ranking revealed that *Cordia Africana, Cordia monoica, Ficus Palmata, Ficus sur, Grewia tenax and Acacia etbaica* were ranked first to six, respectively. Similarly, the seven use-values reported on six selected plant species were summed up and ranked and, the result showed that fuelwood collection, food, farm implements, medicine, furniture, house construction, fence were ranked first, second, third, fourth, fifth, sixth and seventh, respectively.

Table 4

Direct matrix ranking of six plant species by twelve informants based on seven use criteria (5 = best; 4 = very good; 3 = good; 2 = less used; 1 = least used and 0 = no value)

Use diversity	*Cordia Africana*	*Cordia monoica*	*Ficus palmata*	*Ficus sur*	*Grewia tenax*	*Acacia etbaica*	Total	Rank
Food	4	4	3	4	3	3	21	2nd
Medicine	4	0	4	3	3	3	17	4th
Farm implements	5	4	1	4	0	4	18	3rd
Fuelwood	4	4	4	4	4	5	25	1st
Construction	5	2	1	4	0	3	15	6th
Furniture	5	2	0	5	0	4	16	5th
Fence	3	2	1	1	2	5	14	7th
Total	30	18	14	25	12	26		
Rank	1st	4th	5th	3rd	6th	2nd		

Limitations of the study

This study is limited to the documentation of edible wild plants, their life forms, edible part, a season when they are abundantly available, and their habitats and major threatening factors. It does not include the contributions for household food security and market values of edible wild plants.

Table 5

Edible wild plants in Ensaro district, Amhara regional state, Ethiopia.

Scientific name	Local name	Family	Habit	Edible parts	Period of consumption	Mode of utilization	Other uses
Ficus carica L.	Abuar	Moraceae	Tree	Fruit and latex	At normal time	Ripe and uncooked	fuelwood
Carissa spinarum L.	Agam	Apocynaceae	Shrub	Fruit	At normal time	Ripe and uncooked	Medicinal and fence
Commiphora boiviniana Engl.	Anqa	Burseraceae	Shrub	Fruit	At normal time	Ripe and uncooked	Fuelwood
Ficus sycomorus L.	Bamba	Moraceae	Tree	Fruit	At normal time	Ripe and uncooked	Fuelwood, making beehives
Balanites aegyptiaca (L.) Del	Bedeno	Zygophyllaceae	Shrub	Fruit	At normal time	Ripe and uncooked	Fence, fuelwood
Ficus palmata Roxb.	Beles	Moraceae	Shrub	Fruit	At normal time	Ripe and uncooked	Medicine and fuelwood
Cordia monoica Roxb.	Chewanza	Boraginaceae	Tree	Fruit	At normal time	Ripe and uncooked	Fuelwood, fodder
Grewia tenax (Forssk.) Fiori	Cirnchir	Tiliaceae	Shrub	Fruit	At normal time	Ripe and uncooked	Walking stick
Eleusine coracana (L.) Gaertner	Dedeho	Ebenaceae	Shrub	Fruit	At normal time	cooked	Fuelwood and medicine
Pelargonium multibracteatum Hochst.	Demek abeba	Geraniaceae	Herb	Sap	At normal time	Ripe	Has no other use
Acacia etbaica Schweinf.	Derie	Fabaceae	Tree	Fruit	At normal time	Ripe and uncooked	Fence
Ferula communis L.	Dog	Apiaceae	Herb	Stem	At normal time	cooked	Medicine, fuelwood
Syzygium guineense (Wild.) DC.	Dokma	Myrtaceae	Tree	Fruit	At normal time	Ripe and uncooked	Fuelwood, medicine
Rumex nervosus Vahl	Embaucho	Polygonaceae	Shrub	stem shoot	At normal time	Immature and uncooked	Fuelwood, medicine
Strychnos innocua Del.	Engocha	Loganiaceae	Shrub	Fruit	At normal time	Ripe and uncooked	Fuelwood, medicine
Ximenia americana L.	Enqoy	Olacaceae	Tree	Fruit	At normal time	Ripe and uncooked	Fuelwood, medicine
Ekebergia capensis Sparrm.	Ergo(lol)	eliaceae	Tree	Fruit	during famine	Ripe and uncooked	Fuelwood
Ziziphus spina-christi (L.) Desf.	Geba	Rhamnaceae	Tree	Fruit	At normal time	Ripe and uncooked	Fence, medicine
Rubus volkensii Engl.	Injory	Olacaceae	Shrub	Fruit	during famine	Ripe and uncooked	Fence
Dovyalis abyssinica (A. Rich.) Warb.	Koshim	Flacourtiaceae	Shrub	Fruit	At normal time	Ripe and uncooked	Fence
Physalis peruviana L.	Kutalebash	Solanaceae	Herb	Fruit	At normal time	Ripe and uncooked	Has no other use

Scientific name	Local name	Family	Habit	Edible parts	Period of consumption	Mode of utilization	Other uses
Grewia ferruginea Hochst. ex A.Rich.	Lenquata	Fabaceae	Shrub	Fruit	At normal time	Ripe and uncooked	Fuelwood
Rumex abyssinicus Jacq.	Meqmeqo	Polygonaceae	Herb	Rhizome	At normal time	Cooked	Medicine
Snowdenia polystachya (Fresen.) Pilg.	Muja	Poaceae	Herb	Seeds	during famine	cooked	Medicine, fodder
Rosa abyssinica Lindley	Qega	Rosaceae	Shrub	Fruit	At normal time	Ripe and uncooked	Fence
Grewia villosa Willd.	Quaquatie	Tiliaceae	Shrub	Fruit	At normal time	Ripe and uncooked	Fuelwood
Opuntia ficus-indica (L.) Miller	Qulqual	Cactaceae	Shrub	Fruit and leaves	At normal time	Ripe and uncooked	Fence, fodder
Tamarindus indica L.	Roema	Fabaceae	Tree	Fruit	At normal time	Ripe and uncooked	Fuelwood
Urtica simensis Hochst. ex A. Rich.	Sama	Utricaceae	Herb	Leaves	At normal time	Cooked	Medicine
Grewia bicolor Juss.	Sefa	Tiliaceae	Shrub	Fruit	At normal time	Ripe and uncooked	Medicine, fuelwood
Ficus sur Forssk.	Shola	Moraceae	Tree	Fruit	At normal time	Ripe and uncooked	Fuelwood
Mimusops kummel Bruce ex A.DC.	Shoye	Sapotaceae	Tree	Fruit	At normal time	Ripe and uncooked	Fuelwood
Diospyros mespiliformis Hochst. ex A.DC.	Tikurie	Ebenaceae	Shrub	Fruit	At normal time	Ripe and uncooked	Fuelwood, farm implements
Cordia Africana Lam	Wanza	Boraginaceae	Tree	Fruit	At normal time	Ripe and uncooked	Furniture, farm implements, medicine
Ficus vasta Forssk	Warka	Moraceae	Tree	Fruit	At normal time	Ripe and uncooked	Fuelwood, furniture
Aloe berhana Reynolds	Eret	Aloaceae	Herb	Sap	at normal time	Ripe	Medicine
Momordica foetida Schumach.	Yamora misa	Cucurbitaceae	Liana	Fruit	at normal time	Ripe and uncooked	Has no other use
Hibiscus trionum L.	Yeregna selit	Malvaceae	Herb	Seeds	at normal time	Mature and uncooked	Has no other use
Syzygium cumini (L.) Skeels	Zemato	Myrtaceae	Tree	Fruit	at normal time	Ripe and uncooked	Fuelwood
Solanum villosum Forssk.	Tikur Awut	Solanaceae	Herb	Fruit	during famine	Ripe and uncooked	Medicine
Medicago polymorpha L..	Amaqito	Fabaceae	Herb	Seeds	during famine	Mature and cooked	Fodder
Embelia schimperi Vatke.	Meterie	Myrsinaceae	shrub	fruit	During Famine	Ripe and uncooked	Medicine

4. Conclusions

The edible wild plants and associated traditional practices were still active in the study district. The study revealed that most of the edible wild plants were shrubs found in shrub-land areas and fruits were the main consumable parts. Furthermore, the age and family size of the respondents positively correlated with the mentioned number of edible wild plants. This study support to preserve indigenous knowledge associated with edible wild plants. However, there is declining in the retrieved information on *Snowdenia polystachya, Eleusine coracana, Urtica simensis, Embelia schimperi and Medicago polymorpha, which* used as the main food source during the great Ethiopian famine (1888–1892). There is no correlation between gender and indigenous knowledge of respondents on edible wild plants.

Apart from the food values, most of the identified edible wild plants in this study are used other supplementary services. The local people harvest and used edible wild plants for fence, fuel, fodder, medicine and furniture. In particular, edible wild plant species such as *Ximenia Americana, Cordia monoica* and *Ziziphus spina-christi* have multirole for the people. Hence, this poses a high level of threats to these edible wild plants in the study area. Besides, many of the edible wild plants found in Ensaro district are under high threats due to fuelwood collection by the local community. This has led to the reduction of edible wild plants and associated indigenous knowledge.

Declarations

Ethics and consent participant

The present study is purely based on filled survey. Ethical guidelines of the international society of ethnobiology (https://www.ethnobiology.net) were strictly followed. Permissions were verbally obtained by all participants of this study.

Consent for publication

The people interviewed were informed about the objectives of the research and final publication of the information collected, and they were assured that the informants' identities would be remain secret.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on the following link DOI https://doi.org/10.5061/dryad.dncjsxm03.

Competing interest

The authors have not declared any conflicts of interest.

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Author's information

PhD student, Department of Plant Biology and Biodiversity Management, Addis Ababa University, Ethiopia. Lecturer at Debre Birhan University, Ethiopia

Authors' contributions

Asaye Asfaw conceived the idea of doing this research, conducted the interviews, collected samples, outlined and wrote the manuscript. Ermias Lulekal was involved in the identification of collected plant materials and in searching of fund. Asfaw Debella, Eyob Debebe and Samuel Tessema were participated in planning and preparation of semi-structured questions. Tamrat Bekele was revising it critically for important intellectual content. All authors have made substantial contributions to analysis, interpretation of data and writing of the manuscript. All authors read and approved the final manuscript.

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Figures

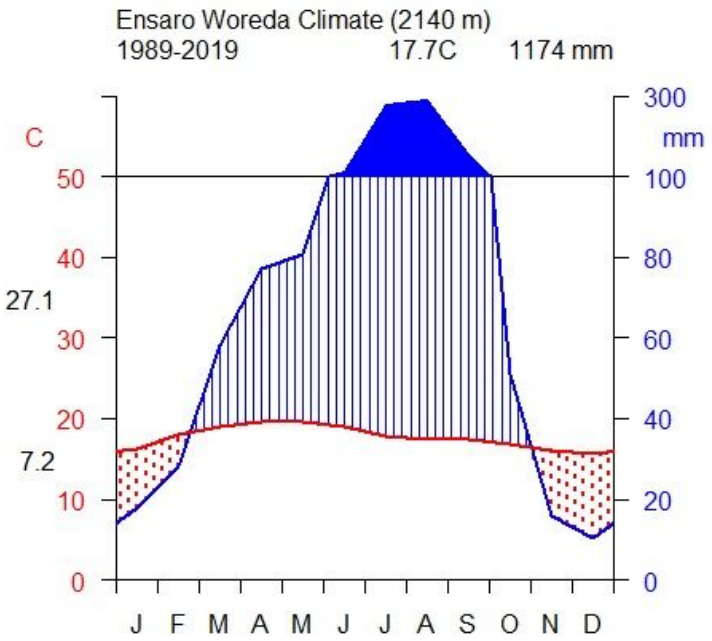

Figure 1

Climadiagram of the study area from 1989 to 2019.

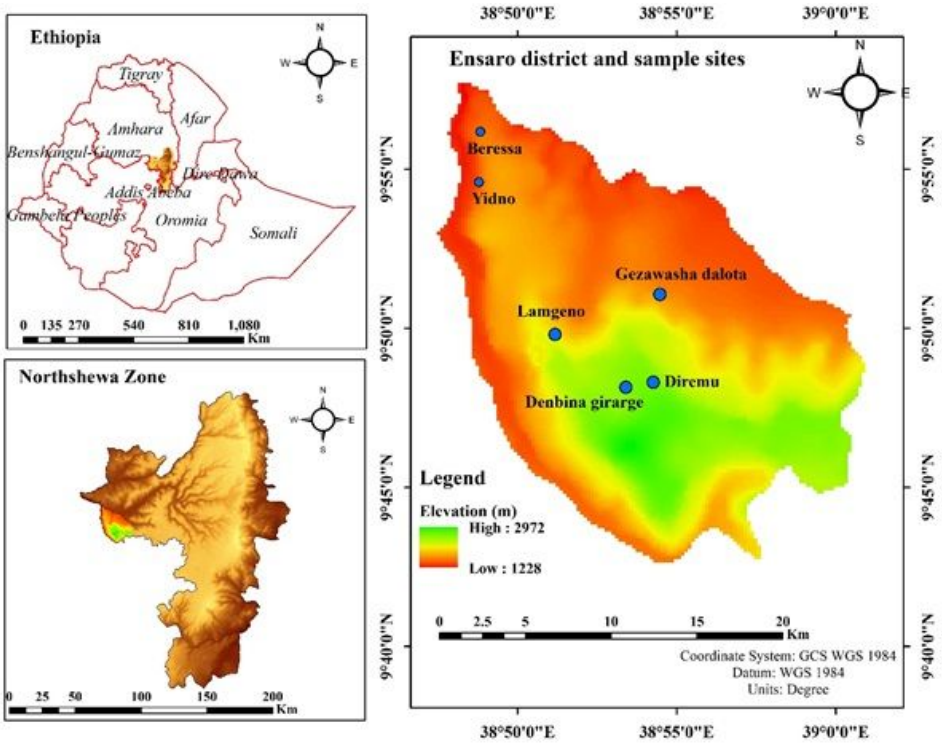

Figure 2

A map the study area, in Amhara region, North Shewa Zone, Ethiopia

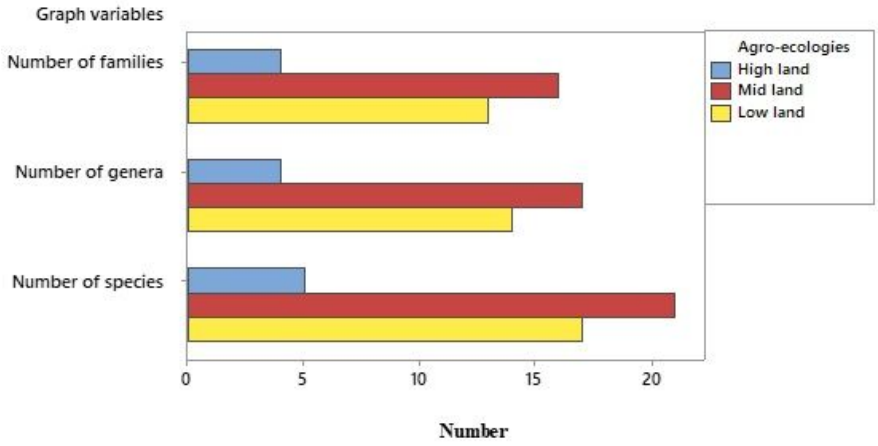

Figure 3

Distributions of edible wild plants in different agro-ecologies in the study area

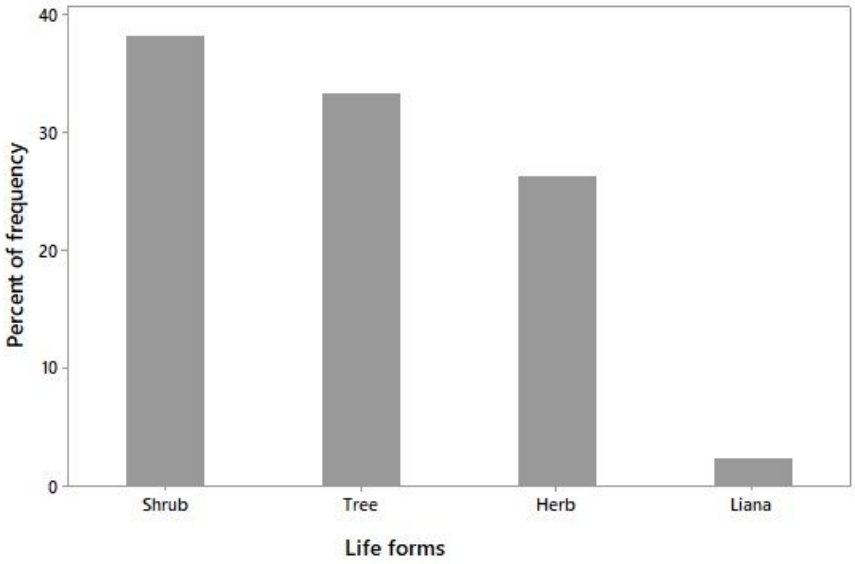

Figure 4

Percentage of wild edible plant taxa arranged by life forms

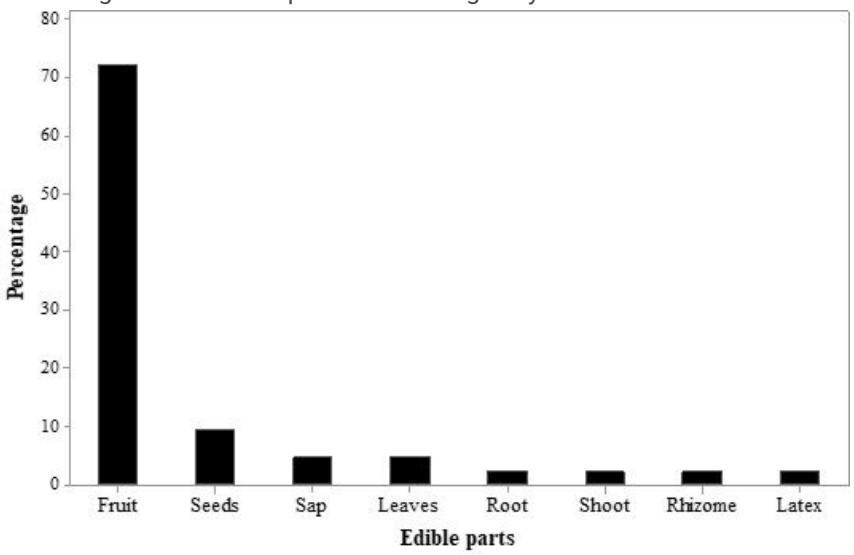

Figure 5

Edible parts of reported edible wild plants in Ensaro district

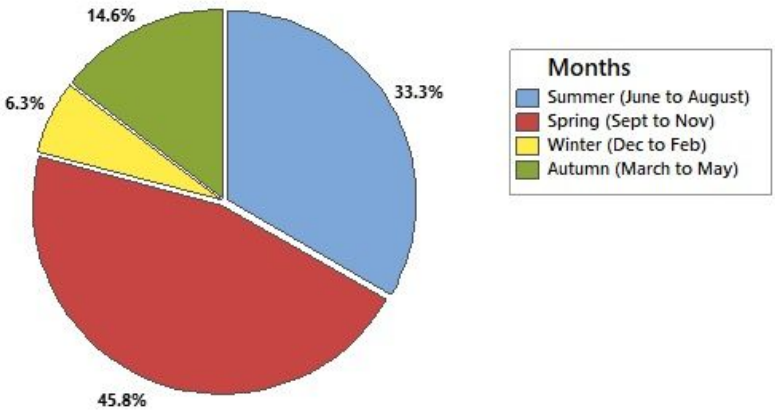

Figure 6

The number of wild edible plants consumed and time of gathering within a year, Ensaro district, North Shewa Zone, Amhara Regional State.

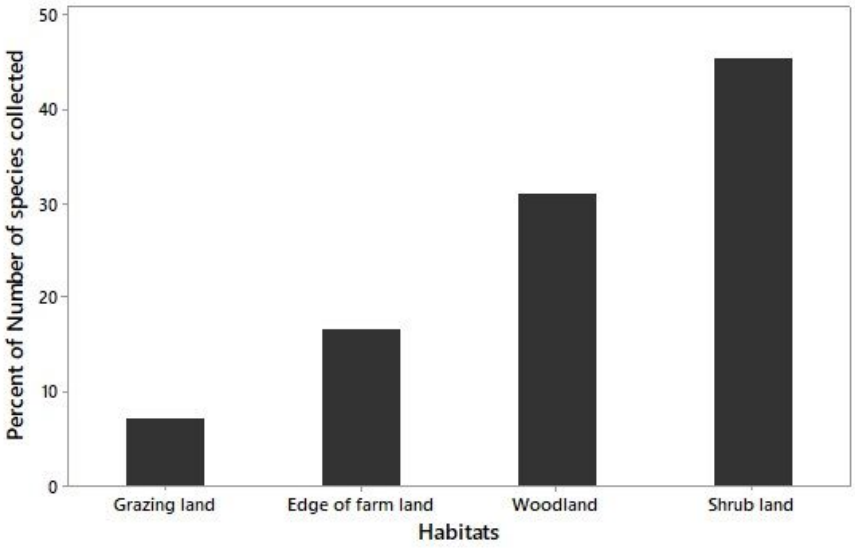

Figure 7

percentage of edible wild plants found in different habitats