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Review Article

Diversity of edible wild Plants used by Local Communities in Kebridehar District, Southeast Ethiopia

Kassaw Awoke Wubu[1]*, Tilaye Aregu Haile[2], Mulusew Birara Yizengaw[3]

[1]Department of Biology, Debark University, Debark, Ethiopia
[2]Department of Biology, Kebridehar University, Kebridehar, Ethiopia
[3]Department of Chemistry, Kebridehar University, Kebridehar, Ethiopia

**Correspondence author:* ✉

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Abstract— Fluctuate seasonal conditions, increasing global warming, and insufficient production of staple foods in developing nations have led to a search for less expensive and alternative source of edible wild plants. In numerous rural regions of developing nations, edible wild plants have been crucial in improving the nutritional and food security of impoverished communities while also improving their general state of health. This study's goal was to conduct an ethnobotanical analysis of wild edibles and their significance to the local community in Kebridehar district, Southeast Ethiopia. Purposive and random sampling was employed to gathering ethnobotanical data. Group talks, field observations, and semi-structured interviews were used to gather ethnobotanical data. The descriptive statistical analysis was conducted using Microsoft Excel. In the study region, thirty distinct species of edible wild plants have been discovered. Based on parts of edibility, fruits accounted for 17 (56.67%) of the edible components, followed by roots 8 (26.67%) and leaves 4 (13.33%). According to preference ranking data, because of their sweet flavor, the leaves of *Ficus sycomorus* and *Ziziphus mauritina* are the most favored plant species. Even though *Grewia pennicillata*, *Dobera glabra*, and *Moringa stenopetala* are among the most well-known species of multi-purpose wild food plants, they are mostly exploited and endangered species as a result of human impacts. Anthropogenic activities like charcoal production, firewood collection, and fencing all played a momentous role in the reduction of these plants. In order to enhance local residents' quality of life and promote sustainable forest management, conservation, value addition, and market linking strategies must be reinforced.

Keywords— Edible wild plants, Indigenous knowledge, Kebridehar district, Key informants, Preference ranking

1. Introduction

Species that are available in their wild natural habitat and used as food sources but are neither grow nor domesticated are referred to as edible wild plants [1]. Indigenous populations living in the flood forests of Africa and South America have a long history of using edible wild plants as food [2]. Rural communities in underdeveloped countries depend on edible wild plants to meet their nutritional demands during periods of food scarcity. Wild plants that can be eaten provide a variety of nutrients, including vitamins and minerals [3].

Various academics claim that Ethiopian rural communities are consuming wild plants as a source of nourishment during times of food scarcity [4]. Families living in poverty and insecure about their access to food have relied on wild edible plants for a long time [5]. Ethiopia's geography, climatic conditions, biological diversity, and societal diversity have resulted in a variety of indigenous knowledge and edible wild plant species that are crucial for the security of food and nutrition, as well as for its exceptional capacity to generate revenue and provide ecological advantages [6]. Hence, ethnobotanical investigations made on edible wild plants showed that more than 7,000 species have been documented for food in human history. Therefore, ethnobotanical studies conducted on edible wild plants revealed that over 7,000 species have been recorded for human use [7]. About 413 species were specifically identified in Ethiopia [1].

According to certain research conducted in Ethiopia, a large number of rural residents possess profound understanding on how to utilize plant resources [3]. Elderly members of the

community are typically the best providers of information about plants in this regard [8]. Edible wild plant and nutritional value have not been thoroughly studied in Ethiopia [9]. However, Ethiopia's edible wild plants faced several environmental and human-caused hazards [1]. Because of this, the variety of wild food plants is occasionally declining, and little is known about their socioeconomic, cultural, traditional, and nutritional features [10].

Compared to other regions of the nation, food-insecure areas consume more edible wild plants [6]. According to the results of the reconnaissance survey, local communities in Kebridehar District frequently rely on edible wild plants. Although there are plant species in this region that are remarkably significant for food security, there aren't many scientific studies on edible wild plants. Ethnobotanical research is crucial for generating scientific data that can be utilized to develop the sustainable use of wild food plants before all of the resources are fully depleted [11]. The Somali Regional State's Kebridehar region is among the places with food insecurity. Since the ethnobotany of edible wild plants has not been documented in the region, edible wild plants must be documented in order to support the national initiative to ensure dietetic diversity and fight food insecurity. In order to evaluate and document the wild edible plants that the local population uses, this study was started to identify the plant parts used for edible values; to assess the preparation and way of administration of edible wild plants, and to determine the major threats of edible wild the indigenous knowledge that residents of Kebridehar District currently possess.

2. Materials and Methods

Reconnaissance Survey and Selection of Study Sites

A reconnaissance survey of the research region was carried out between May 22 and May 29, 2021, and data was gathered between July 2021 and December 2021. One of the districts in Korahie, Kabridahar, is located in several altitudinal ranges and was chosen for the collecting of ethnobotanical data. With the help of local authority, elders, and knowledgeable people, the knowing seniors were identified and deployed as key informants.

Description of the Study Area

Investigation was carried out in Kebridehar district, Korahie zone, and Somali regional state. Ethiopia's capital Addis Ababa is 1004 kilometers away. Geographically, the Kebridehar district was found between 6º 28' 68"-N Latitude and 43º 53' 00"-E Longitude (Figure 1).

The research area is located in Ethiopia's southeast lowlands, where the average district elevation is 706 meters above sea level [12]. Due to the sun's high angle of incidence, the research area's environment is tropical and experiences significant levels of incoming solar insulation. With an average yearly temperature varies between 20.75°C and 31.25°C, a sizable portion of the district has high temperatures and little precipitation. The districts' yearly rainfall varies between 295 and 595.6 mm.

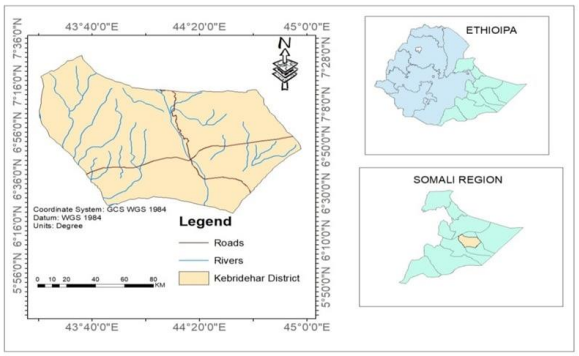

Figure 1: The study area's map

Of the 136,142 residents of Kebridehar district, 77,685 are men and 58,457 are women [13]. There are 50,361 (36.99%) pastoralists in addition to 29,241 (21.48%) urban residents of the population.

Informant selection

Therefore, from the sample set of kebele informants, 80 informants (41 men and 39 women) with ages ranging from 14 to 70 were specifically and randomly selected. Important informants included deliberately chosen from the research location based on suggestions made by the local authorities, kebele agricultural officials, and elderly people with wisdom, religious leaders, and community members. A deliberate selection of 30 important informants was made based on the recommendations of development professionals, responsible residents, and informed elders. The caliber of the explanations provided by particular interviews when choosing important participants was also considered. Indigenous knowledge about edible wild plants is steward by traditional experts, who were automatically certified as essential participants [14].

Semi-structured interview

Eleven important questions in a semi-structured format were created and discussed in a certain order with the informants (Appendix 1). All interviews excited in Afan Somali, the native linguistic that the informants speak the most, and all responses were recorded in English. Interviews with each informant were done independently. People who were either native to the region or had lived there for the majority of their lives were involved. During the interview, details were recorded regarding the edible wild plants' local names, parts used, preparation techniques, route of consumption, dangers and management, and other relevant information [6].

Guided field walk

A guided field walk was part of the investigation or local people, as suggested by the research [14-16]. All relevant information, including plant common and scientific names, vernacular name, habit and habitat of the plant, appearance and relation with other species using all the senses during time consuming were collected during the guided field walk.

Discussion in focus group

Focus groups were conducted to further understand local knowledge of edible wild plants and to confirm the veracity of the data gathered through semi-structured interviews [6, 14]. There was one focus group meeting for each of the district's four kebeles. Each kebele had five to eight informants, and the traditional use of edible wild plants periodically entered the conversation to share some of the shared traditional knowledge among the informants chosen for it.

Gathering ethnobotanical Data

Before the data collection process began, Kabridahar University provided a letter of agreement. Before the interviews, group discussions regarding the study's goals were conducted to get the participants' verbal agreement. Every participant gave their oral consent, which was used to collect all of the data. According to [17], the most important informants were selected based on their indigenous knowledge of edible wild plants.

Ethnobotanical data collection was obtained from July from December 2021. The traditional use of edible wild plants by the local community, conservation efforts, and risks have all been documented using traditional data collection techniques [14]. For ethnobotanical research, semi-structured interviews, field observations, guided field walks, market surveys, and focus group discussions were employed as data gathering methods. Semi-structured interviews, field observations, guided field walks, market surveys, and focus groups were used to collect data for ethnobotanical research. A series of inquiries composed in English and translated into the native tongue, "Afan Somali," was used for semi-structured interviews. Information was carefully documented during a participant interview. Under supervision, the key items on the checklist were discussed during the interview. The timing and place of the interview were determined by the participants' degree of interest. With the help of local guides, the morphological traits and habitats of every species of edible wild plant were observed in the field. Information exchange throughout the community, threats to wild edible plants, and how to preserve them were all covered.

Specimen collection and identification

For identification, wild edible plant specimens were collected, pressed, and dried along with their colloquial names based on the ethnobotanical knowledge informants provided. We gathered the local names, customs, and associated plants. Using various volumes of Ethiopian and Eritrean flora and taxonomic keys, the identification was carried out March and April.

Data Analysis

In accordance with [17, 18] and [19] the acquired data will be calculated using informant consensus, paired comparison, preference ranking, and direct matrix rating. The most important data collected on wild edible plants reported by locals was examined using descriptive statistics. These data included application, methods of preparation, parts used, habit there proportion, and frequency.

Ranking of preference

For the six most significant wild edible plants, preference ranking is carried out after [17] according to their estimated level of significance in their group. Based on their tastes, six informants were chosen to determine which wild edible plant species they favored. Six reports of wild edible plants were given to each informant for testing. In accordance with their order for the remaining ones, they were asked to assign the highest value (6) for the most favored species, the good test, and the lowest value (1) for the least preferred plant, after the leaves of the wild edible plant utilized were tagged with a name. Each species' value is added up, and the rank of each species is established using the sum of the scores. Based on their test quality, this aids in displaying the community's ranking of the most useful wild edible plants.

Matrix ranking directly

The process of matrix ranking is as follows [14, 18]. This study took into account the many uses of edible wild plants, including food, medicine, fuel, fodder, charcoal, and fence-building. These are the applications for edible wild plants that key informants frequently mention. Six multifunctional tree species remained chosen from among the total number of edible wild plants based on information obtained from informants. Each species is assigned use values based on the six use diversities of these plants as reported by six key informants. Medication, food, fire wood, charcoal, fencing, and fodder are among the six use values. By adding all the scores, it was possible to assess the use values of wild edible plants and identify the main cause of plant overharvesting.

Consensus among informants

The validity of the information was established and documented, and informants were interviewed at least twice for the same concepts in order to assess the dependability of the information provided during the interview. As a result, the informant's idea is rejected since it is deemed unreliable if it differs from the original information. As a result, only pertinent ones were taken into account and subjected to statistical analysis [19].

Pair-wise comparison

The degree of preferences or relevance of plant parts can be assessed using this analytical approach [17]. Paired comparisons were used to show the popularity and effectiveness of five wild edible plant species that were found frequently and were thought to have market value by six informants. Six key informants are chosen at random and given the opportunity to independently present their answers for pairings of five wild food plants that are known to have high market usefulness. Prior to each pair being present to select informants, a list of pairs of chosen items with every possible combination was created, and the order and sequence of the pairs were randomized. The informants' responses were then recorded, the total value was compiled, and

the pairs were ranked based on their reports. The formula n (n-1)/2, where n is the total number of edible wild plants considered, were used to determine the sum of all scores.

Threats to edible wild plants

To comprehend the locals' perceptions of activities threatening wild edible plants, a number of threatening factors were identified with the community. Then, each respondent's scores were added up, ranks were established, and the factor with the greatest overall score was ranked [18].

Ethical Consideration

The Ethics Committee of the Kebridehar University member institution approved this research. After being informed of the study's purpose, participants filled out the anonymous questionnaire, choosing to omit any items they did not want to answer. It is important to respect the dignity of research participants and the respect for study participants' dignity and obtain their full consent before beginning any study. Furthermore, the privacy of research participants' personal data must be safeguarded. The approval of ethical consent was given by the ethical committee members, which is affiliated with Kebridehar University.

3. Results and Discussion

Informant sex and age

According to the way in which informants are distributed by age group, the elder's group with the greatest in-depth knowledge was that of elders aged 56 to 65 (30%), followed by that of aged 36 to 45 (23.75%). In terms of gender, 39 (48.75%) of the significant informants were female, while 41 (51.25%) of them were men (Table 1). According to the age distribution of the informants, the majority of them were elders who had a history of interpersonal relationships and long-standing knowledge of the area's edible wild plant resources. The finding of this research showed which respondents' knowledge of edible wild plants rose with age, indicating that younger generations generally know less about these plants than do ageing people. This may be because younger people are less interested in learning about edible wild plants or because they spend less time outdoors because of increased school attendance. This result is consistent with the accounts [20]. Male populations were more knowledgeable than female populations within the instance of the information gap and use of edible wild plants as a diet between the sexes. This could remain as a result of different occupations, such as the fact that males engage extensively with wild edible plants while serving as cattle guards or gathering wood for burning. In the study conducted by [6, 11] it was found that men had greater knowledge than women. In contrast, women in the Chelia District of West-Central Ethiopia were more knowledgeable than men, according to a research by [20]. The quick modernization that readily diverts the attention of the younger generation may be the cause of the knowledge gap between the two age groups. Since documentation is not a regional trend, this will probably be motivated soon. This aligns with earlier similar studies [11, 21]. Indigenous knowledge about edible wild plants and generally speaking about natural plant resources is reportedly passed on to the following generation through oral history, imitation, observation, and covert transmission from elders. This is consistent with the research on [22].

Table 1: Age and sex of the informants

Informants age	Male	Female	Total	Percentage
15-25	7	2	9	11.25%
26-35	3	8	11	13.75%
36-45	9	10	19	23.75%
46-55	9	8	17	21.25%
56-65	13	11	24	30%
Total	41	39	80	100%

Educational level of informants

In comparison to their educational level, non-educated informants knew a lot about wild edible plants. This study shows that 42.50% were illiterate, followed by religious education at 32.50%, and read-and-write informants comprise 8.75% of the total informants (Table 2). These illiterate informants were unable of reading or writing properly. Non-educated informants dominated educated informants when comparing the respondents' educational status. This demonstrates that the locals in the research area did not prioritize contemporary education as a means of maintaining their way of life. Nevertheless, uneducated informants held a wealth of information regarding the usage of edible wild plants part. In the same way, uneducated informants knew more information than literate ones. This result supports [23] findings that education is not a significant determinant of diversity in knowledge of wild edible plants.

Table 2: The informants' level of education

Education status	Male	Female	Total	Percentage
Certificate	3	2	5	6.25%
Diploma	5	0	5	6.25%
Student	2	1	3	3.75%
Illiterate	13	21	34	42.50%
Read and write	2	5	7	8.75%
Religious edu.	16	10	26	32.50%
Total	41	39	80	100%

Edible wild plants in the research area

Many species of plants are utilized by the locals in the research region for conventional dietary objective to combat food insecurity. The study area's local informants stated that thirty wild edible plants were used for food (Appendix 2). There are 23

genera and 17 families in which these plants are found (Table 3). The Fabaceae family represented the greatest number of species which accounted six species and, followed by Burseracceae and Tiliaceae which accounted 4 species, next to this Rhmanaceae which accounted 3 species, and the remaining of families which accounted a single species only. This result is a reliable sign that the research region contains a wide variety of plant species. As reported by [24], thirty wild edible plants were recorded. These findings are similar to the current study result. This similarity it may be due to agro ecological, availability of edible wild plants and perception of local people. In another studies reveled that [25], the largest family of Rosaceae has been reported, a finding that differs from the current study. As reported by [26], Asteraceae and Polygonaceae were reported as the major families, which accounted for 6 species each.

Table 3: Wild edible plants in their family, genera, and number of species

Family	Genera	Plant species.
Amaranthaceae	1	1
Apocynaceae	1	1
Arecaceae	1	1
Asclepiadaceae	1	1
Asteraceae	1	1
Balanophoraceae	1	1
Burseracceae	2	4
Cucurbitaceae	1	1
Cyperaceae	1	1
Euphorbiaceae	1	1
Fabaceae	5	6
Hydnoraceae	1	1
Moraceae	1	1
Moringaceae	1	1
Rhmanaceae	2	3
Salvadoraceae	1	1
Tiliaceae	1	4
Total	23	30

According to the finding of analysis in Table 3, there were a total of 30 edible wild plant species found in the research region. This study area's edible wild plant species were edible both during regular times and during times of food scarcity, preventing starvation and sustaining life throughout protracted droughts. Various researchers have clearly shown the importance of edible wild plants as a coping mechanism for food shortages and as a complement to nutritional requirements [27, 28].

Compared to other regions of Ethiopia, Kebridehar district has a limited diversity of wild food plants. The Bullen District in northwest Ethiopia uses 77 edible wild plant species, according to [3] reports, and the Metema Districts in southern Ethiopia include 44 edible wild plant species, according to [11]. Potential explanations for these variations include differences in local traditions and customs of using certain plants, as well as climatic and environmental conditions that may have reduced the variety of wild edible plants from place to region. The greatest edible wild plant species were found in the Fabaceae and Bruseraceae families, with six and four species, respectively. This finding was in contrast with [6] in Sedi Muja District, Northwestern Ethiopia where family Fabaceae had consisted 3 species. Previous research has also revealed the dominance of Fabaceae [3, 6, 11]. Furthermore, the ability of wild edible plant species in the Fabaceae to adapt to a greater variety of altitudes and agro-ecological zones made them more widely available [11, 29]. There were fewer families in the current study than in the one carried out by [3, 6, 11] in Bullen District northwest Ethiopia was 39 families, and Sedi Muja District, Northwestern Ethiopia was 24 families, Metema district Amhara region Ethiopia was 25 families respectively. Certain differences may have resulted from differences in local customs and practices about the usage of certain plants, as well as climatic and environmental conditions that may have restricted the amount of wild edible plants from one location to another.

Habits of edible wild plants

Many plant species, including herb, shrub, tree, and climber species, have established themselves in the research region. The study's findings indicate that trees make up the greatest category of edible wild plants in the studied area, accounting for 12 (60%) of them, followed by shrubs at 6 (20%), herbs at 4 (13.33%), and climbers at 2 (6.67%) (Figure 2).

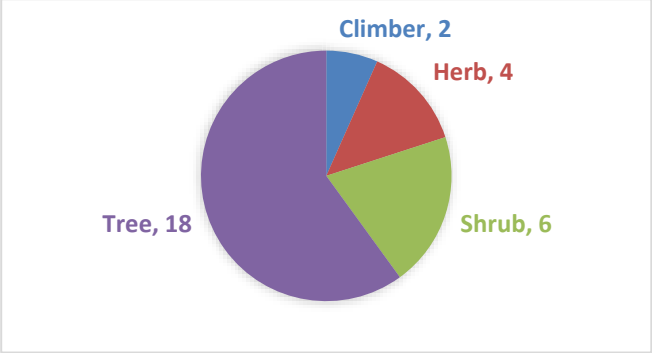

Figure 2: Habits of edible wild plants

Similar studies conducted elsewhere in Ethiopia also revealed a larger percentage of trees used for wild edible purposes [30-34]. The majority of the study's tree plant species were used extensively and predominated, as seen by the results. This might be as a result of their relative greater accessibility and abundance in neighboring locations when compared to other living forms. As a result, the community members acquired indigenous knowledge of many biological types.

The multifunctional benefits of edible wild plants in the study area

Of the 30 edible wild plants found in the research region, 22 (73.33%) species were found to play a variety of roles, whereas 8 (26.69%) of them are solely involved in food (Table 4). Its discovery demonstrates that the native population exploited

edible wild plants for purposes other than eating, primarily for home construction, burning, fencing, and therapeutic benefits (Table 4).

Table 4: Multifunctional benefits of edible wild plants in the study area

Multipurpose	Number of species	Percentage
Only food	8	26.67%
Home building	3	10%
Medicinal	4	13.33%
Fodder for animals	3	10%
Firing and home building	5	16.67
Fencing and home building	4	13.33%
Apparatus	2	6.67%
Firing and fencing	1	3.33%
Total	30	100%

Edible wild plants parts that are utilized for food

In the result of this discovery, seventeen plant species were utilized for fruits in addition eight species were used for roots in the research area. The remaining plant species were utilized for glue and leaves, which accounted for the next one and four species, respectively (Figure 3).

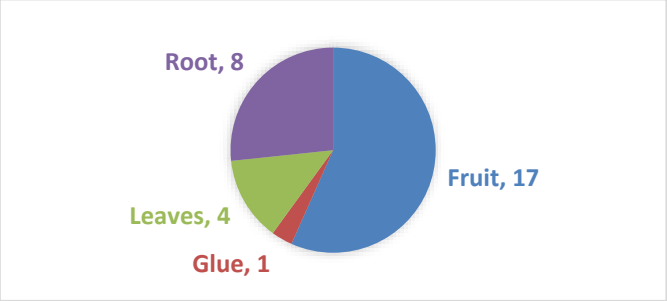

Figure 3: Parts of edible wild plant parts

According to the study area, fruits from 17 plant species and roots from 8 plant species were both utilized. This result is in line with a study by [22] fruits were carried 19 (53%) highly consumable parts of the wild edible plant species by local peoples. Fruits are the most significant edible plant sections, nonetheless. This might be because they have a great flavor and are available easily and unprocessed in the wild. Fruits are crucial sources of critical vitamins and minerals for the inhabitants of the research region as a result. This agrees with [9, 35, 36]. Higher fruit availability is the most widely used wild edible plant portion. Ripe fruit is better than other parts since it is easier to metabolize and easier to eat [37]. Fruits have a more nutritive fleshy section and taste than other plant parts, according to studies conducted in various parts of the country [4, 11, 37] and [38]. But according to other research [21, 39], the most significant edible components were the leaves. The diversity in reports of wild edible plant parts may be caused by the climate and vegetation types of the study location, the socioeconomic activities of the community, the volume and quality of edible plant parts, and the group's traditional knowledge [40].

Mode of preparation: edible wild plants

Depending on the type of eatable plant, there are several preparations. According to reports, chewing accounts for 21 (70%) of all plant parts utilized in form preparation, followed by dizziness 5 (16.67%), crushing 2 (6.67%), and harvest glue and squeezing accounting for the remaining 3% (Figure 4). As stated [41], Meinit ethnic community typically use traditional methods of WEPs food preparation and preservation technique; namely boiling, stewing, brewing, non-oil frying and sun drying.

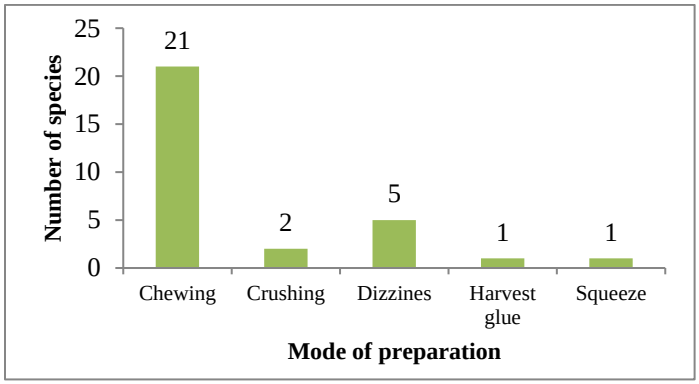

Figure 4: Mode of preparation of wild edible plants

Way of consumption: edible wild plants

The most common method of consumption was through raw, which accounted for 23 (76.67%), and cooked, which accounted for 7 (23.33%) (Figure 5). According to this study, most wild edible plant species or their parts were consumed raw, without any additional preparation. The way of consumption of edible wild plants in Kebridehar District showed that 76.67% are used raw and 23.33% were cooked. Seven edible wild plant species (*Acacia bussei, Dobera glabra, Hydnora johannis, Iphiona rotundifolia, Moringa stenopetala, Sarcophyte sanguinea*, and *Tamarindus indica* are stated to be cooked before consumption. According to the preference for raw eating, plant components are consumed as soon as they are collected from their natural habitat. The preference for consuming raw forms was also noted in other research findings [6, 9, 11] and [42]. The results of the study's cooked vegetable research may assist foster the use of edible wild plant portions after processing. However, overcooking may destroy the flavor and organic nutritional content of sections of wild edible plants. Eating edible wild plant components that have been cooked and processed generally serves to enhance flavor and flavor while lowering toxicity [6, 11].

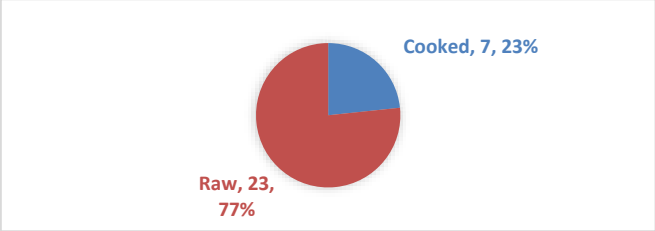

Figure 5: Way of consumption of edible wild plants

Preference ranking

Zizphus mauritiana is the top-ranked edible plant species, according to a preference ranking for six wild edible plants that are primarily used by local communities that was made by six informants (Table 5). And the second, third, fourth, fifth, and sixth most favored edible wild plants are *Ficus sycomorus*, *Cibirhiza spiculsta*, *Commiphora rostrata*, *Iphiona rotundifolia*, and *Indigofera volkenssii* Sweet, respectively. Yet, as noted by respondents, some plant species in the research region are less desirable.

Table 5: Findings from a preference rating of the six most widely used wild edible plants, as judged by respondents in the study area, based on their flavor, accessibility, and regular usage by locals (6=most favored, 1=least desired).

Scientific name	I1	I2	I3	I4	I5	I6	Total	Rank
Ziziphus mauritiana Lam.	4	5	4	6	5	6	30	1
Ficus sycomorus L.	4	5	6	4	4	6	29	2
Cibirhiza spiculata Thulin & Goyder	3	4	4	6	5	6	28	3
Iphiona rotundifolia (Oliv. & Hiern)	3	5	5	4	4	4	25	5
Indigofera volkensii Taub	3	3	4	5	5	4	24	6
Commiphora rostrata Engl.	4	3	4	6	6	4	27	4

Key: I= Informants

Due to a variety of reasons, including their familiarity with the plants, the availability of the species, and social and economic issues, informants ranked the wild food plants in order of preference. Based on their flavor and use by the local indigenous populations, the best candidate for a wild edible plant is chosen and ranked. A species preference ranking of edible wild plants was conducted using the informants' consensus approach to ascertain the relative value of plants to the local population (Table 5). The four kebeles do not significantly differ from one another, and the species preferences are nearly the same throughout the kebele. This might be the result of similar ethnic makeup, a shared culture of using wild food plants, and in the district living together. However, different wild food plant sections were preferred in the research area. For instance, plants eaten during times of famine were not eaten at other times. As stated by informants reported, the roots of *Sarcophyte sanguinea* and the ripe fruit of *Berchemia discolor* are only eaten when there is a shortage of food. According to Table 5, *Zizphus mauritiana* is the most preferred wild edible fruit vegetable. This is a result of their flavor and ease of access.

Matrix ranking directly

In order to assess each plant species' relative importance, a straightforward matrix ranking was done. *Grewia pennicillata*, *Dobera glabra*, and *Moringa stenopetala* in a direct matrix ranking of the six most common multipurpose wild edible plant species, they came in first, second, and third place, respectively. Conversely, *Tamarindus indica* was ranked lowest (Table 6).

Table 6: Findings from the direct matrix ranking of six wild food plants with multiple uses based on six key informants Use values given from 1 to 5: 5 = excellent, 4 = very good, 3 = good, 2 = less, and 1 = least.

Use category	*Grewia pennicillata* Chiov.	Moringa stenopetala (Back. F.) Cuf.	*Crotalaria dumosa* Franch	*Dobera glabra* (Forssk.) Poir.	*Cordeauxia edulis* Hemsl.	*Tamarindus indica* L.
Food	30	30	21	25	26	27
Medicines	28	33	22	19	15	27
Fire wood	27	17	23	30	29	25
Fodder	25	30	23	23	19	18
Charcoal	26	14	21	29	15	15
Fencing	29	14	27	24	26	15
Total	165	138	137	150	130	127
Rank	1	3	4	2	5	6

People in the research area use the forests for a number of purposes, including as charcoal, firewood, fodder, food, medicine, and fence. Identification of these multipurpose plant species in the study area is crucial from the standpoint of conservation and management. This is so that the most valuable can be protected and maintained before they are wiped out by extinction [43]. In a direct matrix ranking of the six most prevalent multipurpose wild food plant species, *Grewia pennicillata*, *Dobera glabra*, *Moringa stenopetala*, and *Crotalaria dumosa* were ranked first, second, third, and fourth, respectively. This suggests that the many daily activities and fundamental needs of the local community have been met by these adaptable plant species. The various uses of various tree species, their relative importance to the community, and the degree of dangers now facing those uses were evaluated using a straightforward matrix ranking (Table 6). The community's extensive indigenous knowledge of plant species was demonstrated by the diverse applications of wild edible plant species. However, their varied uses can affect the availability of native species. According to Getinet [11] and Anbessa [39], the

more plant species are used in a given area, the more they are used for various purposes. Therefore, great consideration should be given to the multipurpose wild edible plant species in order to preserve them for future generations.

Other research has found that wild edible food plant species have many functions in addition to their food value [11, 37] and [44]. The main supplies of fuel wood and building materials for homes are wild trees and bushes, particularly in rural areas. However, the research area's indigenous peoples don't have habit planting trees, and edible wild plants cause their numbers to continue declining, as has been documented elsewhere in Ethiopia [39, 44]. According to reports, there are additional uses for each of the 30 wild edible plants that were discovered in the study area. The use diversity result indicates that *Grewia pennicillata* are ranked first because they are used for a number of purposes in the study area, such as food, medicinal, fuel, charcoal, and fences. This indicates that the villagers do not only collect the wild edible plants for food, but also primarily for firewood, fodder, and fence (Table 6). Therefore, to protect the multifunctional edible wild plant species in the area, an immediate additional conservation intervention is needed. In south Ethiopia, [45] also observed the similar pattern of the highest edible wild plant use for uses other than their food value.

Informant consensus

Application of informant consensus analysis showed that some edible wild plants were more popular than others. As a result, local informants cited the most commonly used plants repeatedly as supplementary foods to the staple food. The revealed data shows that *Ficus sycomorus was* cited by 52 (65%), followed by *Grewia pennicillata* at 41 (51.25%), and on the list, *Commiphora serrulata* accounted for 11 (13.75%) (Table 7).

Table 7: Informant consensus list of plant species

Scientific name	No. of informants	Percentage	Rank
Grewia pennicillata Chiov.	41	51.25%	2
Ficus sycomorus L.	52	65%	1
Acacia bussei Harms ex Sjostedt.	22	28%	4
Grewia tenax (Forssk.) Fiori	27	33.75%	3
Sarcophyte sanguinea Sparrman	20	25%	5
Commiphora serrulata Engl.	11	13.75%	6

Pair-wise ranking based on the taste of edible fruit plants

According to the results, *Grewia pennicilata* came in first place, followed by *Ziziphus mauritiana*, which came in second. On a pair-wise ranking based on the flavor of wild edible fruits, *Cordeauxia edulis* came in last (Table 8). With 52 (65%) citations, *Ficus sycomorus* was identified as the most dependable species in the study region. *Grewia pennicillata* came in second with 41 (51.25%). To put it another way, species were rated according to their popularity and effectiveness, with *Ziziphus mauritiana* coming in second and *Grewia pennicilata* in first. Furthermore, *Grewia pennicillata* Sweet's fruits are the most popular wild food fruits among the other wild food fruits that have been documented, according to the results of the pairwise ranking in Table 8. This is due to the fact that they are known in every neighborhood.

Table 8: Pair-wise ranking based on taste of edible fruit plants

Scientific name	I1	I2	I3	I4	I5	I6	Total	Rank
Cucumella kelleri (Cogn.) C. Jeffrey	5	4	3	4	2	2	20	3
Grewia erythraea Schweinfurth	5	1	2	5	1	3	17	4
Grewia pennicillata Chiov.	2	5	5	3	3	5	23	1
Ziziphus mauritiana Lam.	4	3	4	2	5	4	22	2
Cordeauxia edulis Hemsl.	1	2	1	1	4	1	10	5

Key: I= Informants

Threats to edible wild plants in the research area

The data obtained from the main respondents in this study area suggested that the study area is periodically more at risk from wild food plants. Nowadays, the local community frequently deforests huge quantities of the edible wild plants in the research area. It's mostly related to the pressure brought on by human population growth and its impacts. The results of the five most dangerous issue for edible wild plant species (Table 9) revealed that charcoal, fire, fodder/overgrazing, and fencing are, respectively, the first, second, third, and fourth most dangerous factors for edible wild plant species in the study region.

Table 9: Six respondents' rankings of five elements deemed to be risks to wild food plants (with 1 denoting the least harmful and 5 the most destructive)

Threat	I 1	I 2	I 3	I 4	I 5	I 6	Tota l	Rankin g
Firing	4	3	2	4	4	3	20	2
Charcoal	5	4	3	1	5	5	23	1
Fencing	2	5	4	2	1	2	16	4
Fodder	3	1	1	5	3	4	17	3
Introduced exotic species	1	2	5	3	2	1	14	5

Key: I=Informants

These days, the local population frequently deforests a substantial number of the wild food plants in the study region. Human population pressure and its associated effects are primarily to blame for this. Additionally, the ethno-ecological knowledge on conservation issues and edible wild plant threats was evaluated. Similar to other plant species, edible wild plants are endangered by a number of natural and man-made factors. But according to this study, most threats to wild food plants and the related indigenous knowledge are caused by anthropogenic factors like fencing, the introduction of exotic weedy species, firewood gathering, fodder, and deforestation from the production of charcoal. According to sources, charcoal collection, burning, and population pressure pose the biggest threats to endangered species. Among other things, this conclusion may be the consequence of continued production of charcoal, deforestation, drought, and disregard for the edible wild plants. According to Amente's [46] research, the main harmful elements are drought and agricultural operations, which are followed by urbanization, construction, overgrazing, and fuel wood gathering. By contrast, Balemie and Kebebew [37] found that the primary factor is drought, which is followed by the

gathering of fuel wood and selective cutting for building. The degree of danger posed by edible wild plants differs among the district's many villages under study [3]. According to [3], the main cause endangering the diversity of edible wild plants in Baruda village is overgrazing, uncontrolled fire starting, and then agricultural area growth. The introduction of new grazing pasture due to the high animal density may have resulted in overgrazing of large areas of the Baruda community.

4. Conclusion and recommendation

This study found that gathering and consuming edible wild plant species was a common practice among households in the study region. The local communities are always looking for edible wild plants because of food insecurity in the area and the short and irregular rainy seasons. Fruits were mostly used than the other parts; this promotes the preservation of indigenous knowledge about edible wild plant species that are easily edible. However, there has been a drop within the use of several edible wild plant species that were employed when there was a food shortage, such as the root of *Sarcophyte sanguinea* and the ripe fruit of *Berchemia discolor*, which has progressively led to the collapse of the indigenous knowledge connected with them. When there is a food shortage, rural residents' diets greatly depend on edible wild plants. The bulk of the wild edible plant species found in the investigated area are utilized by the inhabitants for a number of purposes other than eating. This puts the area's multipurpose wild food plants at risk. The other key aspect is that, contrary to popular belief, people in the remote regions are more likely to practice foraging for edible wild plants than they are in the city of Kebridehar. Edible wild plants are utilized as a supplement to grown crops, to make up for food shortages, or as a backup plan during famines. The local population should be encouraged to grow wild food plants in their backyard gardens by providing resources and technical assistance. For the sustainable management and use of wild edible plants in the research region, community involvement is the recommended remedy.

Availability of Data

The text and supplemental materials contain the dataset that was utilized to support the study's conclusions.

A conflicts of interest

There are no conflicts of interest disclosed by the authors.

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Supplementary Materials

Appendix 1: Semi structured checklist interview question for collecting ethnobotanical data of edible wild plants

Appendix 2: List of edible wild plants that were collected in the research area

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AUTHORS PROFILE

Kassaw Awoke Wubu received his bachelor degree in Applied Biology from Arba Minch University in 2013, and MSc in Botanical science from Debre Tabor University in 2020. He is currently working as lecturer and researcher in department of biology, Debark University, Ethiopia. He has published research papers in reputed international journal of forestry and heliyon. He currently resides in Debark, Ethiopia. He has 7 years of teaching experience and 5 years in research experience

Tilaye Aregu Haile received his Bachelor degree in Applied Biology from Debre Tabor University and MSc in botanical science from Bahir Dar University. He is currently working as lecturer and researcher in department of biology, Kebridehar University. He has 6 years of teaching and research experience

Mulusew Birara Yizengaw earned his Bachelor degree and MSc. in applied chemistry and analytical chemistry from Debre Markos University in 2017 and 2021, respectively. He is currently working as Lecturer in Department of Chemistry, Kabridahar University since 2018. He has 7 years of teaching experience and 4 years research experience.

