

Study on Wild Edible Plant Used by Shinasha Ethnic Community at Metekel Zone, Northwest Ethiopia

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Abstract

Wild edible plants are an essential source of supplementary foods in many parts of Ethiopia. The aims of this study were to record and document wild edible plants used by shinasha ethnic community in Metekele Zone Northwestern Ethiopia. The Field surveys were conducted from Jun to Dec, 2022. Semi-structured interview, direct observation, focus group discussion, guided fled walks, and market surveys were used to collect data. A total of 120 informants were participated in interviewed. Descriptive statistical was made to analyze the data using SPSS version.20. A total 46 wild edible plants belonging to 38 genera and 30 families were recorded. Family Moraceae were the most popular edible plant. Trees were the dominant life forms (36.9%) and ripe fruits (58.6%) recorded plants par used in study area. The majority of (14 specie) were collected from natural forest followed by riverine banks habitat (12species). The majority of wild edible plants are mainly harvested and consumed during autumn followed by summer season. Based on the market surveys eight wild edible plants were sold and can provide additional income to the local community in study districts. The wild edible plants were consumed as raw. Agricultural land expansion, fuel wood collection, cutting for construction, uncontrolled fire and overgrazing were the major threats to the wild edible plants. Hence, the finding recommend that the community that practice in on-site and off-site conservation, public awareness raising, which requires participation the government's on sustainable forest management practices approach would help to protect wild edible plant in study area.

Keywords: Ethnic Group, Metekel Zone, Shinasha People, Wild Edible Plants.

Abbreviations: BGRS: Benishangule Gumuze Regional State, WEPs: Wild Edible Plants, Fgd: Focus Group Discussion, Ki: Key Informants, Ka: Kebeles Administration, Hh: Household.

1. Introduction

Wild edible plants (WEPs) can be defined as native species that grow and reproduce naturally in their natural habitat without being cultivated. Humans have gathered WEPs since ancient times, and they have become part of the human diet and traditional food systems. WEPs still play an important role when food crops are scarce, ensuring food sovereignty and food security, and they potentially contribute to wellbeing in vulnerable households [1]. Nearly 390,900 flora species are estimated to exist on our planet, of which 30,000 are edible plants species, but 150- 200 have been cultivated widely (RBGK, 2016) [2].

Millions of people in many developing countries do not have enough food to meet their daily requirements and a further more

people are deficient in one or more micronutrients [3]. Edible wild plants have supplementary, and seasonal and emergency roles in the communities that use them for food; and some are also used as a source of income [4] . According to FAO more than 35% of Ethiopian people are food insecure. The country's ever increasing population along with recurrent drought, war and poor agricultural practices with low productivity, have pulled the country into a vicious circle of food insecurity [5].

Nearly 6500-7000 flora species among this which 12% are endemic plant species estimated to be present in the country of Ethiopia [6]. A recent review documented nearly 413 species of EWP representing 224 genera and 77 families [7]. Forests, grasslands, riverine environments and wetlands are home to numerous WEPs in the country of Ethiopia[8]. Wild edible plants (WEPs) are all non-domesticated plants species used by people which are a continuum results from co-evolutionary relationships between humans and their environment [9,10] .

The rural populations in Ethiopia have a rich knowledge of wild edible plants and consumption of wild edible plants is still an integral part of the different cultures in country. Traditional knowledge on wild food plant uses has been kept in the memory of Shinasha ethnic groups as a heritage and passed orally through generations to generation. However, there has not been sufficient research document on indigenous knowledge the use of wild edible plants in study area. Therefore, this research aims to identify record and document wild edible plant species consumed, threats, and recommend the possible management setups for their conservation by shinasha community in Metekel zone of Benshangule Gumuz Regional State of Ethiopia.

2. Materials and Methods

2.1. Description of Study Area

The study was conducted Metekel Zone is geographical position located between 09.17° to 12.06° N latitude and 34.10° to 37.04°E longitude in Benishangul Gumuz Regional State of Ethiopia (Figure 1). The zone occupies an estimated total area of 22,028 km². The total population of the zone was 276,367 (male 139,119 and female 137,248) of which 238,752 are rural setup while the remaining 37,615 are urban dwellers [11].

The mean annual rainfall is estimated to be around 1607.8 mm. The mean annual temperature is ranged between 16.2 and 32.5°C. The zone has a uni-modal rainfall pattern, with an extended rainy season, from March to September. The peak rainy season is from July to August. The coldest months are December and January whereas March and April are the hottest months of the area [12].

2.2. Methodology

2.2.1. Reconnaissance Survey and Site Selection

A reconnaissance survey was conducted in Metekel zone from Jun to Dec, 2022. The survey was employed to obtain general information from community leaders, traditional healers and governmental agricultural development agents about the study area, indigenous knowledge and practice surrounding use of wild plants for food. The past and current practices about the use, availability, accessibility of WEPs and vegetation coverage were discussed with these knowledgeable persons. After the discussion, two districts were systematically selected as study sites out of the total seven districts in Metekel Zone.

2.2.2. Site Selection

Multistage sampling technique was used for this particular study. In first stage, from Meteke zone the two districts namely Dibati and Bulen were selected for study area as based purposively based on 1) the potential and existence of wild edible plants, 2) has large forest with high population pressure which needs evidence for designing appropriate forest management system and (3) has given lower research attention because of distance and hot climatic condition, 4) and the availability of shinasha ethnic group in the districts. From each selected Districts, three representative kebeles and a total of six kebeles were selected in two districts. In the second stage, the study kebele namely, Gerze, Legebuna, and

Parezyite, were selected from in Dibati district and Bulen Town, Dobina Enkoti and Morana Ekosaki kebele are selected from Bulen districts. The study village were chosen purposively based on availability of wild edible plants as advised by local administrators and elders, proximity to the existing remnant forest resources and representativeness of the different agro-ecologies.

3.2.3. Selection of Sample Households and Key Informants

In this study the sample size for quantitative data was determined by applied the formula to calculate a sample size [13]. This study applied the simplified formula developed by and reviewed by as follows [13,14].

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

Where n = sample size for the research, N= total number of households in all six kebeles e= maximum variability or margin of error 10% (0.1) 1= the probability of event occurring.

Based on the above technique, 90 sample households were selected. Therefore, the total sample size was 90. A total of 120 informants (80 male and 40 female) 30 individuals from each of the study six kebeles from age of above 18 years was selected by purposive and snowball sampling techniques from the local communities, respectively.

2.2.4. Selection of Key Informants

Key informants in this study are persons who are knowledgeable about WEPs, experienced in growing, collection, and selling WEPs plants and who have always lived in the village and for a long time. From each of the six study KAs 5 key informants were purposively selected with the help of kebele administrators and elders. The key informants included elders, wild edible plant collectors, sellers, cooks and buyers of the species. Finally, a total of 30 key informants were selected and used for the study.

2.3 Ethnobotanical Data Collection

The data were collected in six the selected administrative Kebeles of Dibati and Bulen district from Jun to Dec, 2022. As a result, semi-structured interviews, guided field walk, market surveys and group discussions were used to collect indigenous knowledge about wild edible plants with informed consent of local informants. All of the interviews were met on a one to one basis conducted using a checklist of questions developed in English and translated into shinashegina (Borna) the local language of the people. Ethnobotanical data were collected using the method and protocol proposed by [15,16].

2.3.1. Plant Voucher Specimen Collection and Identification

Collection of voucher specimens was made with the help of informants and local field assistants. Wild edible plant specimens were collected pressed, dried, numbered, labeled, identified, and deposited at the Ethiopia Biodiversity Institute, in Assosa Biodiversity Center, Herbarium Room. Photographic records were also taken in the field to capture the field sites, plant parts and other

useful information. Preliminary identification of specimens was performed in the field to family level and some cases to species level. Further identification was made using the flora of Ethiopia and Eritrea [17].

2.4. Data Analysis

The collected data from the questionnaires of household interview responses were coded and entered into Microsoft Office Excel sheet. After cleaning, the data was analyzed using SPSS version 20 software. The processed data presented using as chart, figures and tables for qualitative and quantitative data, respectively. Direct matrix ranking exercise was used to compare the use diversity of a given wild edible plant species using the methods proposed by [15,18]. The data collected was summarized and analyzed by means of descriptive statistics out for qualitative data such as edible parts, life forms, seasonal availability and habitats where edible wild plants are mainly found.

3. Results and Discussions

3.1. Taxonomic Diversity of Edible Wild Plants in Study Area

Overall, 46 WEPS belonging to 38 genera in 30 families were documented to be used by the people of study area (Table1). Family Moraceae was best-represented, accounting for 4 species, followed by Cucurbitaceae and Myrtaceae (3 species in each), eight family's (Amarathaceae, Annonaceae, Apocynaceae, Araceae, Discoreaceae, Rubiaceae, Sapindaceae and Sapotaceae) consisting of two species and 18 families represented by one species each. The highest number of plant species was recorded under family of Moraceae, Cucurbitaceae and Myrtaceae. This finding is in line with studies performed in Ethiopia researchers by [11,19-21]. This might be due to the better adaptation potential of WEPS in this family over the range of attitude deference, climatic change, soil type and other factors.

Table :1 Study of Wild Edible Plants Used By Shinasha Ethnic Community at Metekel Zone

No	Local Name by Shinashegin	Scientific Name	Family	Habit	Plant part Consumed	Method of preparation	Habitat	Collection Seasons
1	Lama	<i>Amarathus cruentus</i> .Thell	Amarathaceae	Herb	Leaves & Seed	The leaves are eaten cooked and the seed is grinded and eaten when it is changed to porridge	wild	Summer
2	Gishita	<i>Annona cherimola</i> Mill	Annonaceae	Tree	Fruit	The fruit is eaten raw	Forest	Summer
3	Babuut'aa	<i>Annona senegalensis</i> Pers.	Annonaceae	Shrub	Fruit	The fruit is eaten raw	forest	Summer
4	Gohaa	<i>Borassus aethiopum</i> Mart.	Arecaceae	Tree	Fruit & young seedling	Germinating part is eaten after being boiled and the fruit is eaten raw after soaking with straw for a month.	Wild	Winter
5	Awawa	<i>Carissa spinarum</i> (Forssk) Vahil.	Apocynaceae	Climber	Fruit	The fruit is eaten raw	Riverine	Winter
6	Koopha	<i>Colocasia esculenta</i> (Hochst)	Araceae	Herb	Tuber	The tuber is cutoff, dried for one day and eaten after being properly boiled. Germinating part are eaten after being boiled	Riverine	All
7	Laliaq	<i>Corchorus olitorius</i> L.	Malvaceae	Herb	leaves	The young leaves eaten raw or after being cooked	Forest	All
8	Banaja	<i>Cordia africana</i> Lam.	Boraginaceae	Tree	Fruit	The fruit is eaten raw	Wild	Winter
9	Mat'maara	<i>Cucurbita pepo</i> L.	Cucurbitaceae	Climber	Leaf	Young leaves are eaten after cooking	Home garden	Summer
10	Maranta /Bukura)	<i>Diospyros mespiliformis</i> hochst. ex a.dc	Ebenaceae	Tree	Fruit	The fruit is eaten raw	River area	Winter
11	Annga	<i>Discorea prehensilis</i> Benth	Discoreaceae	Climber	Tuber	The poisonous parts of tuber are removed and the remain part are eaten after cooking	River area &Forest	Autumn
12	Uutsaa	<i>Discorea alanata</i> L.	Discoreaceae	Climber	Tuber	Tubers are cut in to small pieces and boiled in water, water is decanted, cooked and used as food and then remain part are eaten after cooking.	Home garden	Summer
13	Echecha	<i>Ensete ventricosum</i> (Wild).	Musaceae	Tree	Fruit	The fruit is eaten raw	Riverine	All
14	Zinigibila	<i>Etlingera littoralis</i> L	Zingiberaceae	Herb	Tuber	The fruit is eaten raw	Home garden	All
15	Badirbonga	<i>Eugenia uniflora</i> L.	Myrtaceae	Shrub	Fruit	The fruit is eaten raw	Forest	Summer
16	Eetsa	<i>Ficus sur</i> Forssk	Moraceae	Tree	Fruit	The fruit is eaten raw	River area	Winter
17	Fuuka	<i>Ficus sycomorus</i> L	Moraceae	Tree	Fruit	The fruit is eaten raw	Wild	
18	Doogena	<i>Ficus vasta</i> Forssk	Moraceae	Tree	Fruit	The fruit is eaten raw	Wild	Autumn
19	Qushuwaa	<i>Foeniculum vulgare</i> (Mill)	Apiaceae	Herb	Leaf	Leaves are eaten raw or after being cooked with cucurbita pepo.	Home garden	Summer
20	Gabaa	<i>Gardenia ternifolia</i> Schummach &Thonn.	Sapindaceae	Tree	Fruit	The fruit is eaten raw	Forest	Winter
21	Enguula	<i>Gladiolus candies</i> (Rendle)	Cucurbitaceae	Climber	Young shoot	Young shoots are eaten after cooking/raw of the fruit.	Forest area	Spring
22	Somoya	<i>Grewia bicolor</i> Juss.	Rubiaceae	Shrub	Fruit	The fruit is eaten raw	Riverine	Summer
23	Gali qoriya	<i>Grewia ferrugina</i> Hochst.ex A.Rich	Tiliaceae	shrub	Fruit	The fruit is eaten by raw	Riverine	Winter
24	Kooriya	<i>Grewia mollis</i> Juss.	Tiliaceae	Shrub	Steam Bark	The inner part of the steam bark is safely removed and soaked with water and grinded	Forest	All

						and collecting juice used as sauce.		
25	Duumuga	<i>Justicia schimperiana</i> Hochst.ex Nees.	Acanthaceae	Shrub	Flower nectar	Juice of nectars is sipped by lip.	Home garden	Summer
26	Bakuudaa	<i>Lepisanthes senegalensis</i> Pers	Sapindaceae	Shrub	Fruit	The fruit is eaten raw	Forest	Summer
27	Komandora	<i>Lycoperiscon esculentum</i> Mill	Sapotaceae	Herb	Fruit	The fruit is eaten raw	Home garden	Spring
28	Shimiya/ Qoolat'iya	<i>Mimusops kummel</i> A.DC.	Sapotaceae	Tree	Fruit	The fruit is eaten raw	Riverine	Winter
29	Badha/ Daze mat'aa	<i>Momordica foetida</i> Schumach.	Cucurbitaceae	Climber	Leave & fruit	Yong leaves are eaten after cooking and the fruit endocarp is eaten raw	Forest	Summer
30	Injor	<i>Moras alba</i> L.	Moraceae	Shrub	Fruit	The fruit is eaten raw	Home garden	Summer
31	Sheferwu	<i>Moringa stenopetala</i> Lam.	Moringaceae	Tree	Young shoot leaf	Cooked young leaf eaten with phaseolus vulgaris L and rice	Home garden	All
32	Uula	<i>Oncoba spinosa</i> Forssk.	Flacourtiaceae	Shrub	Fruit	The fleshy endocarps is eaten raw	Forest	Summer
33	Eeleta soha	<i>Oxytenanthera abyssinica</i> (A.Rich.) Munro.	Poaceae	Herb	Young seedling	The young seedling boiled and eaten with bread	Forest	All
34	Munuqa	<i>Pavetta crassipes</i> (K.Schum)	Rubiaceae	Shrub	Fruit	The fruit is eaten raw	Wild	Summer
35	Wolla	<i>Phoenix reclinata</i> Jacq.	Arecaceae	Shrub	Fruit & steam	The fruit is eaten raw or after soaking with straw until it is ripened.	River area	All & winter
36	Maac'a	<i>Piliostigma thonningii</i> (Schum.)	Fabaceae	Tree	Fruit	The fruit is eaten raw	Wild	Autumn
37	Kawaa	<i>Portulaca quadrifida</i> L.	Portulacae	Herb	Leaves	The shoot is ground together with allium sativum ,foeniculum vulgar and ruta chalepenss to form sauce and eaten with porridge and injeria (local bread)	Home garden	All
38	Shaki janega	<i>Rhus retinorrhoea</i> oliv.	Amaranthaceae	Tree	Fruit	The fruit is eaten raw	Forest	Autumn
39	Bakiitela	<i>Rhus vulgaris</i> Meilkle	Anacardiaceae	Shrub	Fruit	The fruit is eaten raw	Riverine & Forest	Summer
40	Ambat'aa	<i>Rumex abyssinica</i> Jacq	Polygonaceae	Herb	Tuber	Root grinded by mortar and squeezed part used as food decoction	Wild	Autumn
41	Fuuyaa	<i>Saba comorensis</i> (Boji.) pichen	Apocynaceae	Climber	Fruit	The fruit is eaten raw	Riverine	Summer
42	Func'a	<i>Solanum nigrum</i> L	Solanaceae	Herb	Fruit & leaves	The fruit is eaten raw & the leaves are eaten raw together with green pepper.	Wild	Summer
43	Dak'uwa	<i>Syzygium guineense</i> (Wild). Dc. Sp.guineense	Myrtaceae	Tree	Fruit	The fruit is eaten raw	Wild	Autumn
44	Diwaa	<i>Syzygium guineense</i> (Wild.)Dc ssp.macrocarpum	Myrtaceae	Tree	Fruit	The fruit is eaten raw	River area	Autumn
45	K'uula	<i>Ximeni Americana</i> L.	Olaceaeaceae	Shrub	Fruit	The fruit is eaten raw	Forest	Autumn
46	Goorka / Kokor	<i>Vitex doniana</i> Sweet	Verbenaceae	Tree	Fruit	The fruit is eaten raw	Forest	Winter

3.2 Life Forms and Parts of Wild Edible Plants

3.2.1 Life Forms of Edible Wild Plants

The largest numbers growth forms (habits) of edible wild plant in Metekel zone tree are (36.9%), followed by shrubs (26%), herb (21.2%), and climbers only (15.2%). This finding is in line with previous ethnobotanical studies conducted by [19,22-25] . Reported the abundance of wild edible trees in three Districts of

Amhara Region, Debub Omo Zone, Konso Ethnic Community and Adola District in Northern and Southern Ethiopia. These similarities could be due to similarities in climatic conditions, WEPs species distribution and other environmental factors, harvesting from verity habitat ranging, or due to cultural variation among the community of the country the consumption of wild food.

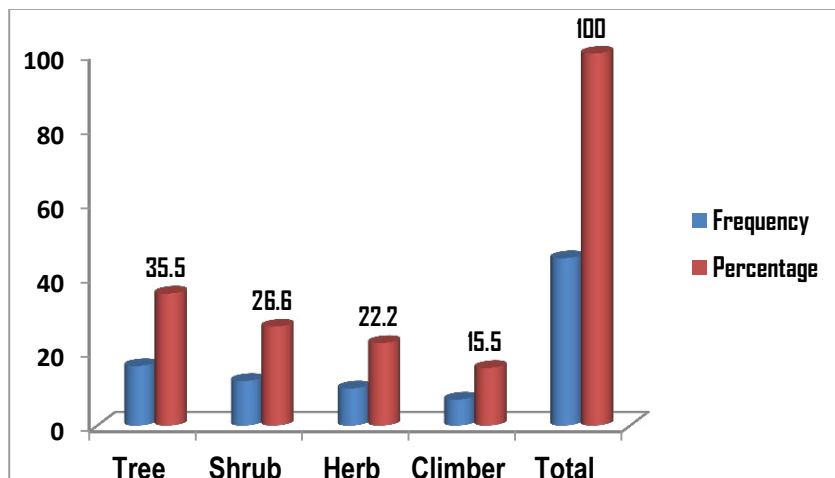


Figure 2: Frequency of Wild Edible Plant Taxa Arranged by Life Forms

3.2.2. Edible Parts of Edible Wild Plants

The edible plant parts in Metekel Zone used by shinasha ethnic group are fruit 26 (57.7%) followed by tuber 5(11.1%) and leaf 4(8.88%). As a result, the fruit was considered an important element of the wild food plant part by the people in the study area. This was consistent with the findings of research by [21,25- 30].

Due to the nature of the fruits that are not needed additional processing and it might be good to consume in raw forms and the other reason might be raw fruits are good source of nutrients that does not loss its nutrients but if it is boiled or cooked some essential nutrients might be lost. This is consistent with other findings including these of [31].

Table 2: Number of wild edible plant parts used by the local people

Plant part that consumed	Frequency	Percentage
Fruit only	27	58.6
Tuber only	5	10.8
Leaf only	4	8.69
Fruit and young seedling	2	4.3
Young Shoot	2	4.3
Fruit and Leaf	2	4.3
Leaf and Seed	1	2.17
Flower Nectar	1	2.17
Fruit and Steam	1	2.17
Steam bark	1	2.17
Total	46	100

Source: From Survey Result (2015/2022)

3.2.3. Plant Habitat Wild Edible Plant

The people in Metekel Zone collect wild edible plants from various habitats, such as forest, riverine, wild and home garden. The largest number 30.4% species) was collected from forest habitats only, and followed by riverine banks (26.08%). The third and fourth largest natural habitats were wild and home garden habitat

that each comprised 23.9% and 19.56% respectively (Fig 2). This finding is in line with studies performed in Ethiopia [11, 30-32].

showed that most WEPs were gathered from forest habitats. Due they are not deforest by anthropogenic factors.

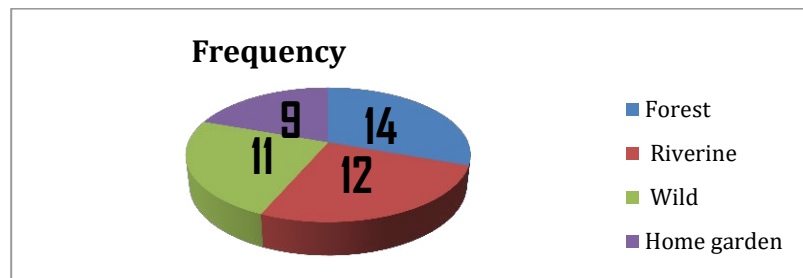


Figure 3: Wild Edible Plants Habitat of the Study Area

3.2.4. Preparation and Consumption of WEPLs

In study area about WEPLs as regards the mode of consumption, 21 (45.65%) are consumed raw, 9 (19.56%) cooked, (6.52%) both cooked and raw and (4.34%) in juice form, (Figure 4). The highest percentage distribution on mode of consumption of wild edible plants is shown below (figure :4). This result is similar with the study conducted by[23,24,33-35].The high consumption of wild edible plants in the form of fruit and vegetable might be explained

by their nutritional value and their desirable taste [22,36,37,]. The high percentage of raw edibles may be due to the nature of the fruits that are not needed further processing and it might be good to consume in raw forms and the other reason might be raw fruits are good source of nutrients that does not loss its nutrients but if it is boiled or cooked some essential nutrients might be lost. This is consistent with other findings including these of [31].



Figure 4: Mode of Preparation and Consumption of the Different Edible Plant Parts

3.2.5. Seasonal Availability of Wild Edible Plants

The plant parts used by Shinasha community were gathered in different seasons/times for food at four seasons of the year in Ethiopia. These seasons are spring (Sep, Oct and Nov) winter (Dec Jan, and Feb), autumn (Mar, Apr and May) summer (Jun, July and Aug) in which the season consists of three months of the year respectively. The highest number of edible plant parts 15 (32.6%) were collected during the short rainy season of autumn 14(30.4) during winter rainy season, 10(21.7%) from winter season 7(15.2%), from all season and 1(2.17%) are also collected from spring season respectively. This due to the time of harvesting varies from plant to plant depending on its availability, and from place to place due to ecological and climatic conditions. The high uses of wild edible plants from March to May (autumn season) might be due to the high sprouting time for most WEPLs. Besides, this season is the flowering time for most WEPLs, and their fruiting is also harvested during this season. Likewise, studies performed elsewhere in Ethiopia by [30]. During the dry season, rural people rely heavily on a stored diet. The relative seasonal availability of WEPLs highly affects the nutritional and food insecurity of households [38]. According to the interview and group discussion of key informants harvesting Seasons of WEPLs depending on phenology of the re-

spective WEPLs species, parts are collected for food in all season. The present study showed that, the identified wild edible plants of the study area were harvested and consumed in different seasons of the year. According to the group discussion and observation interview of the filed conducted also indicated that harvesting season and use of wild edible plant species vary from place to place, species to species and even from tree to tree. This might be due to climatic and intraspecific variations. Moreover, on their study findings reported that time and frequency of harvesting of wild and semi wild edible plants depends on the plant parts and varies from place to place [31]. The findings of this study revealed that, WEPLs species of the study Districts were collected and consumed during dry season, wet season and year round.

Key informants explained that season and frequency of harvesting vary from plant to plant based on the availability of WEPLs. As well, seasons of collection varied from place to place due to ecological and seasonal conditions. For instance, from WEPLs of the study area, *Vitex doniana*, *Phoenix reclinata*, *Mimusops kummel*, *Cordia africana*, *Ficus sur*, *Ficus Sycomorus*, *Ficus vasta* and *Disocorea prehnensis* were harvested and consumed during winter season. Wild edible plant species such *Asannona sengalensis*,

Amarathus cruentus, *lepisanthes sengalensis*, *Soloanum nigrum* and *Amarathus cruentus* were commonly gathered and consumed during summer season. However, *Colocasia esculenta*, *Moringa stenopetala*, *Oxytenanthera abyssinica*, and *Grewia mollis* were available throughout all seasons and consumed year round.

Table: 5 Collection season/harvesting of wild edible plants in the study area

Collection Seasons	Frequency	Percentage
Spring (Sep, Oct, Nov)	1	2.17
Winter (Dec, Jan ,Fab)	10	21.7
Autumn (Mar, Apr ,May)	15	32.6
Summer (Jun, July ,Aug)	13	28.2
All season (All month)	7	15.2
	46	100

Source: From Survey Result (2015/2022

3.2.6. Market Values of Wild Food Plants

In the study of both districts also few wild edible plants were observed at two daily and weekly local and urban markets from four kebeles. During the study we observed eight wild edible plants such as *Portulaca quadrifida*, *Vitex doniana*, *Saba comorensis*, *Dioscorea prehensilis*, *Diosocorreas alanata*, *Syzygium guineense*, *Foeniculum vulgare*, *Cucuribita peop*, and *Grewia mollis* were reported to be sold by women and children can provide the opportunity to house holding additional income to the local communities of the study area. A few numbers of wild foods sold in the market were also reported by other studies made in Ethiopia [8,39].

Market assessment of wild edible plant species showed that most of the edible plants are not sold only for food purposes but also for other purposes such as for timber, agricultural tools, construction, and fuel wood purpose. The other economically important and marketable species is *Cordia africana*. It is the most preferred timber species with higher value and price at local markets. In general income derived from the sale of wild plant species is of particular importance to the poor household to supplement their food product

items and needs. Most of the identified wild edible plants were marketed in the other part of Ethiopia [31,40].

3.2.7. Multipurpose Use of Wild Edible Plants by Direct Matrix Ranking

In Metekel zone, ten commonly reported multipurpose species and ten use-categories were used for in direct matrix ranking exercise. In addition to food values, the local people used the plants for other different purposes such as fuel wood, life fence, construction materials, medicine, agricultural tools and charcoal. The result of direct matrix ranking revealed that *Cordia africana*, *Ficus vasta*, *Syzygium guineense*, *Vitex doniana* and *Moringa stenopetala* were ranked first to fifth, respectively. Similarly, the ten use-values categories reported on ten selected plant species were summed up and ranked and, the result showed that food value, construction materials, fuel wood collection, agricultural tools , medicine value, honey been hugging, erosion controlling ,life fence were ranked first, second, third, fourth, fifth, sixth and seventh, respectively. *Cordia africana* were also reported to be the most commonly used parts for baking bread and in rope preparation respectively.

Table 4: Direct Matrix Ranking of Ten Wild Edible Plant Species by Twelve Informants Based on Ten Use Criteria (5 = Best; 4 = Very Good; 3 = Good; 2 = Less Used; 1= Least Used And 0 = No Value

Wild edible plants	Use categories										Total score	Rank
	Medicinal value	Construction material	Agricultural tools	Honey bee production	Fire wood	Charcoal	Fodder /forage	Life fence	Food	Erosion Control		
<i>Cordia africana</i>	5	5	4	4	4	4	5	3	5	4	42	1 st
<i>Syzygium guineense</i>	1	4	3	5	5	5	3	5	5	2	38	3 rd
<i>Vitex doniana</i>	2	5	5	4	5	4	1	2	5	4	37	4 th
<i>Ficus vasta</i>	5	5	3	5	4	5	3	2	4	4	40	2 nd
<i>Ximeni americana L.</i>	5	3	3	2	3	2	1	3	5	4	31	9 th
<i>Piliostigma thonningii</i>	3	4	5	2	5	4	4	1	4	3	35	6 th
<i>Portulaca quadrifida</i>	4	5	0	0	0	0	4	0	5	0	18	10 th
<i>Moringa stenopetala</i>	5	2	3	3	4	5	4	4	4	2	36	5 th
<i>Oncoba spinosa</i>	3	5	5	3	4	3	0	2	4	4	33	8 th
<i>Mimusops kummel</i>	1	4	4	5	4	4	3	2	5	2	34	7 th
Total	34	42	35	33	38	36	28	24	45	29		
Rank	6 th	2 nd	5 th	7 th	3 rd	4 th	9 th	10 th	1 st	8 th		

3.3. Threats and Conservation of WEPs in the Study Area

3.3.1. Threats to Wild Edible Plants

Informants ranked study area comparison of six threatening factors of wild edible plants was conducted using 12 key informants. The results (Table 5) indicated that expansion of agricultural land, fuel wood collection, timber production, cutting for construction, un-controlled fire setting and overgrazing management problems of plant resources respectively. Similarly, these threats to WEP resources have been reported in ethnobotanical studies conducted

in Ethiopia by [20,21, 26,29-31]. This is because rapid human population and high demand for forest and forest products uses in the study area from time to time. Due to these reasons, plant species such as Phoenix reclinata, Mimusops, kummel, Syzygium guineense, Carissa spinarum and Pappia capensis, Cordia africana and Diospyros mespiliformis are among the wild edible plants under series threatened and near threatened species respectively in the study area.

Table 5: Priority Ranking of Threats to Wild Food Plants Used on Their Degree of Destructive Effects/Values Of 1–6 That Were Given: 1 Is the Least Destructive Threat And 5 Is the Most Destructive Threat

The major threats factors of wild edible plant species	Respondents(R1-R12)												Total	Rank
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈	R ₉	R ₁₀	R ₁₁	R ₁₂		
Agriculture expansion	5	4	5	5	5	4	4	5	5	5	4	5	56	1 st
Fire wood collection	4	5	5	4	3	4	3	5	2	5	3	4	47	2 nd
Uncontrolled fire setting	5	2	3	4	5	5	3	3	4	5	3	4	46	3 rd
Overgrazing	3	4	4	2	5	5	4	3	2	3	4	3	42	4 th
Cutting for construction and others purpose	3	2	4	5	4	3	2	2	5	4	3	4	41	5 th
Overharvesting	4	5	5	3	1	2	4	4	2	3	4	2	39	6 th

3.3.2. Conservation of Wild Edible Plants and Associated Knowledge

The local communities in the study area have a various indigenous knowledge on management and conservation of wild edible plants. For example, many wild edible plants are left to widely grow in farmlands, farm boundaries watershed areas, homesteads as live fence, shade, along road sides and degraded areas.

This practice was actually observed by the researchers in the study

areas. For example, Cordia africana, Justicia schimperiana, Cucurbitia peop and were widely grow in farmlands, farm boundaries and watershed areas and others frequently appear around homesteads as live fence (Moringa stenopetala, Oxytenathera abyssinica, Dioscorea alata, Justicia schimperiana and Moras alba), shade (Phoenix reclinata, Ficus Vasta, and Moringa stenopetala) and along road sides and degraded areas. Similar trend has been reported in the indigenous communities in and the buffer area of Awash National Park [40].

Besides, personal observation and communication revealed that children and livestock herders bring the seeds after consuming the fruits back to homes and cultivate them around homesteads and fence the seedlings saved from livestock foraging. This gives some hint for the possibility of conservation and domestication of wild edible plants. These are sustainable modes of resource use that need to be encouraged and applied by combination them with standard modern management practices.

Although the understanding of the local people about the importance of conserving the wild edible plants, only some in-situ and ex-situ conservation methods like planting in home garden the form of fences and protected pasture land in different worship areas (churches, mosques) and in their farm margins are being practiced in the study area. This indicates that the necessary conservation measures are not being taken in the area, and hence the wild edible plants are not free from threats. Awareness rising Community-based forest management, enclosure, reforestation, afforestation activities, and supplying of alternative energy sources to the community will have a huge chance conserving of the wild edible plants as well as the entire forest.

4. Conclusion and Recommendation

4.1. Conclusion

A total of 46 wild edible plants were recorded in the study area and these plants were distributed in 38 genera and 30 families. Wild edible fruit species have an appreciable role in supplementary food provision, income generation and diversification, nutritional security in different parts of Ethiopia. The result of growth forms was study area that trees were the highest proportion of the edible species followed by shrubs. Fruit is found to be the most edible plant part and mostly taken as raw. The identified WEPs also mainly harvested and consumed in different season of the year including during autumn, summer, and winter season, spring and all season year round. Based on the market surveys conducted in the two study Districts, eight WEPs such as *Portulaca quadrifida*, *Vitex doniana*, *Saba comorensis*, *Dioscorea prehensilis*, *Dioscorea alata*, *Syzygium guineense*, *Cucurbita pepo*, *Foeniculum vulgare* and *Grewia mollis* were reported to be sold and can provide additional income to the local communities. WEPs are highly threatened for anthropogenic factors such as (agricultural expansion, firewood collection, controlling fire setting overgrazing, cutting for construction and others and overharvesting). As a result, wild edible plant species such as *Borassus aethiopum*, *Diospyros mespiliformis*, *Mimusops kummel*, *Vitex doniana*, *Oncoba spinosa*, *Ximenia americana*, and *Phoenix reclinata* are under serious threaten and extinction status in the study area.

4.2 Recommendation

Based on the Findings of this Study, the Following Statements were Recommended

- There should be an extensive Public awareness raising and community based forest management practice need to be encouraged at all levels in order to overcome the threats of wild edible plant

species in study area.

- The government should be included the food agricultural policy makers, NGO, and researchers give attention in exploitation the potential use of wild edible plants.
- Participatory forest management needs to be practiced extensively and effectively in the study districts for the conservation of forests in general and wild edible plants in particular.
- Decision creators and policy makers should include traditional conservation practices such as in-situ (on-site and ex-situ (off-site) conservation and ecological restoration in their natural conservation program should be implemented in study area.

Competing Interests

The authors declare that they have no competing interest

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