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Ethnobotanical Study of Wild Edible Plants in Liben and Wadera Districts of Guji Zone, Southern Ethiopia

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ABSTRACT: *The present study was conducted to identify and document WEPs of the study area and the associated ethnobotanical knowledge of local communities of Liben and Wadera Districts of Guji Zone, in Southern Ethiopia. Ethnobotanical data were collected using key informant interview, focus group discussions, semi-structured interviews, guided field observations and local market surveys. A total of 60 respondents were selected for semi-structured interviews by means of simple random sampling methods. A total of 54 wild edible plant species belonging to 45 genera and 32 families were identified and documented. The growth habits of the identified WEPs of the study area were trees (57.4%), shrubs (29.6%), herbaceous (9.3%) and climbers (3.7%). The frequently WEPs parts used of the study Districts were found to be fruits (87%), tubers (9%), roots (2%) and root barks (2%) respectively. In terms of indigenous knowledge on WEPs with respect to the age of the respondents, the older have high indigenous knowledge on the WEPs names, uses and plant parts used but the youngest have very little indigenous knowledge on WEPs. Based on the findings of this study, the species preference is difference among the two study Districts. Therefore, Syzygium guineense, Pappea capensis, Carissa spinarum, Cordia africana and Rytigynia neglecta were the preferred WEPs of Wadera District. While, Mimusops kummel, Carissa spinarum, Rhus natalensis, Pappea capensis and Grewia bicolor were the preferred WEPs of the Liben District. WEPs of the study Districts are mainly harvested and consumed during dry season, wet season and year round and the most frequent gatherers are children and youngsters. Based on the market surveys conducted in the two study Districts, fruits of four WEPs such as Mimusops kummel, Syzygium guineense, Ficus sur and Flacourtia indica were reported to be sold and can provide additional income to the local communities. The present study found that WEPs in the study area were threatened by anthropogenic factors including expansions of agricultural land, fuel wood collection, un controlled fire setting, timber production, cutting for construction and over grazing. Therefore, along with sustainable utilization and conservation of the existing WEPs of the study area, priority should be given on urgent collection, domestication and cultivation of the most threatened WEPs such as Cordia africana, Mimusops kummel, Syzygium guineense, Carissa spinarum and Pappea capensis.*

KEYWORDS: marketability, preference, threat factors and wild edible plants

INTRODUCTION

Wild edible plants (WEPs) are usually considered to constitute all plant resources that are neither cultivated nor domesticated, but used as nutritional supplements by the local people (Lulekal et

al., 2011; Sogbohossou et al., 2015).Wild Edible plants (WEPs) also play a critical role in ensuring food and livelihood security for countless families and communities around the world (Bell 1995; Neudeck et al., 2012). Moreover, commercialization of fruits of wild edible plants is increasing because of increased demand for fruit in urban centers and as a result of limited alternative economic options for the rural people (Mithofer and Waibel, 2003). Thus, rural communities are dependent on Wild edible plants (WEPs) to meet their nutritional needs and income generation (FAO, 2004).

Wild edible plants(WEPs) play important roles in African countries, such as Ethiopia that are known for the diversity of their flora and fauna, and communities in such countries depend on these resources for various services and products (Getahun 1974). Consumption of Wild edible plants (WEPs) enables people to cope better with erratic weather, untimely rains and seasonal droughts (Mathys, 2000). In Ethiopia, consumption of Wild edible plants (WEPs) is an important local survival strategy, made necessary by climatic fluctuations which hamper agricultural efforts (Gemedo-Dalle et al., 2005). Moreover, in Ethiopia wild edible plants (WEPs) are consumed at time of starvation (Getnet Chekole, 2011).

Ethnobotanical studies have provided basic information on wild edible plants (WEPs), diversity of use and knowledge patterns in different parts of the world. However, academic knowledge is limited with regard to factors shaping the distribution and reproduction of knowledge of WEPs at the global level, which vary according to the specific ecological, cultural, historical and socio-economic context (Antweiler, 1998).

In Ethiopia, research findings conducted on Ethnobotanical study of WEPs indicated that the indigenous knowledge, practice, and skill associated with wild edible plants are highly developed, but it is poorly investigated and documented. This indigenous knowledge, practice and skill is gradually being eroded and lost due to urbanization, industrialization as well as mobility of youth from rural settings(Getahun,1974).

The rapid decline of traditional knowledge about wild edible plants(WEPs) is due to: the appearance of industrial agriculture and modern food industry, associated with shifts in dietary, habits and preference of food, negative perceptions of WEPs, time of consumption associated with WEPs collection, and lack of interest among young generations (Ladio, 2001). Moreover, since traditional knowledge on WEPs is being eroded through acculturation and the loss of plant biodiversity along with indigenous people and their cultural background, promoting research on wild food plants is crucial in order to safeguard this information for future (Lulekal et al., 2011).Therefore, to preserve this knowledge, which is potentially highly valuable for future generations, it needs to be recorded scientifically (Tigist et al., 2006; Demel et al., 2010).

In Liben and Wadera Districts of Guji Zone, in Southern Ethiopia, rural communities of the study Districts are depended on their indigenous knowledge for the management and utilization of wild

edible plants in their surrounds and the study Districts are known by high plant biodiversity as well as cultural diversity of using WEPs.

However, despite the wide availability and utilization of wild edible plants (WEPs) there is no documented study on the Ethnobotany of Wild Edible plants and the associated knowledge so far conducted in the study Districts. Furthermore, site specific identification and local communities' preferences of WEPs, investigation of potential and major threats of WEPs of the study Districts are not yet identified for future conservation and sustainable utilization of WEPs of the area.
Therefore, this study was conducted with the objective of identifying and documenting of wild edible plants (WEPs) of the study area and the associated Ethnobtanical knowledge of local communities of Liben and Wadera Districts of Guji Zone, in Southern Ethiopia.

MATERIALS AND METHODS

Description of the study area

The study was conducted at two selected Districts of Guji Zone, Oromia Regional State, in Southern Ethiopia (Figure 1). Specifically, it was conducted in Wadera and Liben Districts of Guji Zone. Wadera District is located at a distance of 535 km southeast from Addis Ababa, the capital city of Ethiopia. The District is geographically lies between coordinates of 05°40' to 06° 03' North latitude and 39°05' to 39°28' East longitude and with an approximation altitude range between 1,489 and 1,914 m above sea level. Based on the CSA (2007), the District has a total population of 50,075, of which about 10% is suburban. The District has a total area of 95,169 ha. The mean annual rainfall ranges between 1,000 and 1,400 mm and the mean annual temperature of the District is 19°C. The major soil types of the Wadera District are Oxisols and Alfisols, characterized by their red brown colors. High forests, grassland, exposed sand soil, riparian woodland or bush land and cultivated land are available in the District. The land use includes: cultivated land 31,426.2 ha (33.39%), forest land 27,979 ha (29.73%), grazing land 24,012 ha (25.51%), and others 10,417.2 ha (11.07%).

Liben District is located at about 630km south of Addis Ababa. Geographically, it is situated between 5°5′10″ to 5°7′50″ North latitude and 39°32′30″ to 39°36′30″ East longitude. Agro-ecologically, the Liben District is categorized under dry lowlands. The mean monthly minimum and maximum temperature is 16°C and 28°C, respectively. The rainfall pattern is bimodal, and total annual rainfall ranges from 460 to 790mm with an average of 609mm. Based on the 2007 census conducted by the Central Statistical Agency (CSA 2007), this District has a total population of 79,981, of whom 38,284 are men and 41,697 women; 2198 or 2.75% of its population are urban dwellers with an annual population growth rate of 2.7% and a population density of approximately 280 persons per square kilometer..

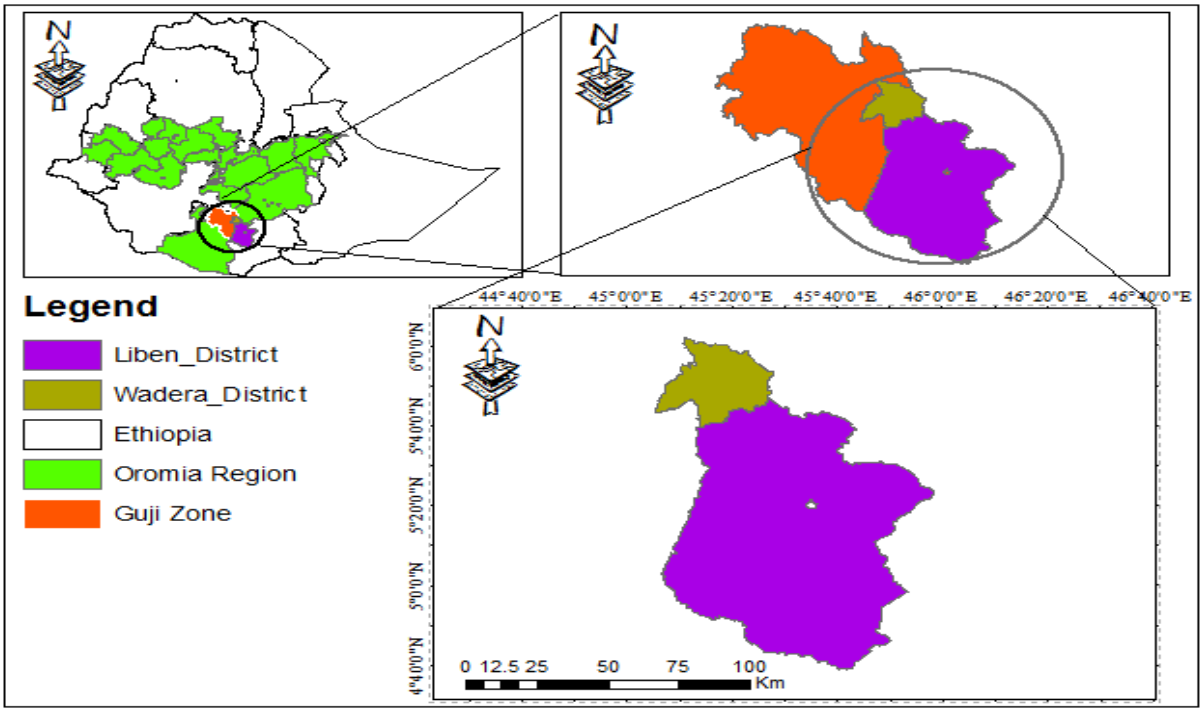

Figure 1. A map showing the study area

Selection of the Study area

The study area was selected purposively based on the potential and existence of Wild Edible plants (WEPs) of the study Districts. Therefore, two potential Districts namely Liben and Wadera were selected. From each selected Districts, two representative kebeles and a total of four kebeles were selected and used for socio-economic survey.

Data collection methods

Various data collection techniques such as key informant interview, focus group discussions, semi-structured interview, guided field observations and local market surveys were employed to gather data on WEPs of the study area.

Focus Group Discussion

Focus group discussions were administered by selecting individuals from different areas including, elders, youngsters, men and women to have triangulated data on wild edible plants while they have reached at consensus. The information collected by focus group discussion was helpful to compare information collected through semi-structured interviews.

Key informant interview

Necessary information was collected from 20 key informants selected from both study Districts. These key informants are those living in the study area for a long time and which have good

understanding about wild edible plant species were selected. This information provides an overview of the socio-economic and biophysical environment of the study area.

Semi- structured Interviews

Thirty respondents were selected from each of the two selected Districts. Semi-structured interviews were used with 60 respondent households randomly selected from Liben and Wadera Districts of Guji zone. The 60 respondents were randomly picked from a separate list of names produced for women, men, and children and young groups from each selected kebeles to ensure all groups were adequately represented. Local criteria were adopted to differentiate among wealth classes of the respondents. All sampled selected households were asked independently the same question to freely name orally all the wild edible plant species they know as it comes into their memory.

Field observations

Field observations were also conducted using transect walk where most of the Wild Edible plants (WEPs) are grown. The purpose of the field observation was to obtain actual information of occurrence, growth habit, habitat characteristics and identification of wild edible plant species mentioned during the interviews. Wild Edible plants (WEPs) data were collected by walking through the forests in the selected study Districts.

Data analysis

The data collected was summarized and analyzed by means of descriptive statistics. The illustrative tables and graphs were also used to summarize the data in precise form using the software programs such as Microsoft Excel and Statistical Packages for Social Sciences (SPSS). Ranking and scoring methods such as preference ranking and direct comparison were conducted by using ten randomly selected key informants.

RESULTS AND DISCUSSION

Wild Edible Plants Diversity

In the study Districts a total of 54 Wild edible plants (WEPs) species were identified and recorded (Table 1). Based on the findings of this study, some of the Wild edible plants identified in the present study were relatively similar with former Ethnobotanical study of WEPs conducted by, Baressa Anbessa, 2016 and Sintayo and Zebene(2020) which was conducted in Bule Hora Woreda of Borena Zone and Adola District of Guji Zone, Oromia Regional State, in Southern Ethiopia.
As compared to some previous Ethnobotanical studies of WEPs carried out and documented in different parts of the country, the current study was higher than the number of WEPs identified by Birhane et al., 2014; Meragiaw et al., 2015; Yigremachew et al., 2015; Ashagre et al., 2016 and Fugaro et al. (2018) which was conducted in South, North and Central Ethiopia. However, the present study indicated that the number of WEPs identified in this study was lower than the number of WEPs documented in former studies carried out by Ahmed Hassen,2021; Yohannis and Abdulaziz,2019 and Getachew et al.(2013) which was reported in North, Southwest and in Southern Ethiopia. The possible clarification for these differences could be the climatic and environmental conditions that might have restricted the number of wild edible plants from region to region and the differences in local traditions and customs of using these wild edible plant species.

Families of Wild Edible Plant Species

The identified and recorded WEPs of the study Districts were belonging to 45 genera and 32 families. The highest number of plant species was recorded under family of Rubiacea with 5 plant species. Anacardiacea and Moracea were represented by four species in each family. Fabacea, Flacourtiaceae and Tilacea families were contained 3 plant species each. Each of Apocynaceae, Boraginacea, Cucurbitaceae, Rosacea, Rutaceae and Sapindacea families were represented by 2 plant species. The other remaining 20 families were represented by single WEPs (Table 1). However, various Ethnobotanical studies so far conducted showed that the dominant WEPs families which contribute edible plant parts vary from place to place. For example, at Bench-Maji Zone, Southwest Ethiopia Astraceae was the dominant family contributing the highest number of species (Abebe et al., 2021). On their former Ethnobotanical study, Tilahun and Mrutse (2010), also reported that Tilaceae was the dominant family in Kara and Kewego Semi pastoralist people in Lower Omo River valley, Debub Omo Zone, Southern Ethiopia. Moreover, Tinsae Bahru et al. (2013) showed that Fabaceae is dominant in and Buffer area of Awash National Park. This variation of distribution of number of the plant species may be due to climate change, soil type, altitudinal deference and other factors.

Wild Edible Plants Growth Habits

The present study found that growth habits of the identified wild edible plant species of the study area were trees, shrubs, herbaceous and climbers. Out of the identified wild edible plant species of the study Districts, 57.4% and 29.6% of the species were trees and shrubs respectively. The

remaining 9.3% and 3.7% of the identified wild edible plant species of the study area were herbaceous and climbers respectively (Figure 2).

Therefore, the findings of this study showed that, the growth habits of WEPs of the study area were dominated by trees followed by shrubs. In consistent with the current study findings, Ethnobotanical studies conducted by Fantahun and Herbert, 2008; Teklehaymanot and Mirutse, 2010; Getachew et al., 2013; Sintayo and Zebene (2020) reported the abundance of wild edible trees in three Districts of Amhara Region, Debub Omo Zone, Konso Ethnic Community and Adola District in Northern and Southern Ethiopia. These similarities could be due to similarities in climatic conditions, WEPs species distribution and other environmental factors. Hence, from the current and previous Ethnobotanical study conducted in different parts of the country observed that trees are more abundance than the other growth forms.

However, in contrary to the current study, Lulekal et al., 2011 and Ashagre et al., 2016 reported that shrubs were the dominant wild edible plants growth forms followed by trees, herbs and climbers. On their former study findings Abebe et al. (2020) also reported that herbs were the highest growth forms followed by shrubs, climbers and trees at Bench-Maji Zone, Southwest Ethiopia. Furthermore, Li et al. (2015) also indicated that among Lhoba people in Milin country, Tibet found herbs and shrubs to be the dominant growth habits.

Table 1. List of Wild Edible Plant Species identified and recorded in Liben and Wadera Districts of Guji Zone, Southern Ethiopia.

Family and Scientific name of the Wild Edible Plants	Local name	Habit	Edible plant parts used
Anacardiacea			
Lenea rivae (Chiov.)Sacl	Handarakkuu	Tree	Fruit
Rhus glutinosa A.Rich	Xaaxxessaa	Tree	Fruit
Rhus vulgaris Meikle	Daboobessa	Tree	Fruit
Sclerocarya birrea (A.Rich.) Hochst	Hudhaa	Shrub	Fruit
Annonaceae			
Annona reticulata L.	Gishxaa	Tree	Fruit
Apocynaceae			
Acokanthera schimperi (A.Dc.)Shweinf	Qaraaroo	Shrub	Fruit
Carisa spinarum L.(C.edulis)	Agamsa	Shrub	Fruit
Araceae			
Clocasia esculenta (L.)	Goodarree	Herb	Tuber
Arecaceae			
Phoenix reclinata Jacq	Meexxii	Shrub	Fruit
Balantiaceae			
Balanites aegyptiaca (L.) Del.	Beddennoo	Tree	Fruit
Boraginaceae			
Cordia africana Lam.	Waddeessa	Tree	Fruit
Cordia monoica Roxb.	Madheedhaa	Tree	Fruit
Burseraceae			
Commiphora africana (A.Rich.) Engl.	Hammeessaa	Shrub	Root bark
Cactaceae			
Opuntia ficus-indica (L.) Miller	Adaamii	Shrub	Fruit
Convolvulaceae			
Ipomoea hildebranditi	Amborkokee	Shrub	Fruit
Cucurbitaceae			
Momordica foetida Schumach.	Suruphaa	Climber	Fruit
Ipomoea marmorata Britt. and Rendle	Homborokkee	Shrub	Root
Dioscoreaceae			
Dioscorea bulbifera L.	Baroodaa	Climber	Tuber
Ebenaceae			
Euclea divinorum Hiern	Mi'eessaa	Tree	Fruit
Fabaceae			
Acacia seyal Del.	Waaccuu	Tree	Fruit
Eriosema cordifolium Hochst.ex.A.Rich	Silingaa	Herb	Tuber
Tamarindus indica L.	Hagalaa	Tree	Fruit
Flacourtiaceae			
Dovyalis abbysinica (A.Rich.)Warb.	Koshimii	Shrub	Fruit
Flacourtia indica (Burm.f)Merr.	Hagalaa	Tree	Fruit
Oncoba spinosa Forssk.	Akukuu	Tree	Fruit
Icacinaceae			
Pyrenacantha malvifolia	Burii	Herb	Tuber
Lobeliaceae			
Cyphia glandulifera Hochst. Ex A. Rich	Kurtee	Herb	Tuber
Moraceae			

Ficus sur Forssk	Harbuu	Tree	Fruit
Ficus Sycomorus L.	Odaa	Tree	Fruit
Ficus thonningii Blume	Dambii	Tree	Fruit
Ficus vasta	Qilxuu/Qilxaa	Tree	Fruit
Myrtaceae			
Syzygium guineense (Wild.)Dc.	Baddeessaa	Tree	Fruit
Oleaceae			
Olea europaea L.subsp.cuspidata	Ejersa	Tree	Fruit
Pittosporaceae			
Pittosporum viridiflorum Sims.	Gaalloo	Tree	Fruit
Rhamaceae			
Ziziphus mucronata Willd.	Huqunquraa	Tree	Fruit
Rubiaceae			
Gardenia ternifolia	Gambeelloo	Tree	Fruit
Vangueiria arisepala	Buruurii	Tree	Fruit
Rhus natalensis Krauss	Daboobessa	Tree	Fruit
Galiniera coffeoides	Kudhumii	Tree	Fruit
Rytigynia neglecta	Miqee	Shrub	Fruit
Rosaceae			
Robus apetalus Poir	Goraa ukkaa	Shrub	Fruit
Rosa abbyssinica Lindley	Goraa	Shrub	Fruit
Rutaceae			
Teclea simplicifolia (Engl.)Verdoorn	Hadheessaa	Shrub	Fruit
Clausema anisata (Wild.)Benth	Xirdhoo	Shrub	Fruit
Sapindaceae			
Haplocoelum foliolosum	Canaa	Tree	Fruit
Pappea capensis Eckland Zeyh	Biiqqaa	Tree	Fruit
Sapotaceae			
Mimuosops Kummel Bruce ex. A.Dc.	Olaatii	Shrub	Fruit
Simaroubaceae			
Brucea ferruginea	Hadhowaa	Tree	Fruit
Solanaceae			
Physalis peruviana	Subbaa ruufoo	Herb	Fruit
Sterculiaceae			
Sterculia africana (Lour.) Fiori	Qararuu	Tree	Fruit
Tiliacea			
Grewia bicolor Juss	Harooressa	Tree	Fruit
Grewia trichocarpa Hoschst. Ex A.Rich	Gororaa	Tree	Fruit
Grewia villosa Willd.	Ogobdii	Tree	Fruit
Verbenaceae			
Lantana camara L.	Dubaroo	Shrub	Fruit

Wild Edible Plants Parts Used

Local communities of the study Districts commonly used wild edible plant parts such as fruits, tubers, root and root barks. This study illustrated that fruits 47(87%) were found as the dominant plant use parts followed by tubers 5(9%). Roots 1(2%) and root barks 1(2%) wild edible plant use parts were reported from *Ipomoea marmorata* and *Commiphora africana* wild edible plant species

respectively. Therefore, fruits were the most edible plant parts of the study area. In agreement with the current study results previous findings conducted by Teklehaymanot and Giday, 2010; Lulekal et al., 2011; Tena Regasa et al., 2014; Alemayehu et al., 2015; Ashagre et al., 2016 and Sintayo and Zebene (2020), on their study findings in different parts of Ethiopia reported that most of the wild edible plants parts used were fruits. The reason for the preference of fruits as the primary source of wild food might be because of their possession of the highest nutritional value than other edible parts (Mahapatra et al., 2012; Nayak and Basak (2015). Addis et al. (2013) also on their study findings indicated that the results of the nutritional analysis of the fruits of some WEPs indicated that fruits contain appreciable nutrients and energy that are useful for food supplements. However, in contrary to this study findings Tilahun and Miruts (2010), in southern Ethiopia reported that leaves and stems are more dominant plant parts used. Moreover, in the Meinit Ethnic Community at Bench-Maji Zone, Southwest Ethiopia leaves were the most edible parts followed by fruits, roots and tubers and seeds (Abebe et al., 2021).In other African countries such as in Uganda herbal plant species were the highest consumed wild edible plants and in Shrugwi District, Zimbabwe wild edible vegetables were the most consumable plant parts followed by fruits (Tabuti et al., 2004; Maroyi, 2013).

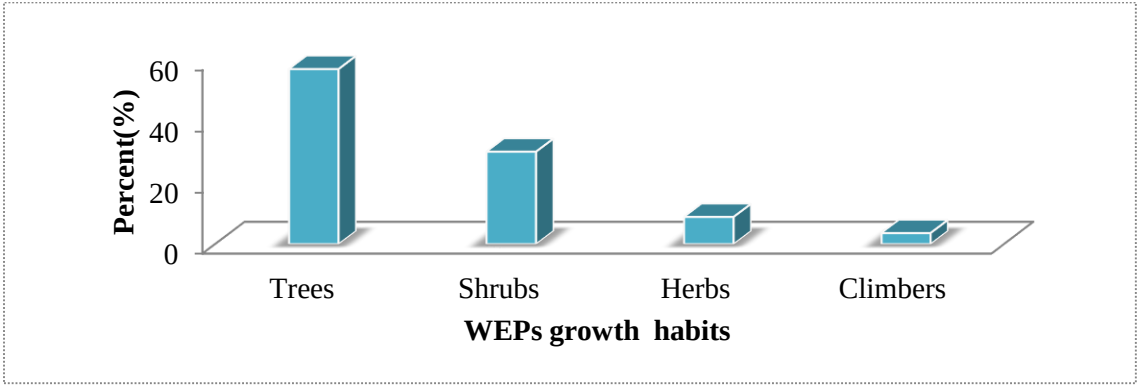

Figure 2: The growth habits of wild edible plant species of the study area

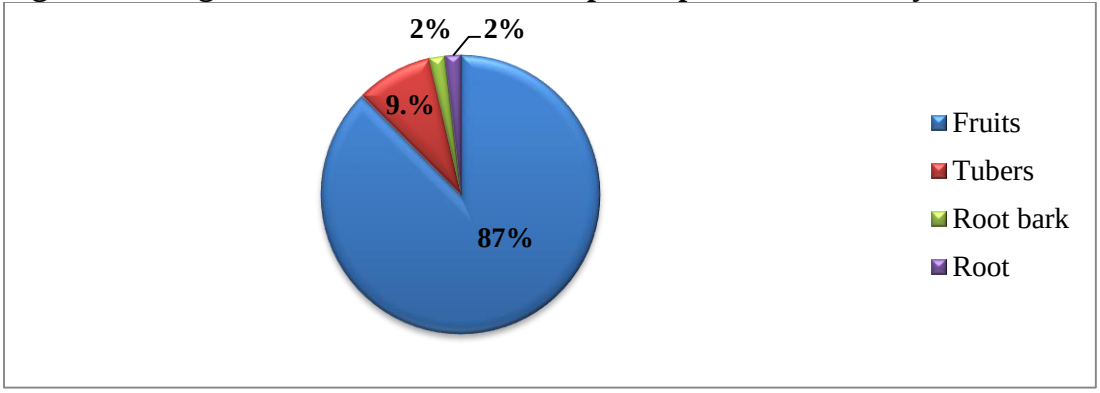

Figure 3: Wild edible plants parts used of the study area

Indigenous Knowledge on WEPs with respect to the age of respondents

In order to detect Wild edible plants indigenous knowledge of local communities of the study area, the age of respondent households were categorized in to three (below 30 years old, 30-50 years old and 50-70 years old). The age groups below 30 years old were reported the minimum proportion of WEPs names, uses and plant parts used. However, the age groups within the ranges of 30-50 and 50-70 years old were reported the highest proportion of WEP names, uses and plant parts used (Figure 4). This indicated that, the older respondents have high indigenous knowledge on the WEPs but the youngest respondents have very little indigenous knowledge on the WEPs. In agreement with the current study findings, in Jiangcheng County, Pu'er, South west China and in Baidi Village, northwest Yunnan province the oldest generation has more traditional knowledge than others (Cao Y et al., 2020; Geng Y et al., 2016). However, the findings of this study contradicts with earlier studies conducted in three Districts of Amhara Region, Ethiopia and Nepal where younger people were more knowledgeable than the older(Mengistu and Hager,2008; Uprety Y et al.,2012).

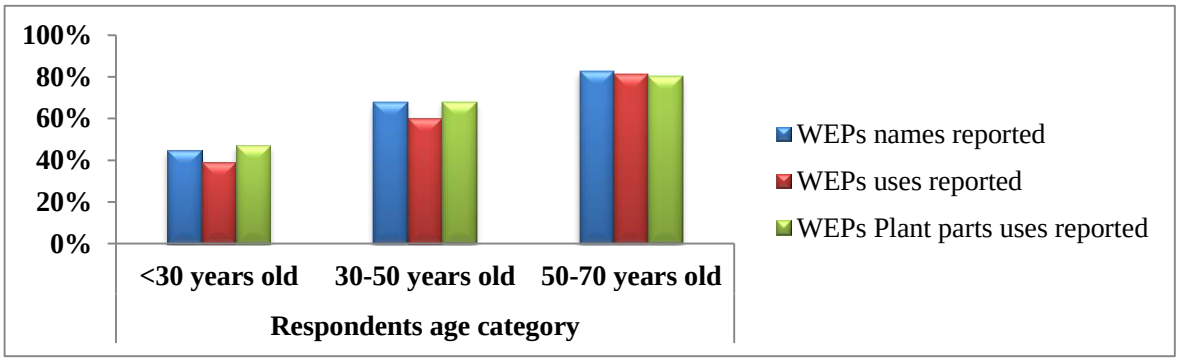

Figure 4. Indigenous Knowledge on WEPs among the three age category

Preferences of Wild Edible Plants

Wild edible plant species preference ranking activities was carried out following a method manual of Martin, 1995.According to this manual, preference ranking involves asking each selected informants to arrange some items, usually five to seven, in accordance to their perceived degree of importance in their community. In this study, from each study Districts 10 randomly selected key informants were participated to rank the five most preferred wild edible plants according to their taste they perceived. The values were five for the most preferred WEPs and one for the least preferred WEPs. Finally, total scores given by key informants were added and then ranked to distinguish the most preferred wild edible plant species.

Therefore, ranking of five wild edible plant species made by ten key informants in Wadera District showed that, *Syzygium guineense*, *Pappea capensis*, *Carissa spinarum*, *Cordia africana* and *Rytigynia neglecta* were ranked 1st, 2nd, 3rd, 4th and 5th respectively (Table 2). However, in Liben District, preference ranking of five wild edible plant species carried out by the key informants revealed that, *Mimusops kummel*, *Carissa spinarum and Rhus natalensis* were the top three most preferred wild edible plants of the study District. The remaining wild edible plants such as *Pappea*

capensis and *Grewia bicolor* were ranked 4rth and 5th respectively (Table 3).

Therefore, the findings of this study showed that the species preference is difference among the two study Districts. This may be due to community importance of WEPs, Personal preference, WEPs coverage with in each Districts as well as due to they are living in the different Districts. Moreover, species preference was reported to vary among difference areas and communities depending on species distribution, indigenous knowledge and economic pursuits of the community (Pauline & Linus, 2004).

Table 2. Preference ranking of five wild edible plants (WEPs) of Wadera District based on their taste as perceived by selected key informants

Wild edible plant species	Key informants(R_1-R_{10})											
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}	Total	Rank
Carissa spinarum	4	4	4	5	4	4	4	5	3	3	40	3rd
Cordia africana	3	3	4	5	4	4	4	3	4	4	38	4rth
Pappea capensis	4	5	4	4	4	5	4	5	4	5	44	2nd
Rytigynia neglecta	4	4	3	3	4	4	3	3	3	3	34	5th
Syzygium guineense	5	5	4	5	4	5	5	4	5	5	47	1st

Note: "R'' refers to key informants who participated in the ranking exercise

Table 3. Preference ranking of five wild edible plants (WEPs) of Liben District based on their taste as perceived by selected key informants

Wild edible plant species	Key informants(R_1-R_{10})											
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}	Total	Rank
Carisa spinarum	5	4	4	5	4	4	4	4	5	4	43	2nd
Grewia bicolor	3	3	4	4	3	3	3	3	4	3	33	5th
Mimusops kummel	5	5	4	4	4	4	5	5	5	5	46	1st
Pappea capensis	3	4	4	4	4	4	4	5	3	3	38	4rth
Rhus natalensis	5	4	4	4	5	3	3	4	4	4	40	3rd

Note: "R'' refers to key informants who participated in the ranking exercise

Harvesting Seasons of WEPs

The present study showed that, the identified wild edible plants of the study area were harvested and consumed in different seasons of the year. Earlier study findings conducted by Getachew (2001) also indicated that harvesting season and use of wild edible plant species vary from place to place, species to species and even from tree to tree. This might be due to climatic and intra-specific variations. Moreover, Balemie and Kebebew (2006), on their study findings reported that time and frequency of harvesting of wild and semi wild edible plants depends on the plant parts and varies from place to place.

The findings of this study revealed that, WEPs species of the study Districts were collected and consumed during dry season, wet season and year round. Key informants explained that season and frequency of harvesting vary from plant to plant based on the availability of WEPs. As well, seasons of collection varied from place to place due to ecological and seasonal conditions. For instance, from WEPs of the study area, *Eriosema cordifolium*, *Mimuosops kummel*, *Cordia africana*, *Ficus sur*, *Ficus Sycomorus*,*Ficus vasta and Pittosporum viridiflorum* were harvested and consumed during dry season. Wild edible plant species such as *Cyphia glandulifera*, *Dioscorea bulbifera*, *Pyrenacantha malvifolia*, *Syzygium guineense*,*Sclerocarya birrea* and *Vangueiria arisepala* were commonly gathered and consumed during wet season. However, *Carissa spinarum*, *Rytigynia neglecta*, *Momordica foetida*, *Vernonia auriculifera*, *Rosa abyssinica* and *Physalis peruviana* were available throughout all seasons and consumed year round.

Main gathers of WEPs of the study area

In the study area collection of wild edible plants were mainly carried out by all age groups and sexes. The results of the current study findings indicated that in terms of age category 35(58.4%) and 25(41.6%) main gathers of the identified wild edible plant species of the study area were children and youngsters respectively (Figure 5). Moreover, 50(83.4%) and 10(16.6%) respondent households indicated that the main gathers of wild edible plant species of the study area were male and women respectively (Figure 5). In line with current study results, on their previous findings, Tinsae Bahru et al. (2013) and Tilahun and Miruts (2010) were reported that collection of wild and semi wild edible plant species was done by children, youngsters and herds men and consume fruits at time of the year when available. However, in contrary with this study results, Tena Regassa et al. (2014) and Birhane Kidane et al. (2014) were reported that women and children were the major gatherers followed by men and all household in Chelia District, West Central Ethiopia and in Maale and Ari Ethinic community in southern Ethiopia respectively.

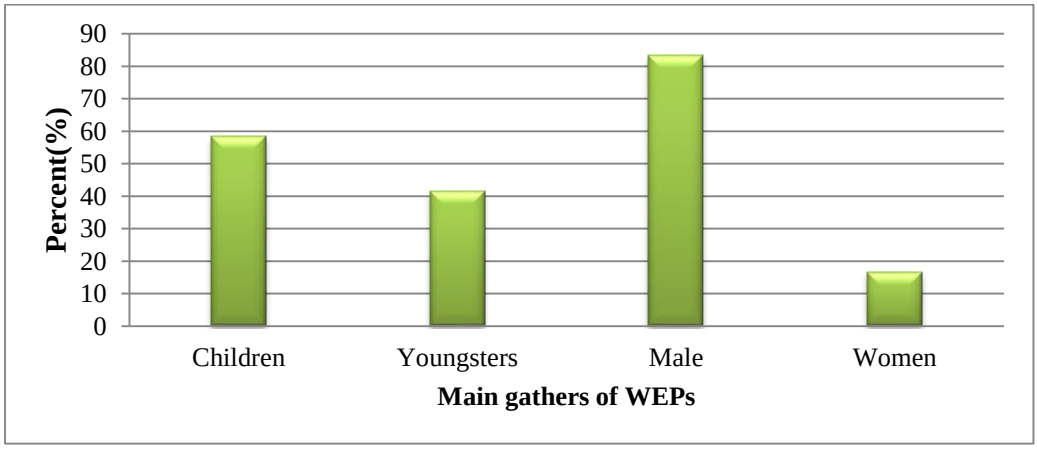

Figure 5. Main gathers of WEPs of the study area in terms of age and gender category

Economic benefits and marketability of WEPs

On their study findings, Teketay and Eshete 2004; Getachew et al., 2005 and Asegid et al. (2011) reported that many marketable wild edible fruits have also made considerable contributions to income generation. In the study Districts also few wild edible plants were observed at weekly local and the daily urban markets. Based on the market surveys conducted in the two study Districts, fruits of four wild edible plants such as *Mimusops kummel, Syzygium guineense, Ficus sur* and *Flacourtia indica* were reported to be sold and can provide additional income to the local communities of the study area. Relatively similar to this study findings, *Syzygium guineense, Balanites aegyptiaca, Mimusops kummel* and *Opuntia ficus-indica* wild edible plants were marketable and used for income generation in Derashe and Kucha, Districts, South Ethiopia and in three Districts of Amhara Region respectively (Baleme and Kebebew,2006; Mengistu and Hager,2008).

The findings of this study showed that as compared to the number of wild edible plant species identified and recorded in the two study Districts, only 7.2% are marketable and the remaining 92.8% of the wild edible plants are not marketable. In agreement with the current study findings, the low availability and marketability of wild edible plants were also recorded by Kidane et al., 2014; Alemayehu et al., 2015 and Baressa Anbessa (2016) in Sothern and Northern Ethiopia. This showed that most wild edible plants are non-marketable in many parts of Ethiopia. Thus, wild edible plants are non-traded wild food sources of the country compared to cultivated fruits such as *Mangifera indica*, *Percia americana* and *Malus domestica*. Moreover, collections of wild edible plants are seasonal and conducted for the shorter period of time and mostly people can collect from the wild only for their own consumption purposes.

Major Threats of WEPs of the study districts

Based on the findings of this study many threats are affecting wild edible plant species of the study area. Relatively similar to this study finding, earlier Ethnobotanical studies have also reported that several wild edible plants of the country were under severe threat (Asfaw and Tadesse 2001; Teketay et al., 2010).

The main identified threats of wild edible plants (WEPs) of the study Districts were expansion of agricultural land, fuel wood collection, timber production, cutting for construction, un controlled fire setting and overgrazing. Similar to current study results, on their former findings, Ashagre et al.,2016, Debela Hunde et al., 2011, Teklehaymanot and Giday ,2010 and Balemie and kebebew (2006), reported that agricultural expansion, overgrazing and fuel wood collection were found to be the most threats factors of WEPs.

The major threats were conducted only for the most 5 frequently used wild edible plant species identified and recorded in the study areas. Therefore, the output of a direct matrix ranking exercise showed that, *Cordia africana, Mimusops kummel, Syzygium guineense, Carissa spinarum* and *Pappea capensis* were the highest ranks on their exploited more for their non-food uses (Table 5)

Table 5. Preference ranking Values of five most threatened wild edible plant species of the Study Districts selected by key informants

Wild edible plant species	Key informants(R_1-R_{10})											
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9	R_{10}	Total	Rank
Carissa spinarum	3	3	2	4	3	3	4	3	3	3	31	4rth
Cordia africana	5	4	5	4	5	5	4	5	4	5	46	1st
Mimusops Kummel	4	5	4	5	4	3	5	4	3	4	41	2nd
Pappea capensis	3	3	1	2	3	2	3	3	2	1	23	5th
Syzygium guineense	3	4	3	4	3	4	3	4	3	4	35	3rd

Note: 5=most threatened species, 1=least threatened species and ''R'' refers to key informants participated in the ranking exercise

CONCUSSIONS

The present study indicated that, about 54 wild edible plants (WEPs) were identified and documented under 45 genera and 32 families. The present study found that growth habits of the identified wild edible plant species of the study area were dominated by trees and shrubs and the remaining were herbaceous and climbers. In the study Districts, local communities are commonly used wild edible plant parts such as fruits, tubers, root and root barks. However, fruits were found as the dominant plant use parts followed by tubers. While, roots and root barks wild edible plant use parts were only reported from *Ipomoea marmorata* and *Commiphora africana* wild edible plant species respectively.

Indigenous Knowledge on WEPs with respect to the age of respondents showed that, the age groups below 30 years old were reported the minimum proportion of WEPs names, uses and plant parts used. However, the age groups greater than 30 years old were reported the highest proportion of WEP names, uses and plant parts used. Based on the findings of this study, the species preference is difference among the two study Districts due to species distribution, community importance of WEPs, personal preference and WEPs coverage with in each District. Therefore, *Syzygium guineense, Pappea capensis, Carissa spinarum, Cordia africana* and *Rytigynia neglecta* were the preferred WEPs of Wadera District. Whereas, local communities of Liben District preferred *Mimusops kummel, Carissa spinarum, Rhus natalensis, Pappea capensis* and *Grewia bicolor* WEPs based on their preference criteria.

In the study area collection of wild edible plants(WEPs) were mainly carried out by all age groups and sexes. In terms of age category, main gathers of the identified wild edible plant species of the study area were children and youngsters respectively. Moreover, in terms of sexes category majority of WEPs collection were conducted by male. The identified WEPs also mainly harvested

and consumed in different season of the year including during dry season, wet season and year round.

Some of the fruits of Wild edible plant species were contributed as additional income sources for local communities of the study area. For instance, fruits of four wild edible plants (WEPs) such as *Mimusops kummel*, *Syzygium guineense*, *Ficus sur* and *Flacourtia indica* were harvested and sold in the local markets of the two study Districts. However, as compared to the number of WEPs identified in the study Districts majority of them are not marketable. The main top three threat factors of WEPs of the study Districts are agricultural expansion, fuel wood collection and timber production and the remaining threats such as cutting for construction, un controlled fire setting and overgrazing had consecutive values. Therefore, along with sustainable utilization and conservation of the existing WEPs of the study Districts, priority should be given on urgent collection, domestication and cultivation of the most threatened wild edible plant species of the study area.

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