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Research article

Ethno-ecological study of medicinal and wild edible plants in Sheka Zone, Southern Nations, Nationalities and Peoples Regional State, Ethiopia

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Abstract: An ethno-ecological study on medicinal and wild edible plants was conducted in Sheka Zone, Southwestern Ethiopia. The objective was to document and analyze the floristic composition and the associated ethnobotanical knowledge of medicinal and wild edible plants. The study applied a combination of standard plant taxonomic, plant ecological and ethnobotanical methods. Ninety five plots of 30 m by 30 m for trees, 10 m by 10 m for shrubs and 5 m by 5 m for herbs were used to collect vegetation data. Four hundred fourteen informants were involved in the ethnobotanical data collection using semi-structured interviews and discussion with informants. Data were analyzed using R Statistical Software version 3.2.3 and analytical methods of ethnobotany. A total of 555 plant species of which 266 (48%) those used as medicinal; 35 (6.31%) wild plants consumed by people were recorded. The plant species recorded indicated high taxonomic diversity as they belong to 341 genera and 115 families. Eight plant community types were identified. In addition to climatic variability, five environmental factors including altitude, slope, aspect grazing, and disturbance had significant contributions in determining plant community types where altitude is the most influential. Fourteen major plant use categories were identified including the medicinal and the wild edibles. The medicinal plants are distributed within the eight plant communities constituting 46% to 72% of their species composition. Of the 35 wild edible plants, 85.71% were also said to be medicinal. Increasing population, commercial agriculture and firewood collection were among the major threats to the vegetation. Plant communities: Ficus-sur-Croton macrostachyus, Schefflera abyssinica-Syzygium guineense, Ilex mitis-Macaranga capensis and Arundinaria alpina-Lepidotrichillia volkensii plant community types constituted more than 65% of their species composition as medicinal, hence, need priority attention for conservation.
Keywords: Ethno-ecology - Use values - Multi-purpose species - Relative cultural importance.

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INTRODUCTION

Rapid population growth is among the fundamental problems currently facing our planet Earth. Natural and anthropogenic factors are the current problems threatening biodiversity and associated traditional ecological knowledge systems in Ethiopia. Biodiversity concerns are global, national and local. The vegetation of Sheka Zone is among the biodiversity priority areas. It is under highly accelerated rate of population increase due to rapid population growth. Research-based biodiversity and ethnobotanical information which can be obtained through detailed studies is required to be used as an input for planning sustainable development projects and policy formulations.

Many traditional medicines and modern drugs are obtained from plant products. According to the World Health Organization (WHO 1999), traditional system of medicine have become a topic of global importance during the past decades. The current estimates suggest that the majority of developing countries' population

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depends mainly on traditional healers where medicinal plants serve as major sources of medicines to meet primary healthcare requirements. The World Conservation Monitoring Centre (WCMC 1992), (Groombridge & Jenkins 1992) reported that around 119 pure chemical substances extracted from some 90 species of vascular plants. Plant bioactive chemicals include alkaloids, terpenes, saponins, steroids, flavonoids, essential oils and many others (Azmir *et al*. 2013). These chemicals are used as modern medicines all around the globe. Similarly, it was stated that out of the estimated 250,000 higher plants on earth, about 35,000 to 70,000 species have at one time or another been used in some cultures for medicinal purposes (WHO 1999, 2002, 2007, 2009).

The general objective of this paper is to present the floristic composition of Sheka Zone, Ethiopia and the ethnobotanical knowledge of the local people emphasizing on the medicinal and wild edible plants that the vegetation maintains.

MATERIALS AND METHODS

Study area

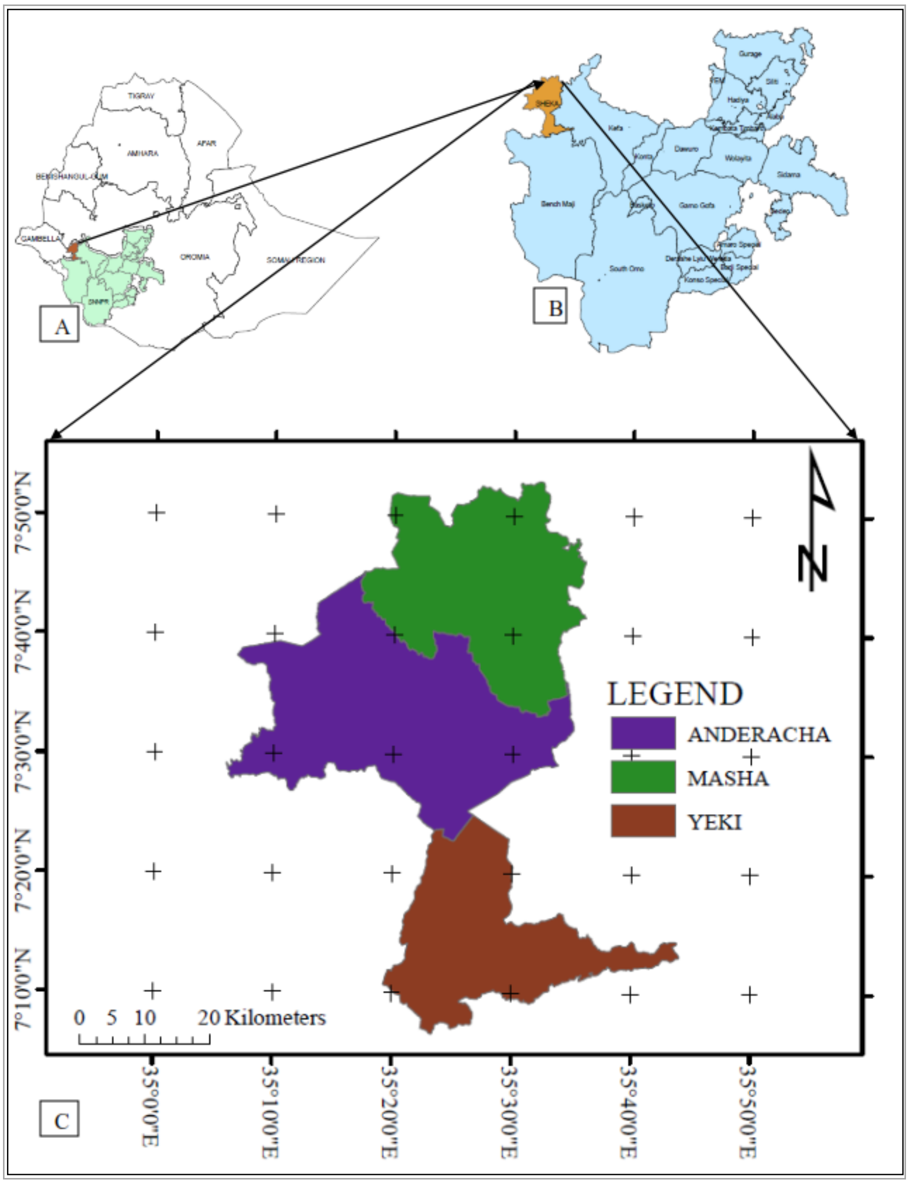

Figure 1. Location of the study area.

Sheka Zone is located at approximately 700 km southwest of Addis Ababa in the Southern Nations Nationalities and Peoples Regional State (SNNPRS), SW Ethiopia. It is bordered by Bench Maji Zone in the south, Kefa Zone in the east, Oromia Region in the north and northwest and Gambella Region in the west. The geographical coordinates of Sheka Zone based on actual field observation lies between 6.93090828 to 6.94082110 N and 35.63917433 to 35.90355391 E with altitudinal ranges of 950 (Bako River Gorges in the south) to 2780 (peak around Lake Gandochi in Andracha District) AMSL (above mean sea level). The average elevation of the Zone is about 1846 meters and composed of three districts; Yeki, Andracha and Masha with three urban centers namely Tepi, Gecha and Masha respectively (CSA 2008, 2011) (Fig. 1).

Geomorphology and climate

According to Lovett & Waster (1993), recent rift tectonics and volcanism have changed some spectacular scenery found in countries like Burundi, Rwanda, Uganda, Ethiopia, Kenya, Tanzania and Malawi resulting in Eastern African monotonous landscapes. Physical observation of the geomorphologic features of Sheka Zone reveals diverse landscapes with associated plant species which varies accordingly from the very lowland areas of Yeki district to the very highland areas Masha and Andracha Districts. There is no weather stations available for Adndracha District and the climate of Masha and Andracha Districts are closer together as both districts are at relatively the same average elevation.

Vegetation of the study area

According to (White 1983, Friis 1986), the forest vegetation in west of the Ethiopian Rift Valley belongs to the humid broad leaved forest, including the humid transitional forest of the southwestern Ethiopian escarpment. It includes the southwestern plateau in Wellega, Ilubabor and Kefa floristic regions. The vegetation of Sheka Zone belongs largely to the Ilubabor (Masha, Andracha and part of the Yeki Districts) and slightly to the Kefa (part of the Yeki District) floristic regions (Friis *et al*. 2011).

Sheka Zone covers an area of about 2175.25 km^2 of which about 47% is covered by forests and it is one of the few remaining forests found in Ethiopia. The area receives high amount of rainfall with average between 1800 to 2200 mm per annum (Friis *et al*. 2011). The authors further noted that areas with annual rainfall between 700 and 2000 millimeters or more are marked as the moist evergreen Afromontane forests in the western high lands. The vegetation of Sheka Zone belongs partly to the Moist Evergreen Afromontane Forest and partly to the Transitional Forest vegetation type. Some of the common plant species in the study area include *Albizia gummifera* (J.F.Gmel) C.A.Sm, *Arundinaria alpina* K.Schum, *Bersama abyssinica* Fresen, *Cordia africana* Lam., *Cyathea manniana* Hook., *Polyscias fulva* (Heirn) Harms, *Pouteria altissima* (A.Chev.) Baehni, *Pouteria adolfi-friederici* (Engle.) Baehni, *Alastonia boonei* De Wild, *Prunus africana* (Hook.f.) Kalkman, *Schefflera abyssinica* (Hochst. ex A.Rich) Harms, *Syzyguim guineense* (Willd.) DC. subsp. *afromontanum* F.White, *Ilex mitis* (L.) Radlk., and *Schefflera volkensii* (Engle.) Harms.

METHODS

Reconnaissance survey

Before starting the actual data collection a reconnaissance study was made between July and August, 2013. Stakeholder identification, finding out a suitable time for data collection and season for fieldwork, together with how best ethnobotanical knowledge can be collected was done. Aerial photographs using Google Earth (Digital Globe, Spot Image and Landsat) and ground survey through recording geo-referencing followed by ArcGIS based mapping was conducted to identify distinct vegetation types, physiognomy and habitat heterogeneity.

A total of 95 plots were sampled from the whole zone proportionally (more plots taken from more dense and more heterogeneous vegetation and less from less dense and less heterogeneous vegetation) taken from the three districts based on their vegetation density and heterogeneity using preferential sampling technique. Species accumulation curve was used to maintain whether the floristic and species composition sampled to its maximum or not.

Geo-referencing and environmental data

To determine plot coordinates and associated geophysical parameters such as slope, aspect and elevation data, global positioning system (GPS), clinometers and compass were used by setting the GPS on the projected coordinate system format (UTM_Adindan_Zone 36). Similarly, SILVA compass and SILVA ranger clinometers were used to record aspect and slope respectively right during plant specimen collection. The aspect was recorded as: N=0, NE=1, E=2, SE=3, S=4, SW=3.3, W=2.5, NW=1.3 and ridge top=4 following the modified scale for the amount of solar energy received by each site (plot) (Yeshitila & Bekele 2002).

Geophysical features, presence/absence and intensity of disturbance were observed and recorded following the method of Milgo (2011) where the type of disturbance was determined by the real situation of the study area. Therefore, the disturbance scales were rated following Milgo (2011) as 0= no disturbance, 1= 0–20% of the plot disturbed, 2= 21–40% of the plot disturbed, 3= 41–60% of the plot disturbed, 4= 61–80% of the plot disturbed and 5= 81–100% of the plot disturbed. Similarly, grazing was also rated as 0= no grazing, 1= low grazing, 2= medium grazing, 3= higher grazing and 4= very high grazing intensities based on the number of grazing animals observed on a given plot of land during data collection.

Ethnobotanical data collection

The ethnobotanical data collection was guided by a pre-prepared semi-structured interview. Both qualitative and quantitative ethnobotanical data were collected through the application of standard ethnobotanical methods following Martin (1995), Cotton (1996), Alexiades (1996). Anthropological methods (semi-structured interview, demonstration, participant observation) were applied during data collection. Martin (1995) noted that if one is attempting to carry out the tasks in a scientifically rigorous way, interviews should be held with one individual at a time and with no onlookers nearby. Therefore, surveys and analytical tools in ethnobotany were properly applied. Ethnobotanical data from and around homegardens were collected by first surveying the types of homegardens and their orientations. Homegarden plant diversity and ethnobotanical knowledge were recorded during guided field walk and participant observation.

Sample size for informants was determined following Cochran's (1977) as:

$$n_o = \frac{(t)^2 * (p)(q)}{(d)^2}$$

Where, t= value for selected alpha level of significance at 0.025 in each tail, α= 1.96 in the normal distribution where the alpha level of α= 0.05 indicates the level of risk the researcher is willing to take that true margin of error may exceed the acceptable margin of error; (p)(q)= estimates of variance = 0.25, that is {(maximum possible proportion(0.5)*{(1-maximum possible proportion (0.5)}= maximum possible sample size, p=q=0.5; d= acceptable margin of error for proportion being estimated =0.05, is the error the researcher is willing to accept; n_o= sample size to be drawn from population (N). If n_o/N is negligible, n_o is a satisfactory approximation to n. If not, a correction factor is used and defined by the formula $n= n_o/ (1 + n_o/N)$ (Cochran 1977).

Data analysis

Data were analyzed through the applications of ecological, both quantitative and qualitative ethnobotanical methods using R Statistical Software (R Core Development Team, 2014) following Woldu (2017) for comparison of plant community types with respect to medicinal plant species richness. Clustering into major plant community types using R Statistical Software was done and the result was compared with the dendrogram output for the ecological data analysis in determining plant community types which later inspected for the number of medicinal plant species contained in each plant community type for the ethnobotanical data analysis. The position of Cluster IDs on the dendrogram was determined by using the programme for cluster analysis to classify sites using base R and Euclidean distance in the R Statistical Software version 3.2.3 thereby pasting the programme onto RStudio version 0.99.489 (RStudio Inc., 2016: http://www.dllexe.info/rstudio-0.99.489.exe/m-download-16319.html) following Woldu (2017). Comparisons of the general flora were done using the methods of Sørensen's coefficient of similarity index Kent & Cocker (1992), Wildi (2010), Kent (2012).

RESULTS

Plant diversity

Following the visually identified vegetation physiognomy and homogeneity, 95 plots were taken and a total of 458 plant species were collected. Additional 97 plant species were recorded outside plots due to their ethnobotanical significance as mentioned by informants. The collected plant specimens were pressed, dried, identified and deposited at the National Herbarium (ETH) following standard herbarium techniques. Taxonomic keys, characters, herbarium posters, Flora books, herbarium specimens and other related herbarium resources were used for determination of the species. Hence, 555 plant species of which 266 (48% medicinal), 35 (6.31% wild edible), 30 (5.4%) endemic to Ethiopia and 57 (10.3%) new records to the Flora of Ethiopia and Eritrea were collected from the study area. Note that the medicinal and wild edibles are add up together to 271 plant species and 30 (85.71%) of the wild edible plants are also medicinal and 5 (14.29%) of the wild edible plants serve only as food (*i.e.* medicinal only = 236, wild edible only = 5, medicinal and wild edible = 30, total medicinal plus wild edible = 236 + 5 + 30 = 271). A total of 284 plant species recorded from the study area are neither used as medicines nor food.

Floristic composition and plant growth forms

The 555 plant species (including three subspecies) belonging to 341 genera and 115 families all these were recorded from the vegetation of Sheka Zone. These species were grouped under six major growth forms (Fig. 2). Note that the lianas are referring to the woody climbers.

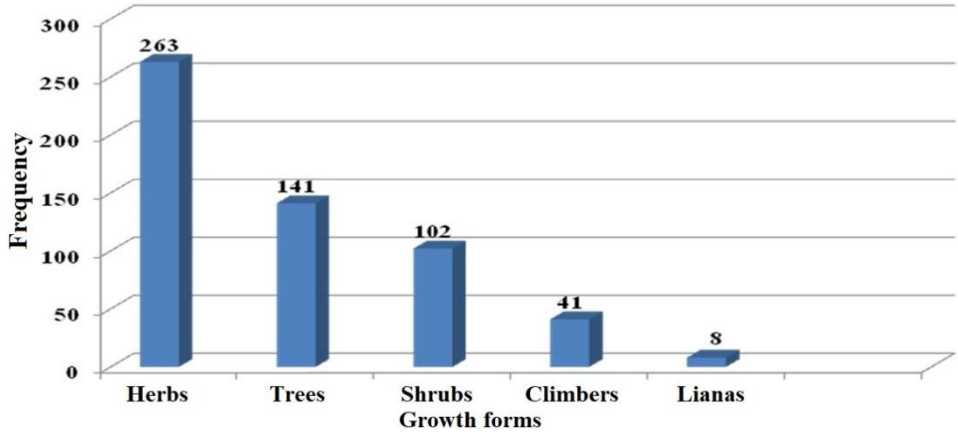

Figure 2. Plant growth forms in the study area.

Most frequent plant families with the highest percentages of the total recorded from the study area are shown in Table 1. About 65 (56.52%) of the families were represented by more than one species. The remaining 50 (43.48%) of the families were represented by single species each accounting 0.87% of the total families.

Table 1. The 15 most species rich plant families recorded from the study area.

Families	Number of Species	Percentage
Asteraceae	62	54.40%
Fabaceae	51	44.70%
Lamiaceae	27	23.70%
Poaceae	24	20.80%
Solanaceae	21	18.40%
Moraceae	20	17.50%
Euphorbiaceae	18	14.90%
Rubiaceae	17	14.90%
Malvaceae	15	13.20%
Amaranthaceae	12	10.50%
Cucurbitaceae	12	10.50%
Acanthaceae	11	9.60%
Rosaceae	11	9.60%
Celstraceae	10	8.80%
Rutaceae	9	7.90%

Results of the proportion of plots among sampling localities based on the heterogeneity of the vegetation, elevation, accessibility, distance, the intensity of disturbance and the geomorphological diversity of sampling localities were indicated in table 2.

Table 2. Proportion of plots among sampling localities.

S.N.	Localities	Plots	Size	%
1	Masha-Kan	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 68, 69, 70, 91	17	18
2	Masha-Yep'	24, 25, 26, 27, 60, 61, 62, 63, 64, 65, 66, 67, 71	13	14
3	Gecha-Sha	30, 31, 32, 33, 34, 84, 85, 86, 87, 88, 89, 90	12	13
4	Gecha-Yuk	44, 45, 46, 76, 77, 78, 79, 80, 81, 94, 95	11	12
5	Gecha-Gam	35, 36, 37, 38, 39, 40, 41, 42, 43	9	9.5
6	Gecha-Geb	17, 28, 29, 72, 73, 74, 75, 93	8	8.4
7	Tepi-Alamo	48, 49, 50, 51, 55, 56, 57	7	7.4
8	Masha-K'ar	20, 21, 22, 23, 59, 92	6	6.3
9	Masha-Che	1, 2, 3, 4, 5	5	5.3
10	Tepi-Bak'o	52, 53, 54	3	3.2
11	Tepi-Erm	82, 83	2	2.1
12	Tepi-Yeki	47, 58	2	2.1
		Total	**95**	**100**

Plant community types

Visual/Physiognomic classification**:** Results of analysis of physical observation of the vegetation of Sheka Zone through Google Earth aided image interpretation and ground walk indicated 12 major vegetation groups. Sample plots were taken preferentially from the respective physiognomy. The results of number of species versus plant community types are shown in figure 3. Plot distribution among visually classified vegetation groups and sites for sampling frame is indicated in figure 4. Plant communities with similar elevation range could come to different clusters because they can also be affected by slope, aspect, and disturbance and grazing.

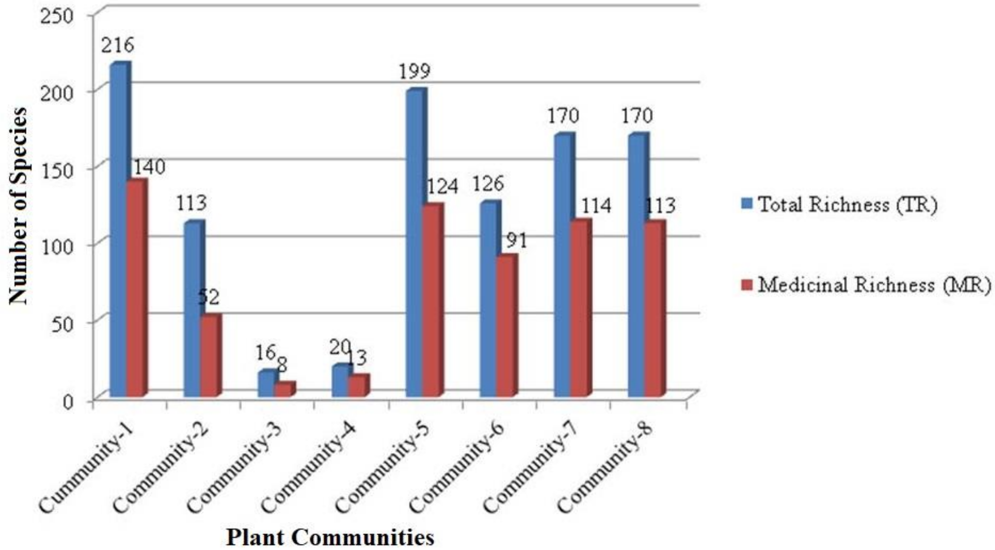

Figure 3. Plant species richness of the eight plant community types. [Key: TR= Total plant species richness, MR= medicinal plant species richness]

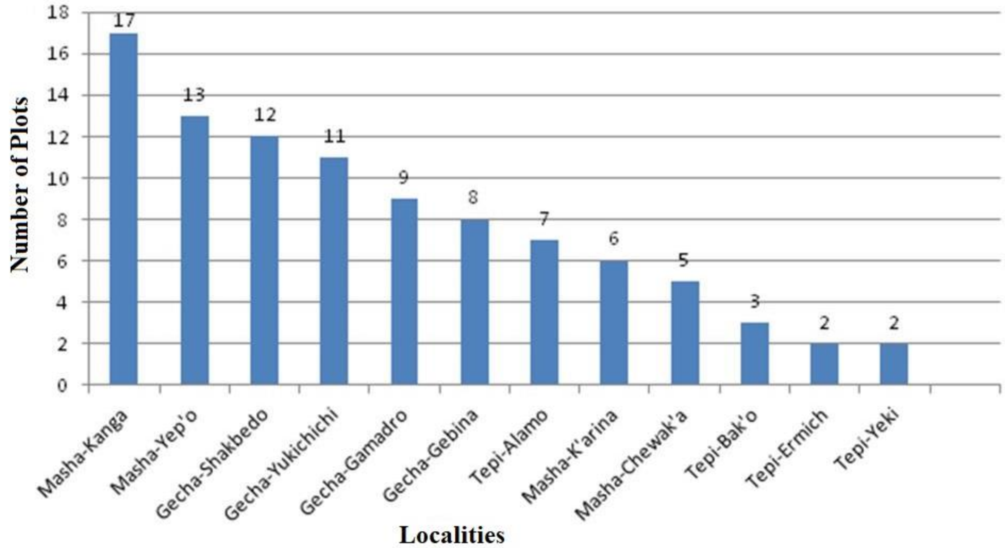

Figure 4. Sampling localities and respective number of plots

Results of agglomerative hierarchical cluster analysis using similarity ratio

Agglomerative Hierarchical Cluster Analysis using Similarity Ratio grouped the visually identified vegetation into eight major clusters (Table 3). Proper inspection of the dendrogram structure and partitioning methods validated the eight cluster groups which can be considered major plant community types.

Table 3. Plot distribution/percentage of plots per cluster.

C	Plots / Cluster Groups / Sites	S	%	NS	ER (M)	DIFF
C1	1, 24, 25, 47, 56, 57, 7, 67, 88, 60, 89, 90, 61, 62 MC1, MY1, MY2, TY1, TA6, TA7, MKG2, MY12, GS10, MY5, GS11, GS12, MY6, MY7	14	15	216	1050-2325 (m)	1275 (m)
C2	48, 49, 50, 51, 54, 55, 58, 52, 53 TA1, TA2, TA3, TA4, TB3, TA5, TY2, TB1, TB2	9	9.5	113	1000-1550 (m)	550 (m)
C3	91, 92, 93, 94, 95 MKG17, MKR6, GGB8, GY10, GY11	5	5.3	16	1800-2490 (m)	690 (m)
C4	79, 81, 80, 82, 83 GY7, GY9, GY8, TE1, TE2	5	5.3	20	2375-2800 (m)	425 (m)
C5	2, 3, 87, 4, 19, 27, 30, 35, 37, 44, 63, 68, 43, 64, 41, 45, 46, 72, 73 MC2, MC3, GS9, MC4, MKG13, MY4, GS1, GG7, GGD1, GY2, GGD3, GY3, GY1, GGB4, MY8, MKG14, GGB5, GGD9, MY9	19	20	199	1650-2450 (m)	800 (m)

C6	36, 66, 38, 39, 42, 40, 65, 70, 71 GGD2, MY11, GGD4, GGD5, GGD8, GGD6, MY10, MKG16, MY13	9	9.5	126	1850-2350 (m)	500 (m)
C7	5, 9, 10, 26, 20, 22, 11, 34, 13, 85, 31, 18, 33, 32, 84, 14, 16, 17 MC5, MKG4, MKG5, MY3, MKR1, MKR3, MKG6, GS5, MKG8, GS7, GS2, MKG12, GS4, GS3, GS6, MKG9, MKG11, GGB1	18	19	170	2200-2575 (m)	375 (m)
C8	6, 21, 8, 78, 15, 69, 76, 77, 23, 59, 86, 12, 74, 75, 28, 29 MKG1, MKR2, MKG3, GY6, MKG10, MKG15, GY4, GY5, MKR4, MKR5, GS8, MKG7, GGB6, GGB7, GGB2, GGB3	16	17	170	1900-2625 (m)	725 (m)
	Total plots	95				

Note: C= Cluster, S= Cluster size, NS=Number of species, ER=Elevation range, Diff= Altitudinal difference

Results of redundancy analysis (RDA)

The results of RDA/PCA values to fit environmental variables to unconstrained ordination represented that in the absence of PC1 Redundancy Analysis significantly explain environmental variables. The significant vectors for RDA showed that altitude is the most influential environmental factor. The importance of components and biplot scores for constraining variables is determined by interpreting Eigen values and their contribution to variance accumulated Eigen values. Biplot of RDA/PCA where environmental factors are fitted into unconstrained ordination is represented in figure 5.

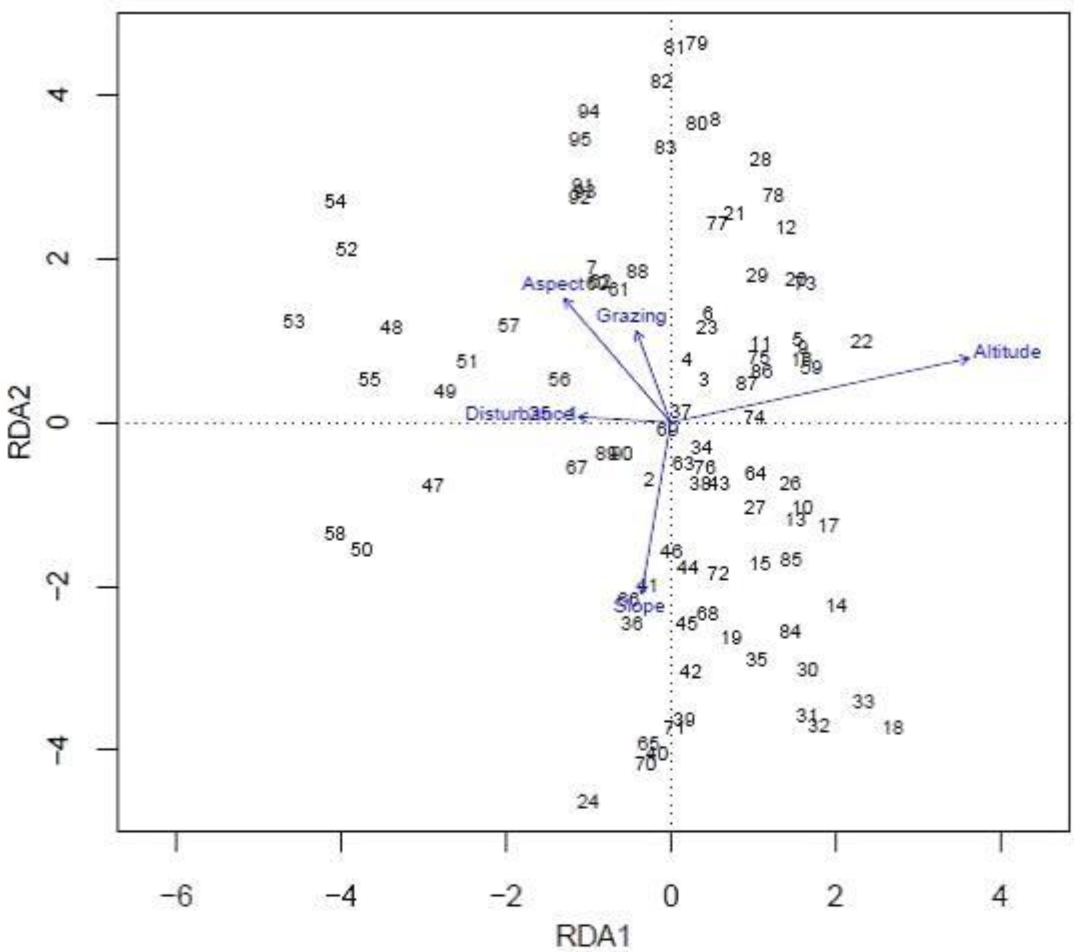

Figure 5. Biplot of RDA/PCA where environmental factors fitted into unconstrained ordination.

About 14 major plant use categories (medicinal, food, drink, firewood, charcoal, shade, construction and tools, commercial, animal feed and fodder, bee forage, culture and rituals, ornamental, life fence and others) were identified during the study and the values of the relative cultural importance of the respective species were calculated. The results were tabulated in the Use Totaled and the three Relative Cultural Importance (RCI) Methodologies: all specific uses recorded only binary data on use categories recorded and subjective allocation of use values in the 14 use records for species 1 through 555 in the whole data set. The Shannon-Wiener use value diversity index for overall use values of the entire species data set with all specific uses recorded is 6.0, where S= 555 is the number of species in the entire data set and the values for the upper 15 individual plant species are indicated in table 4.

Table 4. Use diversity indices of 15 high ranking plant species in the entire data set.

S.N.	Species	UVs	%RUVs	UVs	lnUVs	ABS(lnUVs)	UVs(lnUVs)
1	*Syzygium guineense* (Willd.) DC. subsp. *afromontanum* F. White.	43	1.24	0.01	-4.39	4.39	0.05
2	*Croton macrostachyus* Hochst. ex Delile	41	1.19	0.01	-4.43	4.43	0.05
3	*Manilkara butugi* Chiov.	37	1.07	0.01	-4.54	4.54	0.05
4	*Ekebergia capensis* Sparrm	34	0.98	0.01	-4.62	4.62	0.05
5	*Ilex mitis* (L.) Radlk.	34	0.98	0.01	-4.62	4.62	0.05
6	*Olea welwitschii* (Knobl.) Gilg & Schellenb.	34	0.98	0.01	-4.62	4.62	0.05
7	*Arundinaria alpina* K. Schum.	33	0.96	0.01	-4.65	4.65	0.04
8	*Prunus africana* (Hook.f.) Kalkman	33	0.96	0.01	-4.65	4.65	0.04
9	*Hallea rubrostipulata* (K.Schum.) J.-F.Leroy	30	0.87	0.01	-4.75	4.75	0.04
10	*Millettia ferruginea* (Hochst.) Baker	30	0.87	0.01	-4.75	4.75	0.04
11	*Schefflera abyssinica* (Hochst. ex A.Rich.) Harms	30	0.87	0.01	-4.75	4.75	0.04
12	*Pouteria adolfi-friedericii* (Engl.) A.Meeuse	29	0.84	0.01	-4.78	4.78	0.04
13	*Cordia africana* Lam.	29	0.84	0.01	-4.78	4.78	0.04
14	*Elaeodendron buchananii* (Loes.) Loes.	29	0.84	0.01	-4.78	4.78	0.04
15	*Schefflera volkensii* (Engl.) Harms	29	0.84	0.01	-4.78	4.78	0.04

Note: UVs= use value of species s, %RUVs= percentage of relative use value of species s, UVi= the relative use value of species s, lnUVs= taking the natural logarithm of UVs, ABS= taking the absolute value, UVs (lnUVs)= taking the product of UVs and lnUVs.

Wild edible plants

The informants in the study area were identified 35 plant species belonging to 32 genera and 24 families as wild edible plants. The families Asteraceae and Solanaceae were relatively the most frequent of the wild edible plants in terms of the number of species (Table 5).

Table 5. Summary of percentage families of wild edible plants.

S.N.	Family	N*	%	S.N.	Family	N*	%
1	Araceae	2	5.71	13	Piperaceae	2	5.71
2	Araliaceae	1	2.86	14	Poaceae	1	2.86
3	Arecaceae	1	2.86	15	Resedaceae	1	2.86
4	Asteraceae	4	11.43	16	Rhamnaceae	1	2.86
5	Boraginaceae	1	2.86	17	Rosaceae	2	5.71
6	Cucurbitaceae	1	2.86	18	Rubiaceae	2	5.71
7	Euphorbiaceae	1	2.86	19	Rutaceae	1	2.86
8	Lamiaceae	1	2.86	20	Sapindaceae	1	2.86
9	Moraceae	1	2.86	21	Sapotaceae	2	5.71
10	Myrsinaceae	1	2.86	22	Solanaceae	3	8.57
11	Myrtaceae	2	5.71	23	Tiliaceae	1	2.86
12	Passifloraceae	1	2.86	24	Zingiberaceae	1	2.86

Note: N* = Number of species in each family of wild edible plants

DISCUSSION

The vegetation of Sheka is rich in plant diversity and floristic composition resulting in the documentation of vascular plant taxa with high taxonomic diversity 555 species, 341 genera, and 115 families. The rich plant diversity and floristic composition may be due to great altitudinal range and topographic diversity as well associated environmental factors. The authenticity of these taxa has been checked with the list of Ethiopian plants provided in Hedberg *et al*. (2009a). The accounts and keys found in the relevant volumes of the Flora of Ethiopia and Eritrea (Hedberg & Edwards 1989, Edwards *et al*. 1995, Phillips 1995, Edwards *et al*. 1997, Edwards *et al*. 2000, Hedberg *et al*. 2003, Hedberg *et al*. 2004, Tadesse 2004, Hedberg *et al*. 2006, Hedberg *et al*. 2009b) provided to be very helpful in the determination of the identity of each taxon. Studies also confirmed that there is high floristic richness and diversity in southwestern Ethiopian vegetation such as the Agama Forest (Addi *et al*. 2016) and Masha Forest (Assefa *et al.* 2013).

A little more than half (56.52%) of the families collected from the area are represented by two and more species while the rest (50 families) are represented by a single species each. The 15 most frequent plant families identified from the study area comprise 57.66% of the total families recorded and the remaining 100 plant families comprised of only 42.34% of the total. Moreover, the top 15 most common plant families in the area also included many families of high economic, household medicinal and other importance. The majority of the plant families in the area were associated with multiple purposes.

The Asteraceae, which yielded 62 (11.17%) of the total species recorded, is one of the few species-rich families in the flora of Ethiopia and Eritrea (Tadesse 2004, Kelbessa & Demissew 2014). The Asteraceae constitutes important oil crops including *Guizottia abyssinica* (Vis.) Chiov. and *Helianthus annuus* L. that are of high economic value. It is also a very diverse family in the Ethiopian Flora. The Fabaceae that came as the second species-rich family had 51 (9.19%) species was long recognized as contains species of great economic importance which include pulse crops, forage plants as well as plants of great significance for charcoal and timber production, medicinal plants, ornamental plants and plants having the ability to fix atmospheric nitrogen in association with symbiotic bacteria (Thulin 1989).

There is a wide range ethnobotanical knowledge in Sheka Zone. Analysis and interpretation of the ethnobotanical information retrieved from the informants revealed that the people of Sheka Zone have a wide range of ethnobotanical knowledge base that they have accumulated over generations. These knowledge arrays include the use of plants in health, food, various other livelihood services, as well as traditional natural resource management practices. Elsewhere in Ethiopia, traditional management of human ailments for instance is a common practice (Awas 2007, Yinger *et al*. 2008). Such practices were also common in Sheka Zone. Therefore, it was a worth noting for knowledge integration with science for sustainable vegetation resource use.

The majority of food plants recorded from the vegetation of the study area are also medicinal plants either directly or indirectly in one or more ways. However, as compared to the total number of medicinal plants collected from the study area, the number of wild edible plants is relatively very low. Similarly, the majorities of plants that are used as raw materials for the preparation of local drinks/beverages are also medicinal plants and play great roles as herbal remedies. For instance, *Olea welwitshii* (Krobl.) Gilg & Scellenb and *Rhamnus prinoides* L'Herit both used in the preparation of local drink (TELLA), or mead (TEJ) (local drink prepare from honey mixed with some plant ingredients) and both cultural drinks as well as recommended by traditional healers either as a supplement to or antidote to the medicines they prescribe for their patients. The same is true for *Vernonia amygdalina* Del. leaf extract which is added to local bear and drunk against stomach problems.

In case a given plant species is multipurpose, the people rate all the use-values of a particular species and prefer the best use for best service. This is a common practice concerning plants used as firewood in the study area. For instance, a plant may be an excellent timber plant and still an excellent firewood plant. Under such circumstances, it is only the by-products (leftover parts) such as the branches, the leaves and the bark of the plant that should be used as firewood and the main trunk is preferred for timber, construction and tools as well as farm implements.

CONCLUSION

A considerable number (555 species, 341 genera and 115 families) of plant species are recorded from the three districts of Sheka Zone. The implication is that the study area is very rich in plant species diversity and floristic composition. Plant species such as *Acalypha marissima* M.Gilbert (endemic), *Aframomum corrorima* (Braun) Jansen, *Ajuga integrifolia* (Buch. Ham. ex D.Don) (medicinal), *Alastonia boonei* De. Wild (medicinal), *Amorphophallus gallaensis* (Engl.) N.Br. (endemic), *Clematis longicauda* Steud ex A.Rich (endemic), *Combretum molle* R.Br. ex G.Don, *Manilkara butugi* Chiov. (multi-purpose) and many more occurred in only few number of plots (less than 5 plots). The occurrence of the species in fewer numbers of plots is a good implication of their rarity in the study area despite the fact that these plant species are highly wanted by humans for various purposes.

All the eight plant communities identified in the study area are rich in medicinal plant species composition. They contain 46% to 72% of their species composition medicinal plant species and this figure is considerable percentage. Plant communities 6, 7 and 8 had relatively higher percentages of medicinal plant species and thus deserve priority attention for the purpose of medicinal plant conservation, management and sustainable use.

RECOMMENDATIONS

- There is an urgent need to mitigate the latent threat to vegetation through community based conservation, education, incentives and increased livelihood opportunities;

- Well managed botanic gardens should be established in Sheka for conservation, management and sustainable use of plant diversity in-situ;
- Well known traditional healers of the area should be supported by education, training and finance to have their own mini botanic gardens for medicinal plant conservation because they know the plants including their uses, conservation and management;
- Concerned NGOs who are actively working on indigenous and ecosystem based conservation activities should be encouraged.

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