Ethnobotanical Study of Wild and Semi-wild Edible Plants of Gida Ayana District, East Wollega Zone, Oromia, Western Ethiopia

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Abstract

An ethnobotanical study of wild and semi-wild edible plants (WSWEPs) was conducted in Gida Ayana District, East Wollega, Oromia, Ethiopia, to investigate WSWEPs and document and the associated ethnobotanical indigenous knowledge of the community. Ethnobotanical data related to WSWEPs were collected using focus group discussion, direct field observation and semi-structured interview. Informant consensus, direct matrix ranking and Preference ranking were conducted for cross checking and verification of the information and descriptive statistics were used for data analysis.The result of the study revealed that the study is consists of 47 WSWEPs species which belongs 30 families and 41 genera. Of the families *Moraceae* was the dominant family which contributed the highest number of species 5 (10.6%), followed by *Asteraceae* 3 (6.4%). According to the informants, the highly cited WSWEPs were Syzygium *guineense (Willd.) Dc.*73.1%, followed by *Rubus steudneri* 70.8% and *Carissa spinarum L* 69.6%. The result of study study also revealed that higher number of WSWEPs were reported by men and elder members of the community than by women and younger members. The key informants reported meaningfully higher mean number of edible species of WSWEPs than the general informants ($P < 0.05$). Children (47.3 ± 1.14) and women (25.7 ± 0.67) were the major gatherers followed by men (14.9 ± 0.48) and all household members (12.1 ± 0.47). The majority of respondents (44.45 ± 0.96) reported that WSWEPs were consumed by children followed by men (23.06 ± 0.41), any household (14.38 ± 0.36%), women (11.59 ± 0.31) and elders 6.53 ± 0.25). Most of the WSWEPs species were shrubs signified with 21 species (42%), followed by trees 20 species (40%). Most inhabitants mostly consumed fruits (57.4%) followed by leaves (14.8%). The most commonly used multipurpose species based on multipurpose criteria were *Cordia africana, Vemonia amygdalina* and *Ekebergia capensis*. In this study the majority 32(28.83%) of the WSWEPs were collected from woodland followed by the forest 30 (27.03%). WSWEPs are playing a great role in assisting the livelihoods of the local community by ensuring food security and providing additional multiple uses. o facilitate official actions that promote the use of such plants as a source of vital nutrients, additional research should be done on the nutritional analyses and health relevance of WSWEPs.

1. Introduction

Wild and semi-wild edible plants (WSWEPs) have played a very important role in human life since time immemorial. WSWEPs are important resources for income generation, ensuring food security during period of famine, supplementing the staple food, ecological and socio-cultural values in the rural livelihoods. WSWEPs have been used for food, medicines, fiber and other purposes and fodder for domestic animals (Martin, 1995). These WSWEPs are immensely contributed to family household food security (Regassa *et al.*, 2014). The different parts WSWEPs such as leaves, tubers, seeds, fruits, roots, rhizomes and other parts are used for the supply of different food types. WSWEPs are frequently consumed, particularly during the period of food scarcity such as during times of drought, famine, shocks and risks, extreme weather or political unrest, poverty (Asfaw *et al.*,2023; Carvalho & Barata, 2016). Hence, WSWEPs are playing a great role and contribute to the fulfillment of the goal of eradicating hunger set by UN sustainable development (Singh *et al.*, 2020).

Due to their superior nutrients, edible wild and semi-wild plants can also be used to complement dietary needs (Hunde *et al.*, 2012; Regassa *et al.*, 2014) and provide the local rural communities with cash income (Amente *et al.*, 2017; Aragaw *et al.*, 2021). However, forest loss, historical and contemporary processes of land grabbing, acculturation, and lifestyle changes may causes the erosion of indigenous knowledge transmission to new generations (Barreau *et al.*, 2016).

Although WSWEPs are widely used in Ethiopia, there is a limited amount of ethnobotanical research documenting local knowledge about these plants. Most of the existing studies have primarily concentrated on medicinal plants rather than WSWEPs. According to Addis *et al.*, (2013), the inventory and conservation of WSWEPs has been given very little attention. The fact that just around 5% of Ethiopia's districts are covered by the research data on WSWEPs suggests that more ethnobotanical studies are required to address the nation's uncharted areas (Lulekal *et al.*, 2011). Furthermore, it is unclear how these plants' potential and seasonal availability relate to food security. There is a lack of prior ethnobotanical research conducted and documented indigenous knowledge and practice with WSWEPs in the district where their use is very prominent both at the period of food deficiency and times of excess food. Hence, this study was initiated to assess and document WSWEPs and associated indigenous knowledge to these plants in Gida Ayana District, Western Ethiopia.

2. Material and Methods

2.1. Description of the study area

The survey was conducted in the Gida Ayana district, which is located in the East Wollega Zone of the Oromia National Regional State in Western Ethiopia. It is located within latitude 9°49.5' 00" N -9°59.6' 00" North and longitude 36°40' 00" E – 36 □ 43□ 00" East (Fig. 1). Currently, Gida Ayana has 22 rural kebeles and 3 administrative towns. The total area of the district is 183,063 Hectares. It is 112 km away from the Zonal town of Nekemte, and 442 km away from Addis Abeba. In terms of relative location, Gida Ayana district shares boundaries with Abay river gorge to the North, Limmu and Ibantu district to the West, Guto Gida district to the South, Kiramu district and Abe Dongoro district to the East. Gida Ayana district has total population of 156,137 of which ca. 77,501 (49.6%) are females and ca. 78,636 (50.4%) are males (CSA, 2012). Ayana district has two agro climatic zones, low land(Kola) about 51% and Mid-highland (weyina dega) about 49% of the total land area and falls within altitudinal range of 500m a.s.l to 2200m a.s.l. The majority of the inhabitants mostly deepened on subsistence agriculture, which is dominated by the animal husbandry and cultivation crops.

About 55.17% of the land area of the District falls within altitudinal range of 1500m to 2200m a.m.s.l(above mean sea level). The rest 44.82% the land area of the District falls within altitudinal range of 500m to 1500m a.m.s.l (above mean sea level). There are two types of agro climatic zones in the District: Kola about 51% and Weyina Dega 49% of the total land area (GAANRDO, 2016).

Gida Ayana district has two agro climatic zones, low land (Kola) about 51% and Mid-highland (weyina dega) about 49% of the total land area (GARDO, 2009). Gida Ayana district receives annual rain fall ranging of 1200mm to1434mm. Whereas nearly 76% of the total rain fall is falling from June to September. This

season is favorable season for cultivating different crops in this area. The ten years meteorological data (2005–2016) were collected from federal metrological agency. The annual mean temperature varies from 12.25 to 28.2^{o}c (Ethiopia National Meteorological Service Agency, 2018) (Fig. 2).

Gida Ayana District has total population of 156,137 with the annual growth rate of 0.29 percent, whereby females (77,501) account to 49.6% and males (78,636) account the remaining 50.4% of the total population of the District. A greater fertility rate is reflected in the district's age distribution, which is characterized by a higher number of young people (0–14) and a lower proportion of elderly people (over 65). The young population of ages less than 15 accounts 52.12%, adult and old ages account for 45.59% and 2.3% of the total population of the District respectively. Regarding religious composition of the District the majority of the inhabitants are protestant, with 59.12% of population, 30.4% of the population are followers of Ethiopian Orthodox Christianity and 10.48% is Muslims. The Major ethnic groups in the District are Oromo accounting to 89.6% and Amhara accounting to 7.4%, where the remaining figure is represented by other ethnics (GAANRDO, 2016).

2.2. Site selection and informant sampling

Households (HHs) survey was made in four kebeles (here after study sites) of the district namely: Arele Waja, Kersa Harbukene, Sapera Meti and Sirba Wadesa following purposive sampling method and based on having better vegetation cover (Fig. 1). A total of 171 HHs were involved in this research and the size of the respondents was determined following Kothari, (2004) formula. Systematic random sampling method was employed to select the respondent, where each 8th household was selected to include in the sample starting from 8th household in the list. A total of 20 key informants (five females and fifteen males) were selected from developmental agent (agriculture and health), elderly knowledgeable people in the community, using purposive sampling methods based on their knowledge of plant use.

$$n = \frac{z2xpxqxN}{e2(\ (N-1)\ +z2\ (px\ q)} \quad \text{.....1}$$

Where: n = sample size with finite population correction, N = population size, Z = statistics for a level of confidence, P = expected proportion, q = 1-p and e = precision

$$n = \frac{(2.005)2(0.02)\ (1-0.02)\ (1287)}{(0.02)2\ (1287-1)\ +(\ 2.005)2\ (0.02)\ (1-0.02)}$$

$$n = \frac{101.4059346}{0.07879249+0.5144} = \frac{101.4059346}{0.59319249} = 171$$

The required sample size was 171 and for each kebeles the sample size was determined using proportion of the number of households of 4 kebeles (Table 1).

Table 1
List of kebeles with total number of informants

No	Kebele	Total house holds	Sample of house holds
1	Arele Waja	247	33
2	Kersa Harbu kene	358	48
3	Sapera Meti	250	33
4	Sirba Wadesa	432	57

2.3. Method of Data Collection

Ethnobotanical data of WESPs were collected following Martin, (1995), Alexiades, (1996) and Cotton, (1996) in Gida Ayana District The data was collected based on semi-structured interviews, guided field observation, and focus group discussion. The collection of ethnobotanical data was carried out from the end of November 2018 to January 15, 2019. Prior to data collection and questionnaire administration, the study's objectives and the shared goal of documenting and preserving knowledge about WSWEPs were explained to the informants. This process was facilitated by local authorities, including development and health agents as well as representatives of farmers' associations, to establish trust.

The interview was carried out in *Afaan Oromo* (language of the community in study area) with the informants in a semi-structured way. The interview focused on basic questions prepared for the informant’s knowledge on WESPs in the study area, edible parts, occasions and modes of consumption, harvesting time, threats to WESPs, and additional uses of WESPs. Then it was administered to each of the selected respondents in a face-to-face interview by the researchers. Each interviews were followed by guided field observations with the of assistance of local guides field, as well as interviewees in the study area and the plant part used, habit, preparation, mode of consumption and characteristics of the plants was recorded on site.

Group discussion method and key informant interview were also employed to arrive in agreement on the local classification of resources, local names and use categories of plants and to consolidate and validate all the cultural information relate to plant use patterns and conservation issues of the study area.

2.4. Methods of data analysis

The ethnobotanical data was collected and entered into the statistical computer software such as SPSS and excel spreadsheet software. These entered ethnobotanical data were analyzed by quantitative and qualitative approaches, and descriptive statistics such as percentage and frequency distribution were used to analyze the ethnobotanical data. R-statistical packages was used for One-way ANOVA at 95% confidence level between means using The degree of

preference of selected WSWEPS in the study area was calculated as preference ranking following Martin, (1995), while, data on paired comparison and direct matrix ranking exercises was evaluated following Cotton, (1996) that involved fifteen (eleven men and four women) key informants.

3. Results and Discussions

3.1. Taxonomic Diversity of WSWEPs

Within the study area, a considerable number of WSWEPs were recorded. There was sufficient evidence to support the idea that the local communities in the study district frequently engage with their surroundings and utilize these WSWEPs to partially satisfy their nutritional needs. 47 WSWEP species in all, representing 41 taxa and 30 families, were gathered and identified in the research region. *Moraceae* was the family of plant species with the highest number of species (five species, 10.6%) followed by *Asteraceae* that donated three species (6.4%). *Myrsinaceae, Acanthaceae, Euphorbiaceae, Myrtaceae, Rubiaceae, Rosaceae, Rhamnaceae, Apocynaceae, Meliaceae, Oleaceae* and *Rutaceae, Poaceae* were each represented by two species (4.3%), while, sixteen of the other remaining families each represented by one species (2.3%) (Fig. 3). The dominance of Moraceae as WESPs is reported by Asfaw *et al*., (2023), Hankiso *et al*., (2023), and Abera and Belay, (2022). This is most likely due to the majority of Ficus species which are edible plants is found in this family (Ojelel *et al*., 2019)

Based on the frequency of individual plant citation (FPC), *Syzygium guineense (Willd.) (Myrtaceae)* was given the highest value of citation (73.1%) followed by *Rubus steudneri Schweinf* (*Rocaceae*) (70.8%), *Carissa spinarum L. (Apocynaceae*) (69.6%) and *Phoenix reclinata* (*Arecaceae)* (65.5%) (Appendix 1) Hence, 56.7% of the families were signified by 1 WSWEPs, 36.7% of the families denoted by 2 WSWEPs and 6.6% of the families were represented by more than 2 WSWEPs

The number of WSWEPS species in this study is higher than that was reported by Regassa *et al*., (2014) (58) from Chelia district, central Ethiopia, Tahir *et al*., (2023) and Asfaw *et al*., 2023 each (41) WSWEPS in their respective study area and Biri *et al*., (2024) (36) WSWEPS from Arsi Robe district, but less than some of studies carried out in Ethiopia and elsewhere. For example, Hankiso *et al*., (2023) (64) from Soro District of Hadiya Zone, southern Ethiopia, Giday *et al*., (2023) reported 59 WSWEPS from Raya-Azebo District, Adiis *et al*., (2013) reported 137 edible species used by the Konso ethnic community in Southern Ethiopia, Balemie and Kebebew (2006) who documented 66 species belonging Derashe and Kucha Districts in Southern Ethiopia. Studies from other countries also indicated large number of WESPs for example Agea *et al*., (2011) reported 62 WSWEPs from Matunda and Kiryandongo from Uganda; Pegu *et al.* (2013), (122) species from Poba Reserved Forest (Assam), India, Uprety *et al.* (2012), (81) species and Aryal *et al.* (2009), (85) species both in Nepal; Lentini and Venza (2007), (108) species from Sicily, Italy; Wujisguleng and Khasbagen (2010), (90) species Inner Mongolia, China; Ali-shytayeh*et al.* (2008), (100) species West Bank, Palestine; Ju *et al.* (2013), (116) species Tibetans, China; Nedelcheva (2013), (88) species in Bulgaria and Redzic, (2006), 308 species Bosnia Herzegovina. These differences may be attributed to variations in local traditions, customs related to the use of these plants, and the diversity of local biota. Additionally, the loss of traditional knowledge regarding the use of WSWEPs could also be a contributing factor.

3.2. Ethnobotanical Knowledge of the Community on WSWEPs

The study results revealed that men and elders reported a higher average number of WSWEP species compared to women and younger community members, with a statistically significant difference ($P < 0.05$). Elderly individuals (aged 45 and above) and key informants identified more WSWEPs than younger and general informants (Table 2). On average, male informants in the district reported 27.6 ± 4.7 species, while female informants reported 22.5 ± 7.6 species. Thus, the results showed that both men and women are knowledgeable on use of traditional edible plants regardless of the relative dominance of WSWEPs with men which could be related to the traditional flow of information along the men.

The investigation revealed that knowledge of WSWEPs increased with the respondents' age. Younger individuals (24.8 ± 4.4) demonstrated somewhat less knowledge about WSWEPs compared to elders (28.1 ± 5.1). This disparity could be attributed to the younger generation’s limited interest in learning about wild edible plants or reduced exposure to the wild environment, as many spend more time in schools and away from traditional settings. A significant difference in WSWEP knowledge was also observed between general informants (26.8 ± 9.8) and key informants (28.5 ± 7.1), with key informants exhibiting greater knowledge. Additionally, literate individuals (27.5 ± 4.8) were found to be more knowledgeable than illiterate ones (25.5 ± 4.4), highlighting education as an important factor influencing variations in WSWEP knowledge (Table 2).

Table 2
Statistical test of significance, t-test, on average number of reported WSWEPs among different informant groups in Gida Ayana district

Parameters	Informant groups	N	Mean ± Std. D	t-value	P-Value
Gender	Men	150	27.6 ± 4.7	8.7	0.006
	Women	21	22.5 ± 7.6		
Age	Young	74	24.8 ± 4.4	11.03	0.002
	Elder	97	28.1 ± 5.1		
Literacy level	Literate	95	27.5 ± 4.8	11.3	0.001
	Illiterate	76	25.5 ± 4.4		
Informant category	Key informants	20	28.5 ± 7.1	25.6	0.000
	General informants	151	26.8 ± 9.8		

3.3. Main Gatherers and Consumers of WSWEPs

As it was indicated in Table 3 children (47.3 ± 1.14) and women (25.7 ± 0.67) were the major gathers followed by men (14.9 ± 0.48) and all household members (12.1 ± 0.47). Thus children collect WSWEPs during cattle keeping, playing in the field and travelling and women frequently collect WESPs when they were on their way to collect firewood, when walking home from their fields to fetch water, and to go market.

The majority of respondents (44.45 ± 0.96) in the current study indicated that WSWEPs were primarily consumed by children, followed by men (23.06 ± 0.41). This trend aligns with the traditional roles of children and men, as children often tend cattle in the fields, while men engage in activities such as hunting, charcoal production, and utilizing trees for fencing and house construction, which lead to higher consumption of WSWEPs among these groups. Additionally, 14.38 ± 0.36 of respondents noted that WSWEPs were consumed by entire households, while smaller proportions identified women (11.59 ± 0.31) and elders (6.53 ± 0.25) as the primary consumers.

These findings are consistent with research in Southern Ethiopia, where children were observed to consume wild plant fruits during cattle herding and other field activities (Belayneh *et al*., 2012). Similarly, a study conducted in the Dibatie district of Ethiopia reported that wild edible plants are frequently consumed fresh and raw as complementary foods, with children and women being the primary gatherers and consumers (Megersa *et al*., 2014). The role of WSWEPs in household food security is also highlighted in a review by Addis *et al*., (2013), which underscores their importance as supplementary, seasonal, or survival food sources, particularly during periods of food scarcity.

Furthermore, studies from other regions support these observations. For instance, Ouedraogo *et al*., (2019) in Burkina Faso found that edible wild plants are an essential dietary supplement and contribute significantly to rural livelihoods. Similarly, Shackleton and Shackleton. (2004) emphasize the utility of wild foods during travel, agricultural work, and periods of food shortage.

In conclusion, the present study confirms that children and men are the predominant consumers of WSWEPs, largely due to their involvement in outdoor and labor-intensive activities. This is consistent with previous findings that highlight the integration of wild foods into daily tasks. The reliance on WSWEPs not only supports daily energy needs but also contributes to food security and nutritional diversity, making them indispensable to rural communities.

In the study area, children (47.3 ± 1.14) and women (25.7 ± 0.67) were identified as the primary gatherers of WSWEPs, followed by men (14.9 ± 0.48) and entire household members (12.1 ± 0.47). Children and women frequently collected firewood from forests and fetched water from rivers, with children spending much of their time outdoors. These activities provided them with greater opportunities to gather WSWEPs. The findings of this study differ from those of Agea *et al*., (2011), Barnett (2001), Vainio-Mattila (2000), and Gullick (1999), who observed that women were the primary collectors of WSWEPs, followed by children, in their respective communities.

Table 3
Main gatherers and consumers of WSWEPs

Variables	Informants	Frequency of Citations (%)				
		Arele Waja (± SEM)	Kersa Harbu kene(± SEM)	Sapera Meti(± SEM)	Sirba Wadesa (± SEM)	Over all mean (± SEM)
Main gatherers	Men	16.2 ± 0.37	14.4 ± 0.59	16.5 ± 0.39	12.6 ± 0.56	14.9 ± 0.48
	Women	31.6 ± 0.56	24.9 ± 0.74	23.2 ± 0.45	23 ± 0.91	25.7 ± 0.67
	Children	37.9 ± 0.81	48.5 ± 1.56	47.2 ± 0.88	55.5 ± 1.31	47.3 ± 1.14
	All house hold members	14.3 ± 0.35	12.2 ± 0.56	13.1 ± 0.47	8.9 ± 0.5	12.1 ± 0.47
Main consumer	Men	23.45 ± 0.47	23.59 ± 0.57	23.63 ± 0.23	21.56 ± 0.36	23.06 ± 0.41
	Women	11.04 ± 0.28	12.46 ± 0.44	11.05 ± 0.25	11.81 ± 0.29	11.59 ± 0.31
	Elder	6.49 ± 0.18	6.13 ± 0.29	6.63 ± 0.24	6.85 ± 0.30	6.53 ± 0.25
	Children	43.94 ± 0.89	44.91 ± 1.27	43.4 ± 0.54	45.55 ± 1.13	44.45 ± 0.96
	All house hold members	15.08 ± 0.36	12.91 ± 0.43	15.29 ± 0.28	14.23 ± 0.39	14.38 ± 0.36

3.4. Edible Parts of WSWEPs

In the study area there are diversified edible parts of WSWEPs such as fruits, root, leaves, young shoot, gum, stems, grains, and flowers nectars were used by the local people. From this study, fruits 31 citations (57.4%) and leaves 8 citations (14.8%) were highly consumable parts of WSWEPs (Fig. 4).

Fruits (57.4%) were the most frequently consumed part of WSWEPs followed by leaves 14.8% by indigenous peoples of the study area. The dominance of fruits to other plant parts could be ease of preparation and consumption pattern. Therefore, fruits were the most important edible plant parts and eaten raw while collecting fire wood and making charcoal. This finding is in line with the previous studies made in different parts of Ethiopia by Balemie and Kebebew (2006), Wondimu *et al.*,2006); Adal, (2004), and Tamene et *al.*, (2000), who reported that fruit was the most consumed parts of WESPs as food. The reason for the use of fruit plant parts as food may be due to their taste, nutritional value, ease of processing, and day-to-day requirements (Bhatia et *al.*, 2018; Balemie, Kebebew, 2006)

3.5. Growth and Habitats of plants

The finding of current revealed that shrubs were the most dominant growth forms comprising 21 (42%) species followed by tees 20 (40%), herbs constituted 9 (18%) species. The result of the study is in line with that of the study conducted by Balemie and Kebebew (2006); Teketay *et al.* (2000), who reported that WSWEPS were largely collected from shrubs followed by trees. However, the present study contradict with the study made by, Abera and Belay, (2022); Kidane and Kejela, (2021) and Wondimu *et al.,(2006*), who reported in their respective study that WSWEPS were largely collected from trees followed by shrubs. This variation may come from the differences in ecological and vegetation type of the study area.

In this study, WESPs species were collected from various habitats, most of them occur in two or more habitats including, home garden, woodland, forestland, Agricultural fields, and roadside (Fig. 5). The majority 32 (28.83%) of the WESPs were collected from wood lands followed by the forest 30(27.03%) and the rest 26(23.42%), 15(13.51%) and 8(7.21%) were collected from Agricultural fields, roadside and home garden respectively. In this study, the majority of WESPs were found out from wild vegetation. According to Balemie and Kebebew, (2006) the majority 41 (62.1%) of the wild edible plant species were collected from the wild.

3.6. Other use of WSWEPs

Table 4
Average Direct matrix ranking of twenty KI for eleven WSWEPs and seven use category in the study area based on use criteria

Wild and semi wild Edible plants species	Other use category								
	Traditional Medicine	Fodder	Bee forage	Charcoal	Household tools	Constructions	Firewood	Total	Rank
Ficus sur	0	0	1	4	5	4	3	17	3
Ziziphus mauritiana	0	0	2	4	0	0	5	11	7
Mimusops kummel	0	0	1	4	0	0	5	10	8
Ekebergia capensis	0	0	4	4	5	5	1	19	2
Cordia africana	1	0	4	3	5	5	4	22	1
Syzygium guineense	0	0	5	3	3	1	4	16	4
Phoenix reclinata	5	0	2	0	5	1	2	15	5
Budleja polystachiya	0	0	0	1	0	4	3	8	9
Landolphia budamani	0	0	2	0	0	2	0	4	10
Trichilia prieuriana	2	0	0	1	0	0	2	5	11
Vemonia amygdalina	5	3	5	0	0	0	1	14	6
Total	13	4	26	24	23	22	30		
Rank	6	7	2	3	5	4	1		
NB, 0 = no value; 1 = least used; 2 = less used; 3 = good; 4 = very good; and5 = best									

This study presented that, *Cordia africana* Lam., *Ekebergia capensis* Sparm and *Ficus sur* Forssk. were ranked 1st, 2nd and 3rd respectively, based on seven use categories and hence were the most preferred WESPs by the KI for various uses(Table 4). *Syzygium guineense* and *Phoenix reclinata* Jacq. were ranked 4th and 5th respectively. The result is in agreement with other studies by Ashagre *et al.*, (2016),who reported *C. africana* is the most commonly used plant by the local community. The results of the KIs revealed that most of the local community harvested multiuse species largely for firewood, bee forage, charcoal, constructions, household tools, traditional medicine, and fodder with the rank of 1st, 2nd, 3rd, 4th, 5th, 6th and 7th, respectively. The multiuse of the *C. africana* Lam is resulted in the high rate of loss of the plant in the area. Generally, the result of matrix ranking showed that these WESPs were at conservation risk due to overexploitation for their additional uses for different needs.

3.7. Mode of consumption

The local societies in Gida Ayana area are gifted with indigenous knowledge associated on how to use WSEPs. According to local traditions, the WSWEPs in the study area were consumed mainly in many different ways in the form raw or cooked which require different preparation processes. The result of the study revealed that most of the WESPs were consumed unprocessed 35 (71.4%) whereas 14 (28.6% species) were consumed processed (cooking and dryied and powdered and heat pass). In Gida Ayana district, about 29 (59.2%) species of these fruits were reported to be eaten raw and ripe, 9 (18.4%) were consumed dried powdered, whereas 5 (10.2% species were consumed cooked or processed and the rest 3(6.1%) were consumed raw and sucking nectar from flowers (Fig. 6). The result is in agreement with that of Anbessa *et al.*, (2024) and Kidane and Kejela, (2021), who reported that WSWEPs are consumed mainly in the form raw or unprocessed. However, contrary to Ali-shtayeh *et al.*, (2008), who reported in their study most WSWEPs were taken to home for more elaborated cooking recipes.

The high percentage of WSWEPs consumed directly without any process except few. They were consumed raw and these plants are eaten fresh, directly after they are gathered. The outside consumption of WSWEPs mostly carried out by children and cattle rearing individuals. Similarly, the outside consumption of WSWEPs has been reported in agricultural fields, during firewood collection, travelling and cattle keeping (Anbessa *et al.*, 2024; Guzo *et al.*, 2023; Ashagre *et al.*, 2016. Indigenous knowledge of wild and semi wild food utilization is not limited to only one place or country; instead it related with the traditional knowledge in various parts of the world. This indigenous knowledge passes from the parents to the young generations traditionally. For example, *Embelia schimperi Vatke, Trichilia prieuriana, Ficus sur Forssk, Mimusops kummelA.Dc, Rubus steudneri Schweinf, Cordia africana* and *Syzygium guineense (Willd.) Dc.* were consumed raw and ripe, *Ensete ventricosum (Welw.) cheesman* (Flesh raw fruits), *Justicia schimperiana (Hochst.ex Nees) T.Anders* and *Acanthus polystachius Delile* (Nectar sucked from flowers). The finding of this result is consistent with the reported result of Ali-Shtayeh *et al.* (2008) and few of them were consumed after processed for example *Guizotia scabra (Vis.) Chiov.* and *Snowdenia polystachya* were eaten after Powdered and baked to make injera and bread. Other plants, e.g., *Clutia abyssinica*, the leaves & young shoots are cut, boiled with water, decanted and then the cooked parts are fried using olive oil and finally used for consumption. Other important consumption pattern in the study area includes *Budleja polystachiya* and *Vemonia amygdalina*use as flavors, in preparation of local alcoholic drinks.

3.8. Multiuse of WSWEPS

Some plants were identified for purposes beyond their nutritional value. In the Gida Ayana district, WSWEPs serve multiple roles and are classified into seven major use categories. Various parts of these plants are utilized for activities such as firewood collection, beekeeping, charcoal production, construction,

crafting household tools, traditional medicine, and cattle fodder. However, the sustainability of these highly valued species is in question due to the increasing pressure on their consumption, compounded by the absence of effective propagation techniques in the area. This issue is exemplified by the significant decline in the population of *Cordia africana*. Overall, the use matrix ranking indicates that these wild edible plants face conservation risks due to overexploitation for their diverse applications. Local residents rely on different growth forms of these species for various needs. For instance, *Cordia africana, Ekebergia capensis, Syzygium guineense, Ficus vasta, and Ficus sur* are commonly used as materials for construction, firewood, and charcoal production.

Overharvesting of multipurpose wild and semi-wild edible plant species for uses such as construction materials, charcoal production, and firewood has significantly contributed to the depletion of these species in the area. These findings highlight the urgent need for conservation measures to protect the rapidly diminishing wild and semi-wild edible plants. Previous studies, such as those by Haile *et al*., (2007) and Lulekal *et al*., (2013), have similarly documented the utilization of multipurpose plants for non-nutritional purposes. This trend aligns with observations in other regions of Ethiopia, including the southern parts, where construction practices often demand substantial amounts of wood (Desalegn *et al*., 2003; TFAP, 1996). Several species, such as *Guizotia scabra*, *Vernonia amygdalina*, and *Syzygium guineense* (Willd.) Dc. subsp. *afromontanum*, serve as bee forages. The study identifies plant families like Myrtaceae (two species), Acanthaceae (two species), and Asteraceae (three species) as primary sources of nectar and pollen for bees in the area. Ethiopia's forests and woodlands host diverse plant species that provide essential nectar and pollen for foraging bees (Deffar, 1998). Additionally, plants such as *Snowdenia polystachya*, *Grewia ferruginea*, *Clutia abyssinica*, and *Vernonia amygdalina* are used as fodder for domestic animals.

The families Myrtaceae, Fabaceae, Rutaceae, and Meliaceae were identified as the primary sources for firewood and charcoal production in the study area. Local communities utilized various plant growth forms for these purposes. Of the 47 plant species recognized, 29 were used for fuelwood in this study were fewer than the 66 species documented by Hadera (2000). It is widely acknowledged that most rural households in Ethiopia rely on wood or agricultural residues for heating and cooking. The families Fabaceae, Myrtaceae, and Rutaceae were particularly prominent in charcoal production within the region. Species such as *Embelia schimperi, Carissa spinarum, Vernonia amygdalina, Acacia abyssinica*, and Ximenia americana were noted for their medicinal benefits for both humans and livestock. These findings align with those of Kimondo *et al*., (2015), who reported that the Fabaceae family was commonly used for traditional medicine among the Ilkisonko Maasai community in Kenya.

The study conducted by Kebu and Fassil Kebebew (2006) reported the use of wild edible plants for various purposes in addition to consumption. Moreover, some of the WSWEPs parts used as a food source were also ingested as a cure (Teklehaymanot and Giday, 2010). For example, *Ximenia Americana.* and *Grewia bicolor* were also ingested for medicinal value

3.9. Informant consensus of most popular selected WSWEPs species

Based on number of informants who mentioned the plant for food purposes at different localities, the following were the most utilized plants *Syzygium guineense, Rubus steudneri Schweinf, Carissa spinarum L, Phoenix reclinata, Mimusops kummel A.Dc, Cardia africana, Ficus sur Forssk, Ziziphus mauritiana, Vangueria apiculate, Ficus vasta Forssk and Dovyallis verrucosa* were ranked first, second, third, fourth, fifth, sixth, seventh, eighth, ninth, tenth, eleventh and twelfth respectively. From this study Syzygium guineense was the most preferred edible plants followed *by Rubus steudneri Schweinf and Carissa spinarum* L cited by most of respondents in the study area.

Based on the informant consensus approach, species preference ranking of WSWEPs were carried out to discovery the relative importance of plants to the local community (Table 5). The most preferred species were *Syzygium guineense, Rubus steudneri*, *Carissa spinarum, Phoenix reclinata, Mimusops kummel, Cordia africana, Ficus sur, Ziziphus mauritiana, Vangueria apiculate, Ficus sycomorus, Ficus vasta and Dovyallis verrucosa* were ranked 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th and 12th respectively. The species preference is almost similar throughout the study sites and there is no significant difference among the four study sites. This may be due to resemblance in ethnic composition and sharing of the same culture of wild and semi wild edible plants utilization as well living the same district. *Syzygium guineense* was the most preferred edible plants followed by *Rubus steudneri* and *Carissa spin arum* cited by most of respondents in all study sites.

Table 5
Preference ranking on twelve most popular selected WSWEP species based their taste and repeated consumption by respondents of the study area

WSWEP species	Key informants																				Total
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	
Ficus sur	4	3	3	2	4	1	1	5	2	1	3	4	5	2	1	3	4	2	1	1	52
Mimusops kummel	3	2	2	1	2	4	2	4	5	3	2	4	3	2	2	1	2	5	4	2	55
Ficus sycomorus	2	3	4	2	2	1	1	2	3	3	2	1	1	2	1	2	3	2	5	2	44
Carissa spinarum	5	5	5	4	3	2	4	5	2	1	1	5	3	2	1	4	4	3	2	3	64
Ziziphus mauritiana	3	3	2	4	2	2	3	1	3	1	2	2	3	3	4	5	1	2	2	1	49
Syzygium guineense	5	4	5	4	3	4	5	4	5	3	4	5	3	2	1	4	5	5	2	3	76
Rubus steudneri	2	4	5	3	5	4	5	1	2	3	4	5	4	4	2	1	4	5	2	1	66
Phoenix reclinata	3	4	5	2	5	3	4	1	2	3	3	4	3	3	2	1	1	3	2	4	58
Dovyallis verrucosa	2	2	3	2	1	1	4	2	2	1	1	2	5	2	1	2	2	1	2	1	39
Vangueria apiculate	2	1	2	3	3	1	2	1	2	5	3	2	3	2	4	2	1	1	2	1	43
Cordia africana	1	2	2	3	1	3	2	3	2	5	3	1	3	2	5	2	3	3	2	5	53
Ficus vasta	2	2	2	1	1	2	3	4	2	1	2	2	1	2	2	5	1	2	2	1	40

(1 = least, 2 = less, 3 = good, 4 = very good and 5 = excellent).

3.10. Threats to WSWEPs

Pair wise ranking of six factors (agricultural expansion, charcoal making, fire hazards, over grazing and fire wood collection) were conducted to investigate the local community perception on the factors threatening WSWEPs species in the study area (Table 6). The result indicated that construction & tools and over grazing was positioned at third and fourth stage followed by agricultural activities and charcoal making were ranked as first and second, while fire wood collection and fire hazardous which were ranked as fifth and sixth respectively.

The findings indicated that several factors posed significant threats to WSWEPs in the Gida Ayana district. Key drivers of plant loss included agricultural expansion, charcoal production, construction activities, overgrazing, firewood collection, and fire hazards. Similarly, previous studies have identified agricultural expansion, overgrazing, and deforestation as major threats to WSWEPs (Kelbessa *et al.*, 1992; Addis, 2009; Asfaw, 2009). These human-induced pressures have led to the loss of thousands of hectares of forest land, which serve as habitats for valuable WSWEPs. This destruction has also been reported to reduce the benefits derived from these plants and erode indigenous knowledge associated with their use.

The preservation of knowledge regarding the use of WSWEPs has been challenged by shifts in the dietary habits of the population (Teklehaymanot and Giday, 2010).This study is in agreement with Assefa and Tesfaye, (2011); Lulekal *et al.*, (2011); Balemie and Kebebew, (2006), who reported the agricultural expansions, overgrazing, deforestation and fuel wood collection as the major threats of WESPs in their respective studies, causing the reduction of WESPs throughout the country. Therefore, the awareness of the local community plays a great role to proceeds these crucial wild edible plants and their indigenous knowledge for the future generations.

Table 6
Views of informants' respondents on paired comparison of factors affecting wild and semi wild edible plants in the study area

Preferred item	No	%	Rank
Charcoal making	40	23.4	2
Construction and tools	25	14.6	3
Fire wood collection	18	10.5	5
Overgrazing	20	11.7	4
Fire hazards	12	7.0	6
Agricultural expansion	56	32.8	1
Total	171	100	

Based on the degree of threat, ranking of 9 different wild and semi wild edible plants that were recorded for scarcity, was conducted after selecting 20 key informants in the study area. The results showed that *Cordia africana Lam* got the highest score indicating that it was the most threatened plants followed by *Ekebergia capensis* and *Ficus sur* On the other hand *Trichilia prieuriana* scored the least indicating that it was less threatened when compared to the other species (Table 7).

Table 7
Preference ranking of threatened WSWEPs based on use criteria

List of Edible plants	Key Informants labeled R1 to R20																				
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	Total
Vemonia amygdalina	5	9	5	7	1	1	4	1	7	2	9	3	7	1	9	7	6	1	9	2	96
Trichilia prieuriana	1	5	6	1	4	2	3	9	9	1	4	2	6	3	5	9	1	3	7	3	84
Syzygium guineense	2	1	9	9	8	3	5	2	1	5	8	6	8	5	3	3	9	9	8	1	105
Phoenix reclinata	3	8	7	6	3	4	9	7	5	6	1	7	1	9	2	6	7	2	1	5	99
Ficus sur	6	4	1	2	7	6	8	3	6	7	5	8	7	4	6	4	3	6	6	8	107
Cordia africana	8	6	3	3	9	8	7	4	3	8	7	4	3	7	8	1	4	7	5	7	112
Mimusops kummel	4	3	2	8	5	5	6	6	4	4	2	9	2	8	1	5	5	4	3	4	90
Ekebergia capensis	9	7	4	4	6	9	1	5	2	9	6	5	5	6	7	2	2	8	4	9	110
Ziziphus mauritiana	7	2	8	5	2	7	2	8	8	3	3	1	4	2	4	8	8	5	2	6	95

Scores in the table indicate ranks given to factors considered threats to WSWEPs based on their local perceptions. The highest number (9) is given for the most threatened WSWEPs and the lowest number (1) for the least threatened of WSWEPs.

3.11. Conservation strategies of WSWEPs

Several species would be further endangered and threatened with extinction, if they are left on their own without measures for conservation, cultivation and promotion. Informants reported, positive human intervention is needed in order to control the threat to the biological diversity of the WSWEPs, improve food delivery and maintain environmental integrity. Hence, strategies should be designed to protect and domesticate these plants for future uses. Therefore, the local people identified some conservation strategies of wild and semi wild edible plants in the natural forest and near the home garden. During the study, informants identified five major methods of conservation of wild and semi wild edible plants in the study area.

Subsequently the local people of Gida Ayana district in the study area have close link to their natural environment, they were identified some strategies of conservation on WSWEPs. Therefore, during the study, informants identified five major methods of conservation of wild and semi wild edible plants by priority position in the study area. According to informants response, the most cited conservation to wild and semi wild edible plants in the study area were decrease deforestation (44.7 ± 4.7), Protect vegetation (26.8 ± 5.1), individual protected area (11.3 ± 1.8), bordering the farm land from the forest (9.2 ± 1.9) and living fences (8.0 ± 2.1), and thus these methods conserve threatened WSWEPs in the study area. The result of this study revealed that all the five conservation methods of WSWEPs had significant variation at ($P < 0.005$) (Table 8).

Most of the informants' reported that conservation to WSWEPs in the study area were decrease deforestation, protect vegetation, individual protected area, bordering the farm land from the forest and living fences. Similarly, Hunde *et al.*, (2012), reported the conservation of WSWEPs in agro-forestry and living

fences. This indicates the presence of similarity in the indigenous knowledge of the local people to conserve the WSWEPs in different parts of the country. Resource management through indigenous laws was probably more maintainable than a top down forced system of controlling overharvesting (Balemi*e et al.* 2004, Maundu *et al.* 1999).

The controlling of illegal gathering and overexploitation of natural resources will be essential to safeguard and sustainable use the resources. An organized effort is needed for long-term management of WSWEP species by all sectors to develop and implement in-situ conservation, domestication and other conservation and management strategies (Aryal *et al.*, 2009; Rijal, 2011; Modi *et al.*, 2006, Sundriyal & Sundryal, 2003). Furthermore, the promotion of WSWEPs by large-scale cultivation and integrating them into agricultural systems and making markets profitable for the benefit of the people is needed (Konsam *et al.*, 2016). The participation of local community is important in conservation and management, as they are both the protectors and users of the resources as well as they have the utmost knowledge about the natural resources.

Table 8
Strategies for conservation of threatened WSWEPS in the study area

Methods	*Kebeles*								*Total*		*Statistics*	
	AreleWaja		*Kersa Harbu kene*		*Sapera meti*		*Sirba Wadesa*					
	No	*%*	*No*	*%*	*No*	*%*	*No*	*%*	*No*	*%*	*Mean ± SEM*	*Sig.*
Individual protected area	*4*	*12.1*	*7*	*14.6*	*2*	*6.1*	*7*	*12.3*	*20*	*11.3*	*11.3 ± 1.8*	*0.008*
Decrease deforestation	*19*	*57.6*	*17*	*35.4*	*15*	*45.4*	*23*	*40.4*	*74*	*44.7*	*44.7 ± 4.7*	*0.003*
Protect vegetation	*5*	*15.1*	*11*	*22.9*	*13*	*39.4*	*17*	*29.8*	*46*	*26.8*	*26.8 ± 5.1*	*0.014*
Living Fences	*2*	*6.1*	*6*	*12.5*	*1*	*3.0*	*6*	*10.5*	*15*	*8.0*	*8.0 ± 2.1*	*0.033*
bordering the farm land from the forest	*3*	*9.1*	*7*	*14.6*	*2*	*6.1*	*4*	*7.0*	*16*	*9.2*	*9.2 ± 1.9*	*0.017*
Total	*33*	*100*	*48*	*100*	*33*	*100*	*57*	*100*	*171*	*100*		

4. Conclusion and Recommendations

In the study area a total of 47 WSWEPs species were documented and identified, indicating the presence of significant diversity of WSWEPs. The most commonly consumed WSWEPs were *Syzygium guineense, Rubus steudneri, Carissa spinarum*, and *Phoenix reclinata.* From this study it was possible to conclude that *Syzygium guineense* was the most favored edible plant species followed by *Rubus steudneri* in Gida Ayana. Moraceae and Asteraceae were the plant families with more number of species per family in the study area. The senior members have HHs had more knowledge of WSWEPs than younger people in relation, implying that traditional knowledge is directly proportional to the age of the respondents in. Regardless of their age, men knew more number of WSWEPs than women. The key informants and literate were respectively higher to the general informants and illiterate in having local knowledge of WSWEPs. The main gathers and consumers of WSWEPs were Children and women followed by men and all household members.

The most predominantly consumed plant parts in the study area were fruits, leaves and shoots and these were consumed directly without any process except few. The consumption of wild edible plants mostly carried out by children who were participating cattle and sheep keeping. WSWEPs in the study area were used for various purposes in addition to the use for consumption. These includes the use for fire wood, bee forage, charcoal production, construction, house hold tools, Traditional medicine and food for cattle. However, these multipurpose use of wild edible plants leads to the depletion and extinction of WSWEPs in the area. Additionally, threats such as agricultural expansion, charcoal making, construction and tools, over grazing, fire wood collection, and fire hazardous also affect the WSWEPs in the area. Therefore, it is better to educate and create awareness to the local communities toward the conservation of these WSWEPs for sustainable use in the future.

In the study area, WSWEPs serve as vital resources, consumed both during periods of food scarcity and as supplementary foods alongside cultivated crops. Local communities possess indigenous knowledge regarding the utilization of these plants. To ensure their sustainable use in the future, it is crucial to adopt mindful harvesting practices and implement effective conservation and management strategies. Given their significance, further research is necessary to modernize records and enhance information on their availability and utilization.

The present finding reported various threats of WSEPs. Thus, the local community should develop conservation strategies to decrease deforestation activity. In addition, the practical domestication of WSWEPs required from the local community for sustainable use in the area. This is very important specially to arrive some WSWEPs which were found under threatened condition before the occurrence of extinction.

Declarations

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Author Contribution Statement

T.R. Contributed to the conceptualization and design of the study, data collection, and drafting of the manuscript, B.Y, played a key role in the data analysis, interpretation of results, and critical revision of the manuscript for important intellectual content, S.M, provided substantial contributions to the methodology,

validation of findings, and final approval of the manuscript version submitted.

Conflict of interest

The authors declare no conflict of interest related to this papers.

Consent for publication

The authors have agreed to submit and approved the manuscript for submission.

Data Availability Statement

All data generated or analyzed during this study are included in this published article.

Plant collection and Identification

The plants used in this study were collected from Sibusire district during guided field walk with the informants. Plants identification by using taxonomic keys following the Published Flora of Ethiopia and Eritrea by Dr. Tena Regasa (Ethnobotanist) and voucher specimens were deposited in Wollega University Herbarium the after.

Ethics approval and consent to participate

Permission to collect data was obtained from Ambo University Institutional Research Ethical Committee (AUIREC) through a written letter with reference number AUIREC /007/13/2021 and. Informants had agreed and signed the informed consent before starting the survey and the interview.

References

1. Abera, M., & Belay, K. (2022). Ethnobotanical study of wild edible plants and their indigenous knowledge in Sedie Muja District, South Gondar Zone, Northwestern Ethiopia. American Journal of Plant Sciences, 13(2), 241-264.
2. Adal, F. (2004). Traditional use, management and conservation of useful plants on dryland parts of North Shoa Zone of the Amlmra Region: An ethnobotanical approach (Doctoral dissertation, MSc Thesis, Addis Ababa University, Addis Ababa).
3. Addis, G, Asfaw, Z. and Woldu, Z. (2013). Ethnobotany of Wild and Semi-Wild EdiblePlants of Konso Ethnic Community, South Ethiopia,Ethnobotany Research & Applications, 11: 121-141.
4. Addis, G. (2009). Edible wild and semi-wild plants of Hamar and Xonso (South Ethiopia) with emphasis on their ethnobotany and nutritional composition of selected species. Addis Ababa: Addis Ababa University.
5. Addis, G., K. Urga & D. Dikasso (2005). Ethnobotanical study of edible wild plants in some selected districts of Ethiopia. Journal of Human Ecology 33(1):83-118.
6. Agea, J.G., Okia, C.A., Abohassan, R.A.A., Kimondo, J.M., Obua, J., Hall, J. and Zewge Teklehymanot (2011). Wild and Semi-Wild Food Plants of Bunyoro-Kintara Kingdom of Uganda: Growth Forms, Collection Niches, Parts Consumed, Consumption Patterns, Main Gatherers and Consumers. Environmental Research Journal 5:74-86.
7. Alexiades, M. (1996). Collecting ethnobotanical data. An introduction to basic concepts and techniques. In: (Alexiades, M. and Sheldon, J.W. eds.). Selected Guideline for ethnobotanical research: A Field Manual, Pp.58-94. The New York. Botanic Garden, U.S.A
8. Ali-Shtayeh, M.S., Jamous, R.M., Al-Shafiel, J.H., Elgharabah, W.A., Kherfan, F.A., Qarariah, K H. (2008). Traditional knowledge of wild edible plants used inPalestine (Northern West Bank): A comparative study. Journal of Ethnobiology and Ethno medicine 4:13.
9. Amente, D. A. (2017). Ethnobotanical survey of wild edible plants and their contribution for food security used by Gumuz people in Kamash District; Benishangul Gumuz Regional State; Ethiopia. Journal of Food and Nutrition Sciences, 12(1), 217-224.
10. Anbessa, B., Lulekal, E., Getachew, P., & Hymete, A. (2024). Ethnobotanical study of wild edible plants in Dibatie district, Metekel zone, Benishangul Gumuz Regional State, western Ethiopia. Journal of Ethnobiology and Ethnomedicine, 20(1), 27.
11. Aragaw, H. S., Nohr, D., & Callo-Concha, D. (2021). Nutritional potential of underutilized edible plant species in coffee agroforestry systems of Yayu, southwestern Ethiopia. Agroforestry Systems, 95(6), 1047-1059.
12. Aryal, S.P. (2009). Ethnobotany of Tharu: Incorporation of Culture and Biodiversity Conservation: A case Study of Jayanagar Kapilvastu District. M.Sc. Thesis,Tribhuvan University, Kathmandu.
13. Asfaw, A., Lulekal, E., Bekele, T., Debella, A., Tessema, S., Meresa, A., & Debebe, E. (2023). Ethnobotanical study of wild edible plants and implications for food security. Trees, Forests and People, 14, 100453.
14. Ashagre, M., Asfaw, Z., & Kelbessa, E. (2016). Ethnobotanical study of wild edible plants in Burji District, Segan area zone of southern nations, nationalities and peoples region (SNNPR), Ethiopia. Journal of ethnobiology and ethnomedicine, 12, 1-15.
15. Assefa, A., & Abebe, T. (2011). Wild edible trees and shrubs in the semi-arid lowlands of southern Ethiopia. J Sci Dev, 1(1), 5-19.
16. Balemie, K., & Kebebew, F. (2006). Ethnobotanical study of wild edible plants in Derashe and Kucha Districts, South Ethiopia. Journal of Ethnobiology and Ethnomedicine, 2, 1-9.
17. Barnett, A. (2001). Northern Ethiopia: what's on the menu?. Nutrition & Food Science, 31(1), 35-49.

18. Barreau, A., Ibarra, J. T., Wyndham, F. S., Rojas, A., & Kozak, R. A. (2016). How can we teach our children if we cannot access the forest? Generational change in Mapuche knowledge of wild edible plants in Andean temperate ecosystems of Chile. Journal of Ethnobiology, 36(2), 412-432.
19. Belayneh, A., Sebsebe, D., & Zerihun, W. (2012). Ethnobotanical study of wild edible plants in Southern Ethiopia. Journal of Ethnobiology and Ethnomedicine, 8(31), 1-10.
20. Belemie K, Kelbessa E, Asfaw Z:(2004). Indigenous medicinal utilization, management and threats in Fentale area, Eastern Shewa, Ethiopia. Ethiopian Journal of Biological Sciences, 3:1–7.
21. Bhatia, H., Sharma, Y. P., Manhas, R. K., & Kumar, K. (2018). Traditionally used wild edible plants of district Udhampur, J&K, India. Journal of ethnobiology and ethnomedicine, 14, 1-13.
22. Biri, S., Ayenew, B., Dida, G., Sebsibe, A., Gurmessa, F., Woldeab, B., ... & Megersa, M. (2024). Ethnobotanical study of wild edible plants in Arsi Robe district of East Arsi Zone, Ethiopia. Journal of Ethnobiology and Ethnomedicine, 20(1), 70.
23. Carvalho, A.M., and Barata, A.M. (2016). The consumption of wild edible plants. Wild Plants, Mushrooms and Nuts: Functional Food Properties and Applications, 159–198.
24. Cotton, C. M. (1996). Ethnobotany: principles and applications (pp. ix+-424).
25. Deffar, G.. (1998). Non-Wood Forest Products in Ethiopia. EC-FAO Partnership Programme (1990- 2000). Addis Ababa. Pp 1-5
26. Desalegn, G., Tadesse, W., Fekadu, W., Kaba, G., Teketay, D., & Taye, G. (2003). Effectiveness of protection measures on 32 timber species against subterranean termites and fungi at Zeway research station, Central Ethiopia. Ethiop. J. Biol. Sci, 2(2), 189-216.
27. Giday, M., & Teklehaymanot, T. (2023). Use of wild edible and nutraceutical plants in Raya-Azebo District of Tigray Region, northern Ethiopia. Tropical Medicine and Health, 51(1), 58.
28. Gullick, C. (1999). Wild foods-blessing or burden? Field exchange, Issue No. 6, 16Pp.
29. Guzo, S., Lulekal, E., & Nemomissa, S. (2023). Ethnobotanical study of underutilized wild edible plants and threats to their long-term existence in Midakegn District, West Shewa Zone, Central Ethiopia. Journal of Ethnobiology and Ethnomedicine, 19(1), 30.
30. Hadera, G. (2000). A study on the ecology and management of the Dessa forest in the northeastern escarpment of Ethiopia. Unpublished MSc Thesis Addis Ababa University.
31. Haile, Y. Ensermu, K., Tamrat, B., & Ermias, L. (2008). Plants used in traditional management of human ailments at Bale Mountains National Park, Southeastern Ethiopia.
32. Hankiso, M., Warkineh, B., Asfaw, Z., & Debella, A. (2023). Ethnobotany of wild edible plants in Soro District of Hadiya Zone, southern Ethiopia. Journal of Ethnobiology and Ethnomedicine, 19(1), 21.
33. Hunde. D, J.T. Njoka, Asfaw. Z, and Nyangito, M.M. (2012). Comparative Analysis of Indigenous Knowledge on Use and Management of Wild Edible Plants: The case of Central East Shewa of Ethiopia, Ethnobotany Research & Applications, 10: 287-304.
34. Ju, Y., Zhuo, J., Liu, B. and Long, C. (2013). Eating from the wild: diversity of wild edible plants used by Tibetans in Shangri-la region,Yunnan, China. Journal of Ethnobiology and Ethnomedicine 9:28.
35. Kidane, L., & Kejela, A. (2021). Food security and environment conservation through sustainable use of wild and semi-wild edible plants: a case study in Berek Natural Forest, Oromia special zone, Ethiopia. Agriculture & Food Security, 10(1), 29.
36. Kimondo, J., Miaron, J., Mutai, P., & Njogu, P. (2015). Ethnobotanical survey of food and medicinal plants of the Ilkisonko Maasai community in Kenya. Journal of Ethnopharmacology, 175, 463-469.
37. Konsam S, Thongam B, Handique AK. (2016), Assessment of wild leafy vegetables traditionally consumed by the ethnic communities of Manipur, northeast India. J Ethnobiol Ethnomed. 12:9.
38. Kothari, C. R. (2004). Research methodology: Methods and techniques. New Age International.
39. Ladio A, Lazada M. (2004). Patterns of use and knowledge of wild edible plants in district ecological environments; Acase study of a Mapuche community from northwestern Patagonia. Biodiversity Conserv. 13:1153–73.
40. Lentini, F. and Venza, F. (2007). Wild food plants of popular use in Sicily. of Ethnobiology and Ethno medicine 3:15.
41. Lulekal, E., Asfaw, Z., Kelbessa, E., & Van Damme, P. (2011). Wild edible plants in Ethiopia: a review on their potential to combat food insecurity. Afrika focus, 24(2), 71-122.
42. Lulekal, E., Asfaw, Z., Kelbessa, E., & Van Damme, P. (2013). Ethnomedicinal study of plants used for human ailments in Ankober District, North Shewa Zone, Amhara region, Ethiopia. Journal of ethnobiology and ethnomedicine, 9, 1-13.
43. Martin, G. J. (1995). Ethnobotany: A method Manual. A 'People and Plants' Conservation Manual. Champman and Hall, London, pp. 268.
44. Maundu, P.M., G.W. Ngugi & C.H.S. Kabuye. (1999): Traditional Food Plants of Kenya. National Museums of Kenya Press, Nairobi.
45. Megersa, B., Ensermu, K., & Zemede, A. (2014). Ethnobotanical study of wild edible plants in the Dibatie district, Ethiopia. Journal of Ethnobiology and Ethnomedicine, 10(12), 1-14.
46. Modi M, Modi AT, Hendriks S. (2006). Potential role for wild vegetables in household food security: a preliminary case study in Kwazulu-Natal, South Africa. Afr J Food Agric Nutr;6(1):1–13.
47. Nedelcheva, A. (2013). An ethnobotanical study of wild edible plants in Bulgaria. EurAsian JournPal of BioSciences 7: 77- 94.
48. Ojelel, S., Mucunguzi, P., Katuura, E., Kakudidi, E. K., Namaganda, M., & Kalema, J. (2019). Wild edible plants used by communities in and around selected forest reserves of Teso-Karamoja region, Uganda. Journal of ethnobiology and ethnomedicine, 15, 1-14.

49. Ouedraogo, M., Tenkouano, A., & Akinola, R. (2019). The role of wild edible plants in food security: A case study from Burkina Faso. Journal of Economic Botany, 73(3), 198-209.
50. Pegu, R., Gogoi, J., Tamuli, A.K. and Teron, R. (2013). Ethnobotanical study of Wild Edible Plants in Poba Reserved Forest, Assam, India: Multiple Functions and Implications for Conservation. Research Journal of Agriculture and Forestry Sci.1:1-10.
51. Redzic, S.J. (2006). Wild edible plants and their traditional use in human nutrition in Bisnia- Herzegivina. Ecology of Food and Nutrition 45: 189–232.
52. Regassa T, Kelbessa E and Asfaw Z. Sci. Technol. Arts Res. J. (2014). Ethnobotany of Wild and Semi- Wild Edible Plants of Chelia District, West-Central Ethiopia, 3(4): 122-134
53. Rijal A. (2011). Surviving knowledge: Ethbot Res Appl. ethnobotany of Chepang community from mid-hills of Nepal. 9:181–215.
54. Shackleton, C. M., & Shackleton, S. E. (2004). The importance of non-timber forest products in rural livelihood security and as safety nets: A review of evidence from South Africa. South African Journal of Science, 100(11-12), 658-664.
55. Singh, A., Dubey, R. K., Bundela, A. K., & Abhilash, P. C. (2020). The trilogy of wild crops, traditional agronomic practices, and UN-sustainable development goals. Agronomy, 10(5), 648.
56. Sundriyal, M., Sundriyal, R.C., and Sharma, E. (2003). "Dietary Use of Wild Plants Resources in the Sikkim Himalaya, India." Economic Botany.
57. Tahir, M., Abrahim, A., Beyene, T., Dinsa, G., Guluma, T., Alemneh, Y., ... & Mohammed, A. (2023). The traditional use of wild edible plants in pastoral and agro-pastoral communities of Mieso District, eastern Ethiopia. Tropical Medicine and Health, 51(1), 10.
58. Tamene, B., Bekele, T., & Kelbessa, E. (2000). An Ethnobotanical study of the Semi-wetland Vegetation of Cheffa. Addis Ababa University, Department of Biology.
59. Tebkew, M., Gebremariam, Y., Mucheye, T., Alemu, A., Abich, A., & Fikir, D. (2018). Uses of wild edible plants in Quara district, northwest Ethiopia: implication for forest management. *Agriculture & Food Security*, *7*(1), 1-14.
60. Teketay,D. Bekele, T. and Hasse, G. (2000). Forests and Forest genetic resources ofEthiopia, pp 2-3.
61. Teklehaymanot, T., & Giday, M. (2010). Ethnobotanical study of wild edible plants of Kara and Kwego semi-pastoralist people in Lower Omo River Valley, Debub Omo Zone, SNNPR, Ethiopia. Journal of ethnobiology and ethnomedicine, 6, 1-8.
62. TFAP (1996). Tigray Forestry Action Program, main report, vol. I. Bureau of Agricultural and Natural Resources Development, Mekelle, Tigray, Ethiopia.
63. Uprety, Y., R.C. Poudel, K.K. Shrestha, S. Rajbhandary, N.N. Tiwari, U.B. Shrestha and H.Asselin, (2012). Diversity of use and local knowledge of wild edible plant resources inNepal, Journal of Ethnobiology and Ethno medicine, 8: 16.
64. Vainio-Mattila, K. (2000). Wild vegetables used b the Sambaa in the Usambara Mountains, NE Tanzania. Annales Botanici Fennici 37:57-67.
65. Wondimu, T., Asfaw, Z., & Kelbessa, E. (2006). Ethnobotanical study of food plants around'Dheeraa'town, Arsi, Ethiopia. SINET: Ethiopian Journal of Science, 29(1), 71-80.

Figures

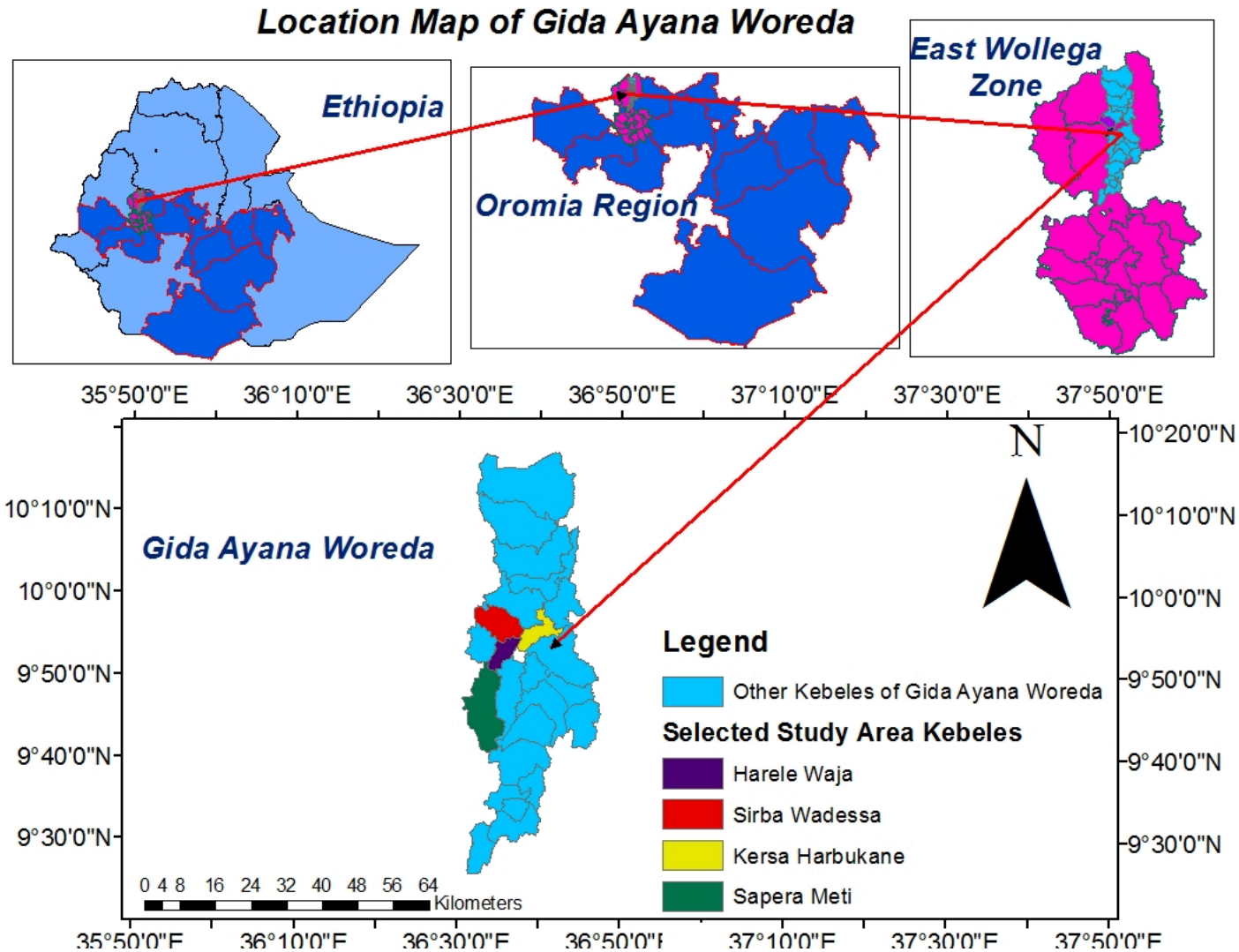

Figure 1

Map of Ethiopia, Oromia, East wollega zone and the study Area

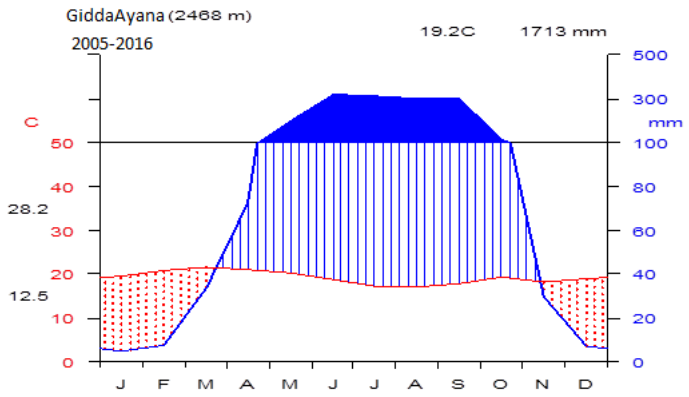

Figure 2

Climate diagram of Gida Ayana meteorological center(2005-2016)

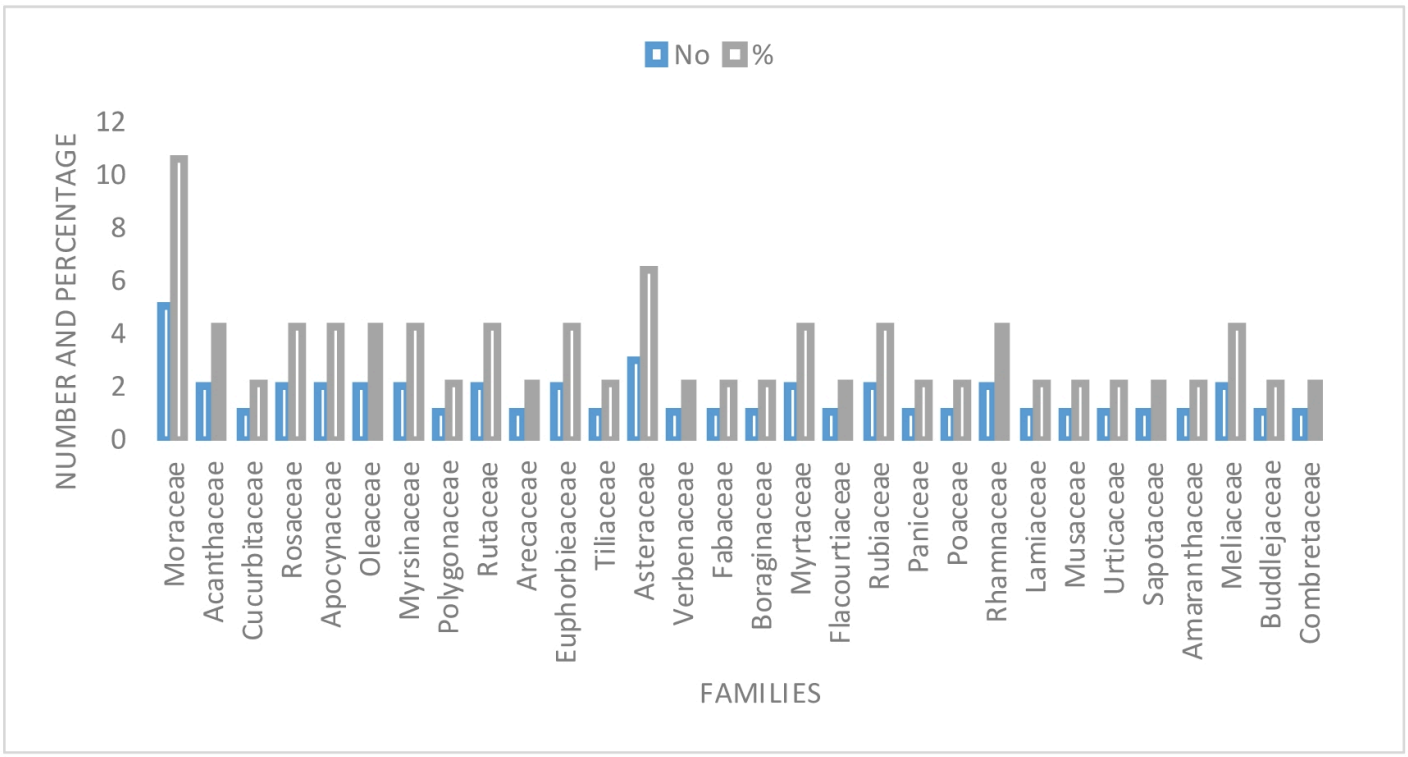

Figure 3

Diversity of families of WSWEPs of Gida Ayana district

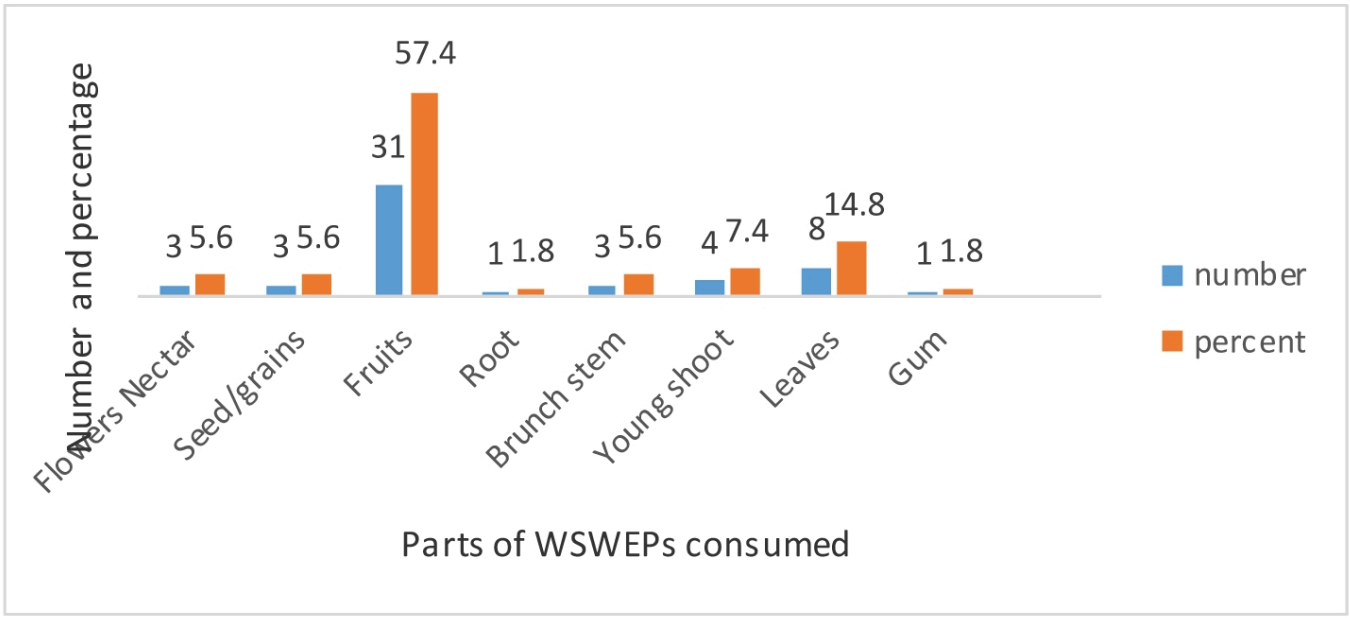

Figure 4

Parts of WSWEPs commonly consumed

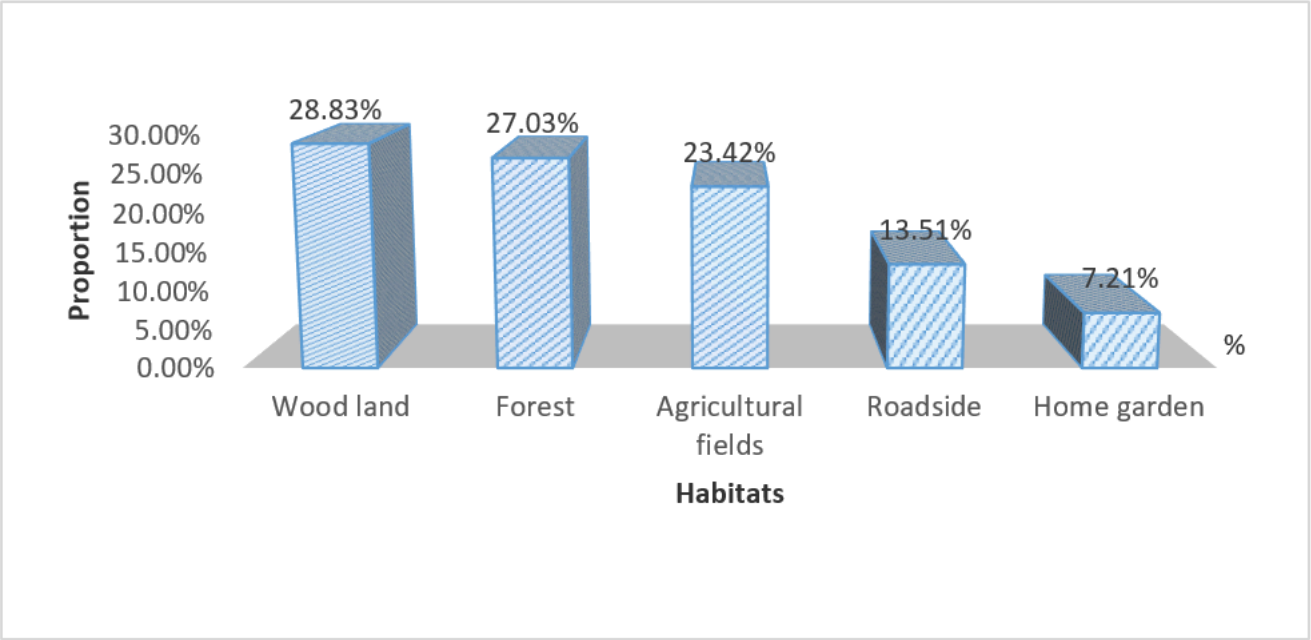

Figure 5

Habitats of WSWEPs

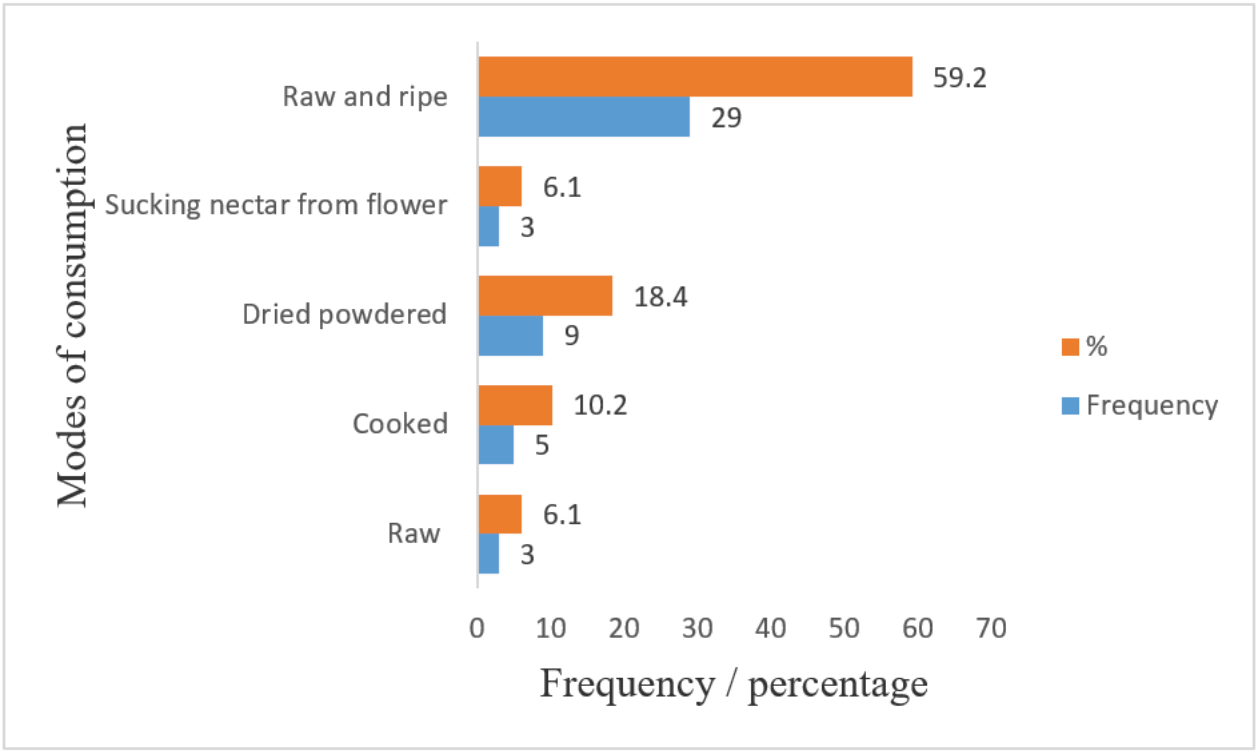

Figure 6

Modes of **consumption of WSWEPs**