Vol. 16(1), pp. 11-25, January, 2022
DOI: 10.5897/JMPR2021.7193
Article Number: 7682ED868516
ISSN 1996-0875

http://www.academicjournals.org/JMPR

ACADEMIC JOURNALS

Journal of Medicinal Plants Research

Full Length Research Paper

Ethnobotanical survey of medicinal plants utilized by forest edge communities in southern Sierra Leone

Jonathan Johnny[1*], Aiah Lebbie[2] and Richard Wadsworth[2]

[1]Department of Wildlife Management and Conservation, School of Natural Resources Management, Njala University, Sierra Leone.
[2]Department of Biological Sciences, School of Environmental Sciences, Nala University, Sierra Leone.

Received 27 October 2021; Accepted 5 January 2022

A total of 128 medicinal plant species belonging to 71 genera and 46 families were identified and used to treat 42 human ailments. Euphorbiaceae was the leading family with 14 species, followed by Rubiaceae and Leg-Caesalpiniaceae with 12 and 8 species, respectively. Seven species (*Coffea stenophylla, Garcinia afzelii, Mitragyna stipulosa, Irvingia gabonensis, Milicia regia, Nauclea diderrichii* and *Nesogordonia papaverifera*) are of conservation concern. Herbs are the highest followed by shrubs, trees, climbers and epiphytes. Leaves are the most used parts, followed by roots, fruits, stems, flowers, nuts, tubers and seeds. The highest calculated Relative Frequency of Citations Index (RFC) was for *Musa sapientum*, followed by *Zingiber officinale, Anisophyllea laurina, Cola nitida, Nauclea latifolia, Tetracera potatoria Allophylus africanus, Cassia sieberiana* and *Termitomyces microcarpus*. The highest Use Value index (UV) was calculated for *Cola nitida* (1.9) followed by *Nauclea latifolia* (1.56), *Zingiber officinale* (1.55) *Ficus exasperata* and *Tetracera potatoria* (1.44) respectively. Medicinal plants knowledge is strongly associated with the elderly in secret societies which are structured along gender lines. Plant use for medicinal reason actually addresses a significant part of the way of life and customs of the people living in this area and other rural locations in Sierra Leone.

Key word: Medicinal plants, ethnobotany, indigenous technical knowledge, Sierra Leone forests.

INTRODUCTION

Traditional medicine in Africa relies very heavily on plants the continued use of which depends on connected cultural and economic factors (Birhan et al., 2011; Diaz et al., 2013). The world health organisation (WHO) has urged African member states to advance and coordinate traditional medical practices in their health system (WHO, 2008). In many places medicinal plants are the most easily accessible health resource accessible to the community. Also, they are regularly the favored choice for the patients (Opara and Osayi 2016; Stangeland et al., 2011). For the majority of these individuals, traditional healers offer data, guiding, and treatment to patients and their families in an individual way just as having a comprehension of their patient's environment (Gurib-Fakim and Mahomoodally, 2013). Explanations for its continued popularity is credited to its minimal expense,

*Corresponding author. E-mail: jonathan.johnny@njala.edu.sl. Tel: +232 (76) 705354/78 183577.

availability, arrangement with patient's cultural and religious values, and perceived efficacy and safety as well as disappointment with conventional healthcare (Birhan et al., 2011; Malik et al., 2013). Traditional medicine in Sierra Leone is normal with large percentage of the populace utilizing it (Diaz et al., 2013; James et al., 2018).

Most traditional medicinal remedies in this country use plants as the primary component. One unusual feature is the use of mixtures of plants or in combination with other non-plant materials. In Sierra Leone, medicinal plant use cuts across regional and tribal divide with an enormous extent of the population relying on plants for their health care needs. In specific regions, particularly in the north where livestock domestication is rampant, wild plants assumed a basic part in the health of the animals (Van der Merwe et al., 2001; Sanhokwe et al., 2016; Sankoh, 2017; Abebe, 2019).

Nationally, provincial regions are starved of medical facilities and medical staff are reluctant to live and work in rural areas because of the poor working conditions. Besides, health centers in distant regions are sparse, making its availability practically impossible for many communities. Of the six communities sampled in this survey, only two were within walking distance of health centers (less than 28 km).

The Rebel war (1991-2001) and the Ebola outbreak (2014-2015) both had a detrimental impact on natural resources of the region and particularly on forests such as the Kasewe forest reserve.

After the war, a large number of internally displaced persons (IDP) were unable to obtain land to farm and took advantage of weak central Government control to move into the “protected” forest either as charcoal burners, loggers or to make farms. A similar phenomenon happened during and after Ebola when people withdrew from settlements and “self-isolated”, and relied on exploiting the forest through logging, non-timber forest products (NTFP) harvesting, fuel wood collection, pole harvesting, plant parts and fruit collection, hunting and charcoal burning. Loggers and charcoal burners are now being “sponsored” by outside actors who provide power saws (chain saws) that allow significantly more exploitation to occur. Kasewe is conveniently situated on the main road connecting the capital (Freetown) to the largest provincial city (Bo), and hence allows easy sale or products.

There are very limited data regarding the use of traditional medicinal plants in central Sierra Leone, and it was uncertain whether there were significant differences between the Temne and Mende tribes that inhabit this region. The main aim of the current investigation is to document the ethnomedicinal information from the traditional healers of the forest edge communities. Specific objectives include: to identify medicinal plants used for the management of various disease conditions, and to perform quantitative analysis of the documented data using quantitative ethnobotanical indexes.

MATERIALS AND METHODS

Study area

The study was conducted in communities around the Kasewe forest reserve. Field data for this research was conducted from March to July, 2020. The reserve forest is located in the south-central portion of Sierra Leone approximately 170 km east of Freetown. This lowland forest gives way to medium-altitude forest (approximately >100 m) on the slope and peaks at the Kasewe hill ridges. Kasewe Forest Reserve (8°18′53″N 12°15′43″W / 8.31472°N 12.26194°W) is approximately 2,331 ha in size (UNEP, 2008). It is located in an area of hills along the Freetown-Bo highway in the Moyamba District, southern Sierra Leone. It is a tropical rainforest and contains a mosaic of moist semi-deciduous forest, evergreen forest and savanna (UNEP, 2008). The area is made up of volcanic rock with the hills standing up to about 500 m above the interior plains of the country, serving as an important water catchment area for all communities around the reserve (Lytwyna et al., 2006).

Demography

Kasewe Forest Reserve lies between Moyamba District in the Southern Province and Tonkolili District in the Northern Province of Sierra Leone. Communities around the Kasewe Forest Reserve are sparsely populated, except for three of these communities which are densely populated with a total population of 48,256, and over half of this population is made up of women (Statistics Sierra Leone, 2015). In terms of religion, Muslims dominate, followed by Christians and others. Administratively, Kasewe forest reserve is between three chiefdoms: Yoni in Tonkolili district, Kori and Fakunya in Moyamba district. Bush-fallow farming remains the mainstay of the residents outside the forest and the largest sector of the economies in these districts, providing livelihoods for over 80% of these communities (OCHA, 2015). Very few of the residents are involved in small scale trading in and outside these communities; formal employment is limited to teachers, police and health workers. Crops grown in these communities include cereals (maize, rice, sorghum and millet), other starch food crops (yam, cassava and sweet potato) and vegetables and spices like okra, pepper, ginger, in addition to fruits like pineapple and sugarcane. Moyamba junction is a resting stop for long-distance Government buses and is an important market for crops coming from Moyamba and Bonthe districts.

Sampling design and plant identification

Ethnobotanical survey was conducted in six villages where the two ethnic groups, Mende and Temne reside. The method utilized to collect data is essentially based on Participatory Rural Appraisal (PRA). Both qualitative and quantitative approaches were used to collect information on medicinal use of the plants. The qualitative methods included informal conversations, semi-structured interviews, field excursions and visits to some of their patients and treatment areas while the quantitative methods included preference ranking, relative frequency of citation and pairwise ranking (Giday et al., 2001; Gari et al 2015; Yineger and Yewhalaw, 2007). We worked with traditional herbalists, identified through consultative meetings held in the community where the village, section and paramount chiefs were resident. During the inception meetings, the community stakeholders identified established Traditional Medicinal Practioner (TMP) and Traditional Birth Attandent (TBA) and locally recognised herbalists (H) in each of the communities. A total of 14 traditional healers were interviewed. For each of the plants listed, the part(s) used and where possible, the disease(s) treated were recorded. At each of the six forest edge communities, interview

was conducted with the informants on knowledge about the local flora, and the practicing traditional healer provided information on the ethnomedicinal uses of each species. Two traditional healers who served as informant from each community were taken to the field on a separate day and time to prevent collaborated answers. During the inventory, informant started from their backyards and walked into the forest patch providing information on the local names, uses, parts utilized, and collection and preparation methods of the species. With each informant, voucher specimens of the plants were collected and identified at the National Herbarium of Sierra Leone (at Njala University), and voucher specimens were deposited there as well. The status of the collected plants has been verified according to the International Union for Conservation of Nature and Natural resource (IUCN).

Pair wise and preference ranking techniques were used to study the ranking given to each of the different types of plants. The ranking was done with 6 respondents, 2 from each of the categories of herbalists. Each respondent ranked six different types of species in their order of preference. Preference ranking was done in order of preference of medicinal plant collected to obtain total ranks by the total number of rankers. While pair wise ranking was done to obtain a total score computed for each type of species. The higher the total score, the more preferred the given type of species.

Calculation of indices

The importance of each plant was calculated based on five attributes:

(i) Frequency of citation (FC) (Tardio and Pardo-de Santayana, 2008)
(ii) Relative frequency of citation (RFC) (Tardio and Pardo-De-Santanyana, 2008).
(iii) Use value,
(iv) Fidelity level (FL) (Friedman et al., 1986)
(v) Preference index (PI) (Amatya et al., 1996)

Frequency of citation (FC) is calculated as follows (Tardio and Pardo-De Santayana, 2008):

$$FC = 100 * N_S / N_T \quad (1)$$

Where: N_S = Number of times a particular species was mentioned) N_T = Number of times that all species were mentioned) × 100.

Relative Frequency of Citations Index (RFC) is calculated (Heinrich et al., 1998):

$$RFC = N_{ur} – N_t / (N_{ur} - 1) \quad (2)$$

Where: N_{ur} = total number of use reports from informants for a particular plant-use category; N_t = total number of taxa or species associated with that plant-use category across all informants. Use Value index is calculated as;

$$UV = X/N \quad (3)$$

Where; X = number of uses mentioned by the informants for a given species; N = total number of informants interviewed

Fidelity level (FL) is calculated as (Friedman et al., 1986):

$$FL = Ni/ N \times 100 \quad (4)$$

Where; Ni = the number of informants mentioning the use of plant species for a particular disease category; N = the number of informants citing the usage of that plant species for any disease category; Fidelity level shows the percentage of informants claiming the use of a certain plant species for the same major purpose. This is designed to quantify the importance of the species for a given purpose.

Preference Index (PI) is calculated (Amatya et al., 1996) thus:

Preference Index = Sum (Preference level * No. of respondent / Total no of respondents)

RESULTS AND DISCUSSION

Demography and knowledge variation

Demographic data demonstrates that women (average known species = 5.72; average cited uses = 9.38) had more knowledge about plants than men (average known species = 4.98; average cited uses = 8.05), and the paired sample t-test of p-value = 0.024 indicated a significant difference between the gender and knowledge about medicinal plants score. Age was used as second classification criterion and informants were classified into three major categories that is, above 60, between 40-60 and less than 40. Elders (age above 60) had more knowledge (71.43%) about plants than younger people (28.57%). It was evident that 89% of the traditional healers in all communities around Kasewe forests are “title holders” (highly placed) in both the male and female secret societies, and they are also highly skilled in the utilization of plants for purposes other than traditional medicine. Lebbie and Guries (1995) made similar observations about the Kpaa Mende tribe in the Moyamba District of Sierra Leone where they found ethnobotanical information about medicinal plants frequently dwelling with specific individuals or families, often women. Much of this knowledge was found to be acquired through their enrollment in specialized social groups, such as 'secret societies', which are also structured along gender lines (Hughes et al., 2015; Langat et al., 2021).

Age and gender seem to be closely related in terms of medicinal plant use and knowledge, and these relationships have been observed in various studies involving medicinal plant knowledge (Asfaw and Mekuria 2016; Aziz et al., 2018). In general, older people are far more knowledgeable about medicinal plants than the younger people (Lebbie et al., 2017; Morka, 2021; Silva et al., 2011; Ghorbani 2005; Voeks and Leony, 2004; Onyiapat et al., 2011). For male herbalists in Western Cameroon, it was reported that they held more knowledge of medicinal plants than female herbalists (Tsobou et al., 2015), although another study from Nigeria found men and women holding similar knowledge (Ayantunde et al., 2008). In three rural communities in Niger, Guimbo et al. (2011) stated that the average and total number of medicinal plant species cited by men and women did not differ significantly. They also observed women were vastly knowledgeable with edible plants, but less detailed on construction plant species. These results indicate the fact that plant knowledge variation among gender and

age largely depends on the culture, gender roles and values of different communities.

Medicinal plants of the study area

A total of 128 medicinal plant species belonging to 71 genera and 46 families were used by the local communities to treat 42 human ailments (Table 1). Euphorbiaceae was the leading family with fourteen species (10.38%), followed by Rubiaceae and Leguminosae-Caesalpiniaceae with twelve and eight species respectively. Chetri et al. (2018) conducted a similar study in Gosiling Gewog, Bhutan and reported that Euphorbiaceae have the highest number of medicinal plants species that are used by local people. This trend has also been observed by Ibrahim et al. (2010)); Giday et al., 2007 and Soladoye et al. (2010) in Nigeria wherein they recorded the highest number of species of medicinal plants among the Fabaceae followed by Euphorbiaceae. Of the species recorded, more than three-quarters (79.74%) were collected from the wild and the remaining (16%) were from home gardens. Hunde et al. (2006) and Regassa et al. (2017) reported that about 54 and 49% of medicinal plants, were collected from the wild in Tehuledere and Halaba districts, respectively. Gonfa et al. (2020) reported Fabaceae and Asteraceae as the leading families each represented by five species in studies conducted in the Gera District in Ethiopia.

In Sierra Leone, Kabba (2016) recorded 48 medicinal plants species used by communities around Kasewe Forest Reserve, with 32 species recorded in both studies, while 14 medicinal plant species recorded in that study could not be accounted for in the current study. The largest percentage of medicinal plants obtained belonged to the family Rubiaceae followed by Euphorbiaceae, Leguminosae, Apocynaceae, Malvaceae and Anacardiaceae. Ethnobotanical assessment of the Kpaa Mende tribe recorded 75 medicinal plants from sacred groves in Moyamba District, Sierra Leone. With the highest number of medicinal plants obtained belonging to the family Euphorbiaceae followed by Rubiaceae, Apocynaceae, Asteraceae, Leguminosae, Malvaceae and Anacardiaceae.

Through market survey, Cuni-Sanchez and Jusu (2014) recorded more than 40 species traded in urban markets, with nine of the most frequently traded species recorded here. Lebbie and Turay (2017) recorded a total of 18 plant species belonging to 14 plant families reportedly used as anti-venom plants by herbalists treating snakebites in 14 villages in the Kori chiefdom in southern Sierra Leone. The family Euphorbiaceae was recorded with the highest number of species followed by Graminae in the management of snake bite in the area. In an investigation of ethnomedicinal uses of plants among the Bassa of Rivercess County in Liberia, they recorded a total of 112 species belonging to 52 families in 93 genera. Seven plant families were reported to account for 43.9% of the total number of species utilized, including Annonaceae, Apocynaceae, Costaceae, Rubiaceae, Euphorbiaceae, Fabaceae and Verbenaceae The list of species and uses from the Kasewe herbalists are given in (Table 1 and Figure 1).

Growth form and plant parts used as medicine

The growth form analysis of medicinal plants revealed that the largest proportion were herbs (33 species, 31.13%), followed by shrubs (17 species, 24.3%), trees (24 species, 22.64%), climbers (14 species, 13.21%) and epiphytes (8 species, 7.55%). Similar findings were also reported in work done by Kyoshabire et al. (2017), which recorded herbs and shrubs as the two leading growth forms. Lautenschläger et al. (2018) reported related observations in northern Angola, while Hamilton (2004) and Tabuti et al. (2003) confirmed the dominance of herbs in local medicinal plant remedies. In agreement with this, several authors have recorded that, herbs with medicinal plant properties were dominant in local plant remedies (Amsalu et al., 2018; Bahadura et al., 2020; Ali et al., 2020; Chekole et al., 2015). Mbuni et al. (2020) have observed shrubs as the most used form, followed by trees, herbs, climbers, epiphytes and parasitic plants in Western Kenya. Lagnika et al. (2016) indicated that among the reported plants, trees were the most cited, followed by shrubs and herbs. Similar findings were also reported in work done by Adefa and Abraha (2011), where shrubs were the dominant lifeform applied in treatment.

Results showed that leaves (48%) and bark (21%) were the most commonly used plant parts, followed by roots (9%), fruits (7%), stems (6%), flowers (2%), nuts, tubers and seeds (1.5%). Amjad et al. (2020), reported leaves, whole plant, and roots as the most preferred plant parts used in herbal preparations. Studies by Poffenberger et al. (1992) and Giday (2001) made similar observations that mirror results obtained by Kumar et al. (2013); Hosseini et al. (2021); Urso et al. (2016) and Naghibi et al (2014); Morshed and Nandni 2012). On the contrary, Mbuni et al. (2020) observed roots as the most dominant parts followed by leaves, bark, fruits and branches in studies in Western Kenya. Nankaya et al. (2019) cited roots as the most dominant plant parts used in traditional medicine in the Maasai community in Kenya. Luitel et al. (2014) recorded the fruits and seeds as the frequently used plant parts followed by leaves and petioles in central Nepal. In an ethnobotanical investigation carried out in Turkey, Emre et al. (2021) observed that the aerial parts are the most frequently used plant parts followed by leaves, fruits and flowers. Tsioutsiou et al. (2019) reported flowers and inflorescences as the most used plant parts followed by aerial parts, leaves, fruits and seeds, and underground

Table 1. Medicinal plants and ethnomedicinal uses reported by herbalists in Kasewe.

Scientific name	Family	Collection no	Parts use	UV	RFC	Ethnobotanical values
Acioa scabrifolia Hua	Rosaceae	JJ 222	Leaves	1	0.21	Heart pain
Aframomum latifolia K. schum	Zingiberaceae	JJ 364	Leaves	1	0.07	Fever, abdominal swelling
Aframomum sceptrum (Oliv. & Hanb.) K Schum	Zingiberaceae	JJ 228	Stems	1	0.07	Tuberculosis
Aframomum sp	Zingiberaceae	JJ 226	Leaves	1	0.21	Fever
Ageratum conyzoides L.	Compositae	JJ 353	Leaves	1	0.29	Fever
Albizia adianthifolia W.Wight	Leguminosae Mimosaceae	JJ 389	Bark, roots and leaves	1	0.21	Hip-pain, body wounds, toothache
Albizia zygia (DC.) JF Macbride	Leguminosae Mimosaceae	JJ 363	Barks	1	0.07	Body pains, headache, reproductive problems in women, respiratory problems, wounds and pain, skin diseases, diabetes, eye problems, aphrodisiac
Alchornea cordifolia (Schumach. &Thonn.) Mull. Arg	Euphorbiaceae	JJ 290	Leaves	1.25	0.29	Bleeding from a new wound, high blood Pressure
Alchornea hirtella Benth.	Euphorbiaceae	JJ 220	Leaves and or barks	2	0.07	Excessive bleeding from new wounds
Amaralai sherbourniae Benth	Rubiaceae	JJ 284	Leaves	1	0.14	Heart problems, cough
Amorphophallus aphyllus (Hook.) Hutch.	Arcaceae	JJ 280	Leaves	1	0.07	Witch gun(fetish)afflictions
Amphimas pterocarpoide Harms	Leguminosae-papilionoideae	JJ345	Bark, root, leaves	3	0.14	Fever (including malaria) and female sterility, aphrodisiac
Ananas comosus (L) Merr.)	Bromeliaceae	JJ 366	Stems	3	0.36	Asthema, malaria, typhoid and fever
Ancistrocladus barteri Sc. Elliot	Araceae	JJ 356	Leaves /Barks	2	0.29	Potency, stomach pain
Anisophyllea laurina R Br.	Rhizophoraceae	JJ 275	Stems and leaves	1.25	0.79	Eye problems, stomach pain
Anthocleista vogelii Planch.	Gentianac	JJ 315	Leaves/Barks	1	0.07	Severe body pains
Bacopa erecta Hutch.& Dalziel	Scrophulariaceae	JJ 265	Leaves	1	0.07	Severe head ache
Baphia polygalacea (Hook. f.) Bak.	Leguminosae Papilionaceae	JJ 385	Leaves	1	0.29	Common cough
Bombax buonopozense **Beauv.**	Bombacaceae	JJ 343	Leaves	1	0.14	Head ache
Bridelia micrantha (Hochst.)	Euphorbiaceae	JJ 266	Leaves	1	0.07	Ulcer
Cajanus cajan (Linn.) Millsp.	Leguminosae Papilionaceae	JJ 219	Leaves	2	0.03	Measle
Carica papaya Linn.	Caricace.ae	JJ 380	Leaves	1	0.14	Stop bleeding
Carapa procera DC	Meliaceae	JJ 248	Bark, root, fruits and seeds	1	0.07	Cough, Fever, Syphilis skin diseases and Kwashiorkor
Cassia alata. Linn,	Leguminosae - Caesalpiniaceae	JJ 305	Leaves	3	0.03	Excretion problems, constipation
Cassia sieberiana DC.	Leguminosae Caesalpiniaceae	JJ 269	Leaves and Fruits	1.25	0.57	Stomach ache, malaria
Ceiba pentendra Linn	Bombacaceae	JJ 401	Bark	1	0.14	Paralysis
Chasmopodium caudatum (Hack.) Stapf	Graminae	JJ 292	Leaves	2	0.02	Snake bite

Table 1. Contd.

Chromolinia odorata (L.) R.M.King & H.Rob.	Compositae	JJ 221	Leaves	1	0.14	Bodily wounds
Cleistopholis patens Engl. & Diels	Annonaceae	JJ 368	Barks	1	0.14	Constipation
Cleradendron scandens Beauv.	Verbancece	JJ 397	Leaves	1	0.21	Stomach ache
Cnestis ferruginea DC.	Connaraceae	JJ 259	Leaves	1.25	0.57	Heart pain, head ache
Cola caricaefolia (G. Don) K. Schum.	Sterculiaceae	JJ 302	Leaves	1	0.07	Eye problems
Cola heterophylla (P.Beauv.) Schott & Endl.	Sterculiaceae	JJ 287	Leaves	2	0.12	Inability to pass stool, bowel obstruction
Cola lateritia K Schum.	Sterculiacea	JJ 224	Barks	1	0.36	Menstrual problems
Cola nitida (Vent.) Schott & Endl.	Sterculiaceae	JJ 301	Leaves	1.9	0.71	Eye pressure
Combertum smeathmannii G.Don	Crombretaceae	JJ 344	Leaves	1	0.21	Malaria
Thaumatococcus daniellii (Benn.) Benth.	Marantaceae	JJ 217	Leaves and roots	1	0.07	Sedative, diabetes, antidote against venoms, strings and bites
Combretum comosum G.Don	Combretaceae	JJ 330	Leaves	2	0.03	Fever
Costus afer Ker Gawl	Zingiberaceae	JJ 309	Stems	1	0.14	Cough
Craterispermum laurinum (Poir.) Benth.	Rubiaceae	JJ 332	Bark	1	0.29	Cough
Cucurbita pepo L.	Cucurbitaceae	JJ 403	Bark	1	0.17	Side pains
Cymbopogon citratus **(DC.) Stapf**	Gramineae	JJ 421	Leaves and root	2	0.35	Antiseptic, fevers, nervous and gastrointestinal disorders.
Cuviera acutiflora DC.	Rubiaceae	JJ 284	Leaves	1	0.06	Skin infections
Daniellia thurifera (Harms) Rolfe ex Holland	Leguminosae Caesalpiniaceae	JJ 315	Leaves and bark, root	1	0.14	Coughs, skin diseases and parasitic infections
Datura mentele L.	Solanaceae	JJ 300	Leaves	1	0.16	Skin boils
Dialium guineense Willd.	Leguminosae Caesalpiniaceae	JJ 329	Leaves	1	0.21	Internal stomach pain.
Dichrostachys glomerata (Forssk.) Chiov.	Leguminosae Mimosaceae	JJ 323	Barks	1	0.35	Testicle enlargement, deworming, fever
Diodia scandens Swart	Rubiaceae	JJ 296	Stem	1.24	0.23	Babies with weak legs to walk faster
Dioscorea multiflora Mart. ex Griseb	Dioscoreacea	JJ 304	Roots	1	0.15	Malaria
Diospyros heudelotii Hiern	Ebenaceae	JJ 234	Roots and Leaves	1	0.07	Impotency, erection, dysentery, swollen stomach in children
Dissotis paucistellata Stapf.	Melastomaceae	JJ 350	Leaves	1	0.09	Malaria
Elaeis guineensis Jacq.	Palmae	JJ 289	Roots and Barks	1	0.5	Fibroid
Erythrococca anomala (Juss. ex Poir.) Prain	Euphorbiaceae	JJ 396	Leaves	1	0.14	Skin boil, neck pain
Euphorbia lateriflora Schum. & Thonn.	Euphorbiaceae	JJ 308	Leaves	1	0.18	Split head
Fagara macrophylla Engl.	Rutaceae	JJ 388	Leaves, bark and root	1	0.21	Cough, fever, nervous system
Ficus capensis Thumb	Moraceae	JJ 238	Roots	1	0.43	Malaria
Ficus exaperata Vahl	Moraceae	JJ 270	Leaves	1.44	0.29	Swollen feet in pregnant women
Futunmia africana (Benth.) Stapf	Apocynaceae	JJ 282	Roots and Leaves	1.32	0.14	Impotency, spinal problems
Geophila obvallata (Schumach. & Thonn.) Didr	Rubiaceae	JJ 236	Leaves	1	0.21	Stomach ache
Gmelia arborea Roxb.	Verbancece	JJ 254	Barks	1	0.07	Malaria, miscarriage, foot pain and use for artificial limbs
Gossypium barbadense L.	Malvaceae	JJ 322	Bark	1	0.07	Joints pains

Table 1. Contd.

Garcinia afzelii Engl.	Guttiferae	JJ 347	Leaves, bark, seed and root	1	0.21	Aphrodisiac, cough and stomach-ache,
Gracinia kola Heckel	Guttiferae	JJ 231	Seed, root and bark	2	0.07	Purgative, antiparasitic, throat infection, diarrhea, bronchitis, and aphrodisiac
Guibourtia copallifera Benn.	Leguminosae-Caesalpiniaceae	JJ 375	Bark	1.14	0.5	Diarrhea, fevers
Hallea stipulosa (DC.)	Rubiaceae	JJ 380	Leaves, bark	1	0.07	Coughs arthritis, rheumatism and colic
Harungana madagascariensis Poir.	Hypericaceae	JJ 327	Leaves Root and Bark	1	0.14	Ear pain, internal stomach pain, bodily wounds
Hibiscus esculantus (L.) Moench	Malvaceae	JJ 387	Leaves, root and bark	1	0.21	Fever. cuts, wounds and boils diuretic
Hibiscus sabdaritta (Roselle)	Malvaceae	JJ 358	Leaves	1	0.07	Cough
Hibiscus sterciliitolius Balf.f.	Malvaceae	JJ 311	Leaves	2	0.21	Tooth ache, sickle cell
Hippocratea iotricha Loes.	Celastraceae	JJ 245	Leaves/Roots	1	0.14	Split head, sexual desires in men
Holarrhena africana A. DC	Apocynaceae	JJ 361	Leaves	1	0.03	Spinal problem, impotency in men
Homalium letestui Pellegr.	Samydaceae	JJ 390	Bark	1	0.07	Swollen body parts
Hymenocardia lyrate Tul.	Euphorbiaceae	JJ 244	Leaves/Barks	1	0.05	Joint pains and Cough
Imperata cylindrica Linn.	Graminae	JJ 351	Leaves	2	0.04	Bone problems
Ipomoea batatas (L.) Lam	Convolvulaceae	JJ 436	Leaves and Stem		0.07	Dysentery, constipation, fatigue, kidney ailments
Ipomoea involucrata P.Beauv.	Convolvulaceae	JJ 381	Leaves	1	0.21	Malaria and boils
Irvingia gabonensis	Irvingiaceae	JJ 248	Bark, leaves and root	1	0.07	Headache, asthma, liver and kidney
Lecaniodiscus cupanioides Planch.	Sapindaceae	JJ 255	Leaves	2	0.29	Strengthening young babies with physical weakness to growth healthy
Lonchocarpus cyanescens (Schum. & Thonn.) Benth.	Leguminosae Papilionaceae	JJ 349	Leaves	1	0.02	Split head and miscarriage
Luffa aegyptiaca Mill.	Cucurbitaceae	JJ 264	Leaves	1	0.14	Stomach ache
Macaranga barteri Mull.-Arg.	Euphorbiaceae	JJ 367	Leaves	1	0.07	Gonorrhoea
Magifera indica L.	Anacardiaceae	JJ 360	Barks	1	0.21	Skin rash and infections
Manihot esculentus Crantz	Euphorbiacene	JJ 288	Leaves	1	0.14	Witch gun(fetish) afflictions
Mareya micrantha Müll.Arg.	Euphorbiaceae	JJ 239	Leaves	1	0.07	Frequent stooling, constipation, broken hands and legs, fracture
Margaritaria discoideus (Baill.) Webster	Euphorbiaceae	JJ 216	Leaves	1.33	0.21	Swollen stomach, Boils, ribs pain, witch gun (fetish)
Marsdenia latifolia (Benth.) K.Schum.	Asclepiadaceae	JJ 253	Leaves	1	0.07	Stomach pain
Massularia acuminata(G.Don) Bullock ex Hoyle	Rubiaceae	JJ 336	Root	1	0.14	Potency in men
Mezoneurum benthamianum Baill.	Leguminosae Caesalpiniaceae	JJ 299	Leaves	1	0.07	Internal stomach problem, body pain, enable children with weak legs to walk faster
Microdesmis puberula Hook.f. ex Planch.	Euphorbiaceae	JJ 372	Leaves	1	0.14	Witch-crafts activities (Fetish), rectum projection
Milicia regia (A.Chev.) C.C.Berg	Moraceae	JJ 392	Bark	2	0.07	Blood pressure
Millettia sanagoma Sc. Elliot	Leguminosae Papilionaceae	JJ 346	Leaves	1	0.21	Bodily pains
Monodora spp	Annonaceae	JJ 298	Leaves	0.23	0.43	Malaria, Pain killers

Table 1. Contd.

Mimosa pudica L.	Leguminosae-Mimosaceae	JJ 383	Leaves/stems	1	0.14	Pregnancy pain, skins boil, nervous system and swollen foot
Monodora spp	Annonaceae	JJ 298	Leaves	0.23	0.43	Malaria, Pain killers
Morinda germinata DC.	Rubiaceae	JJ 215	Leaves	1	0.07	Heart attack, stomach ache, deworming. Resolve stomach ache problems in newly born babies
Musa sapientum L	Musaceae	JJ 286	Leaves / fruit	1.22	0.86	Stomach upset, vomiting
Napoleona heudelotii A.Juss.	Lecythidaceae	JJ 306	Leaves	1	0.21	Dysentery, diarrhoea
Nauclea diderrichii (De Wild. & Th.Dur.) Merrill	Rubiaceae	JJ 370	Barks	1	0.07	Malaria
Nauclea latifolia Smith.	Rubiaceae	JJ 316	Barks/Roots	1.56	0.64	Malaria
Coffea stenophylla G.Don	Rubiaceae	JJ 240	Leaves / Bark / Roots	1	0.29	Influenza, anemia, edema and body pain
Newbouldia laevis Seem.	Bignoniaceae	JJ 325	Roots	1	0.14	Rectum pains, pile
Ochthocosmus africanus Hook. f.	Ixonnanthaceae	JJ 359	Leaves	1	0.13	Waist bone
Octoknema boreale Hutch. & Dalziel	Octoknemataceae	JJ 345	Leaves	1.32	0.12	Ear-drum pains
Olyra latifolia L.	Graminae	JJ 307	Leaves and stem	1.24	0.22	Kashiworkor, Goita
Oryza sativa Linn.	Gramineae	JJ 431	Leaves, stem and seed	1	0.29	Urinary dysfunctions, diuretic, pile, pregnancy pain
Palisota hirsuta (Thunb.) K. Schum.	Commelinaceae	JJ 373	Leaves	2	0.32	Boils. Fever and sedatives
Parinari excelsa Sabine	Chrysobalanaceae	JJ 248	Leaves and bark	1	0.07	Enlargement of body parts
Phyllocosmus africanus (Hook.f.) Klotzsch	Ixonnanthaceae.	JJ 272	Leaves	1	0.07	Hip and ribs pains
Piptadeniastrum africanum (Hook.f.) Brenan	Leguminosae-Mimosaceae	JJ 227	Bark	1.22	0.05	Elephantiasis
Pleicarpa tricarpellate Benth.	Apocynaceae	JJ 223	Bark	1	0.14	Malaria
Premna hispida Benth.	Verbancece	JJ 328	Roots	1	0.14	Boil
Psidium guajava L.	Myrtaceae	JJ 246	Leaves	1	0.07	Dysentery
Psychoria reptans Benth.	Rubiaceae	JJ 218	Leaves	1	0.02	Skin infections, Gonorrhea
Rauvolfia vomitoria Wennberg	Apocynaceae	JJ 320	Roots, leaves, and stem	1	0.04	Convulsions, fever, weakness, inability to sleep, mental disorders, pain and prolonged menstruation
Rhaphiostylis beninensis (Hook.f.) Planch.	Icacinaceae	JJ 277	Stem	1	0.14	Broken hand or leg, fracture
Rhigiocarya racemifera Miers	Menispermaceae	JJ 225	Stem	1	0.21	Enlargement of body parts
Salacia senegalensis (Lam.) DC.	Celastraceae	JJ 362	Roots	1	0.14	Inflammation from fire burn, Stomach-ache
Terminalia ivorensis A. Chev	Combretaceae	JJ 337	Barks and Leaves	1	0.07	Malaria, waist bone problem, enlargement of body parts
Samanea dinklagei (Harms) Keay	Leguminosae Mimosaceae	JJ 324	Bark	1	0.07	Bodily wounds
Santiria trimera (Oliv.) Aubrev.	Burseraeae	JJ 233	Root, Leaves and Bark	1	0.14	Constipation, Kwashiwokor
Selaginella myosurus (Sw.) Alston	Selaginelliaceae	JJ 213	Leaves	1	0.13	Skin infections (Alay), Cough, body pains
Sida latifolia L.	Malvaceae	JJ 314	Leaves	1	0.07	Pregnancy pain
Sida stipulate Cav.	Malvaceae	JJ 409	Leaves, roots	1	0.14	Nasal congestion, cough, urinary tract infections, headaches
Sorindia junglandifolia A. Chev	Anacardiaceae	JJ 341	Leaves	1	0.06	Internal stomach problems
Spondias mombin Linn.	Anacardiacece	JJ 278	Leaves	1	0.07	Menstrual problems

Table 1. Contd.

Steganotaenia araliacea Hochst.	Umbelliferae	JJ 365	Barks	1	0.05	Enlargement of body
Sterculia tragracantha Lindl.	Sterculiaceae	JJ 271	Leaves	2	0.14	Enlargement of body parts, stomach pain
Termitomyes microcarpus (Berk. & Broome) R. Heim, Mem.	Lyophyllaceae.	JJ 352	Leaves	1.38	0.57	Head ache, gonorrhea, barreness, liver diseases
Tetracera potatoria G.Don	Dilldeniaceae	JJ 319	Leaves	1.44	0.64	Witch gun (fetish), tooth-ache, gonorrhoea.
Tragia tenuifolia Benth.	Euphorbiaceae	JJ 378	Leaves	1.22	0.07	Stomach complication
Trichilia heudelotii Planch. ex Oliv.	Meliaceae	JJ 333	Leaves	1.31	0.06	Malaria
Triclisia patens Oliv.	Menispermaceae	JJ 374	Roots	1	0.07	Testicle enlargement (scrotrum), scrotum problem in men
Tristemma coronatum Benth.	Melastomaceae	JJ 249	Leaves	1	0.12	Asthema
Triumfetta cordifolia A Rich.	Tiliaceae	JJ 237	Leaves	1	0.15	Pregnancy pain (aid in delivery).
Uapaca guineensis Mull. -Arg.	Euphorbiaceae	JJ 407	Leaves	1	0.21	Internal stomach ache
Uncaria africana G.Don	Rubiaceae	JJ 294	Leaves	2	0.32	Cough
Uvaria afzelii Sc. Elliot	Annonaceae	JJ 230	Roots	1	0.11	Malaria
Uvaria chamae P. Beauv.	Annonaceae	JJ 274	Roots/Bark	1	0.14	Malaria and fever
Vismia guineensis Druce	Hypericaceae	JJ 348	Leaves	1	0.08	Wounds
Xylopia aethiopica A.Rich	Annonoceae	JJ 241	Fruits	2.23	0.43	Lung problems
Zanthoxylum gilletii (De Wild.) P.G.Waterman	Rutaceae	JJ 283	Leaves	1	0.13	Headache, stomach-ache, toothache and pain after childbirth. cough, colds, skin complaints
Zinger officinale (L.) H. Karst.	Zingiberaceae	JJ 237	Roots and leaves	1.55	0.79	Catarrh, asthma, stroke, toothache, constipation, diabetes

parts in work done in Central Macedonia.

Method and condition of plant preparations

Several modes of preparation are employed; decoction is the most common (31.11%), followed by drying and turning into a powder (24.45%), dried extract (20%), poultices/dressing (15.56%) and infusion (8.8%). Fongod et al. (2014) in Southern Cameroon observed the preparation of plants in this order: decoctions, infusions macerations, powders, mixtures, squeezing, boiling, and direct eating. Nankaya et al. (2019) recorded decoction as the most common preparation method followed by pounding and burning. Tsioutsiou et al. (2019) reported infusion or decoction as the principal method of herbal preparations followed by maceration in alcohol or oil, used raw, poultice, and other. Kadir et al. (2014) and Song et al. (2013) and James and Bah (2014) observed various preparation methods for administering medicinal plants including decoction, infusion, juice, powder, paste, pills, sirup, smoke and raw. In contrast to this, Gonfa et al. (2020) reported crushing as the principal method of plant remedy preparation followed by exudation, squeezing, concoction, and pounding among local people in Ethiopia. Infusion was reported by Erasto et al. (2005) as the commonest method of herbal preparation in Eastern Cape Province (South Africa). In western Nepal, Singh et al. (2012) observed herbalists making juice preparation to be common followed by decoction. The variations reported here in the modes of preparations depend on the diseases, area of infection, experience of traditional healer, intensity of sickness and availability of plant species or alternatives. Kadir et al. (2014) and Song et al. (2013) observed various preparation methods for administering medicinal plants including decoction, infusion, juice, powder, paste, pills, sirup, smoke and raw, and bear some similarity to some of the findings obtained in the Kasewe area in Sierra Leone.

The majority of the remedies (91.78%) in the study area were prepared exclusively from fresh parts, with a few made from previously prepared and stored material (2.63%). Two-thirds (67.8%) of remedies consist of a single species, the remaining are a mixture of two or more plants.

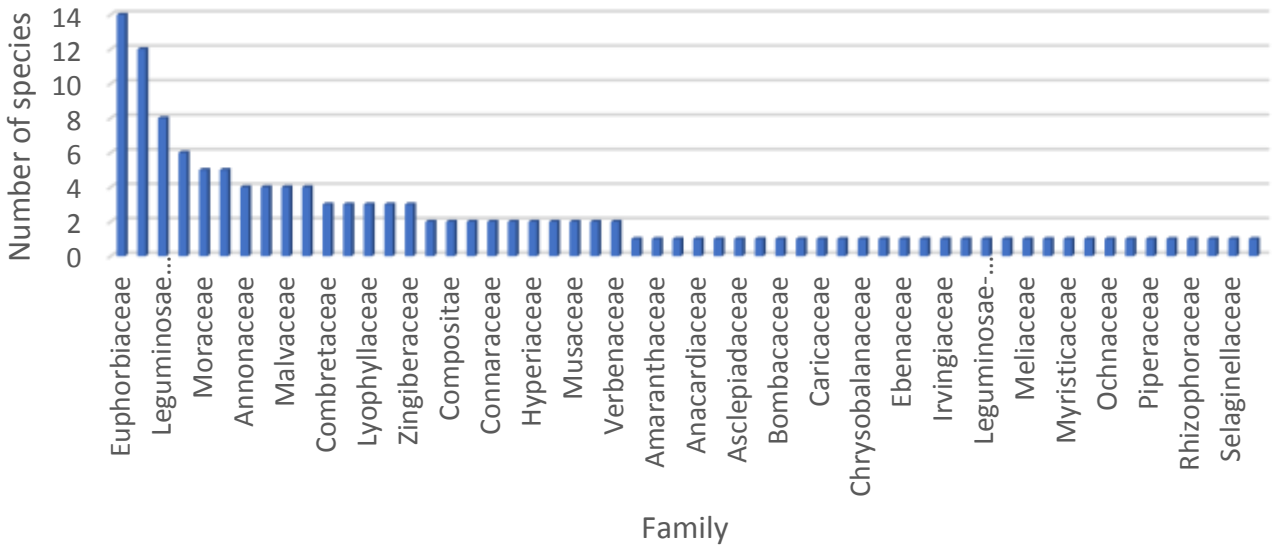

Figure 1. Families and species of medicinal importance (Frequency).

Similar results were reported by Abdurhman (2010) indicating that 86% of preparations were in fresh form. Eshete et al. (2016), as well as others (James et al., 2016; Megersa et al. (2013); Ranasinghe et al., 2015; Bahadura et al., 2020; and Chekole (2017) reported the use of single plant species or parts for traditional medicinal plant treatment. Among secret society women in Sierra Leone, it was reported that multi-species combinations are common in the treatment of afflictions. Multi-species use in traditional medicine is known to have synergistic effect which might serve to explain the common practice among some herbalists. They recorded a concoction of the following five plants is used as a remedy for malaria, *Napoleona heudelotii, Nauclea latifolia, Morinda geminata, Gouania longipetala,* and *Alstonia boonei*.

Sources of knowledge about medicinal plants

Most informants (73.2%) said they were taught about medicinal plants by their parents, friends (23.81%), traditional healers (9.52%) and husbands (9.52%). All of the informants were members of the Poro (male) and Sande (female) secret societies and their adherence to secrecy often prevents them from saying anything about what they learnt in the “sacred bush”. Ethnobotanical information on the Kpaa Mende tribe in Sierra Leone reported similar research observations, although the former was able to get female herbalists of such a secret society to have their knowledge of medicinal plants documented. Secrecy of traditional medicinal practices is a wide spread phenomenon among traditional healers in some regions of the world. Several studies have however, revealed that some traditional healers might have considered knowledge transfer whilst others maintain secrecy (Mesfin et al., 2014; Agisho et al., 2014; Tora and Heliso. 2017). The idea that medicinal plants will lose their mending power and the dread of losing cultural acknowledgment and notoriety which traditional healers have earned because of their insight are reasons forwarded by Agisho et al. (2014) and Mesfin et al. (2014).

Relative frequency of citation index (RFC)

The RFC of the reported species ranged from 0.07 to 0.86%, with an average of only 9% (Table 1). The highest RFC was calculated for domesticated plants such as *Musa sapientum* (0.86%), *Zingiber officinale, Anisophyllea laurina* (0.79% each), *Cola nitida* (0.71%), and farmbush species such as *Nauclea latifolia, Tetracera potatoria* (0.64%) and *Allophylus africanus, Cassia sieberiana, Termitomyces microcarpus* (0.57%). Giday (2001) and Lautenschläger et al. (2018) made similar observations in Ethiopia and Angola respectively with slight differences, like some of the species are more farm bush and domesticated, while we have a mix of forest and domesticated. Lautenschläger (2018) and Ngbolua et al. (2019) used the RFC in their study in Angola and Gabon to determine the most important local plant species of the various communities. Lautenschlager (2018) recorded RFC below 0.05 and 14% between 0.05 and 0.1, and 20% more than 0.1. The values ranged from 0.37 to 0.02, and majority of the species are from the wild.

Use value index (UV) and fidelity index (FL)

The use value (UV) index demonstrates the relative

importance of plant species and families for a population. In the present investigation, the UV of the reported medicinal plant species varied from 1 to 1.9. If a plant secures a high UV score, that indicates there are many use reports for that plant, while a low score indicates fewer use reports cited by the informants. The highest UV was calculated for *Cola nitida* (1.9) followed by *Nauclea latifolia* (1.56), *Zingiber officinale* (1.55) *Ficus exasperata* and *Tetracera potatoria* (1.44). A low UV for plants like *Panicum dinklagei, Parinari excelsa, Pentaclethra macrophylla, Phyllocosmus africanus* and *Piper umbellatum* may be partly due to less accessibility and limited ethnobotanical uses to the informants. Afolayan et al. (2014) employed this analytical tool to do quantification and cross verification of the ethnobotanical information for the management of skin disorders in the study area. They observed twenty-five skin disorders, classified under five categories. The highest ICF (0.45) was linked to bacteria-related skin disorders, comprising of 57 use citations; 3 skin disorders; with sore throat being the most frequently mentioned. Rokaya et al. (2010) Kretchy et al., 2014; Kumar et al., 2010 and Gul et al. (2012) employed the use value index to determine the overall effectiveness of the mentioned plant species in the context of curing skin ailments. They documented 161 plant species belonging to 61 families used for treating 73 human ailments. Gastro-intestinal ailments have the highest ICF (0.40), whereas ophthalmological uses have the lowest (zero) ICF. *Mentha spicata* and *Rumex hastatus* had the highest FL (100% each) both being used for gastro-intestinal ailments.

Fidelity level shows the percentage of informants claiming the use of a certain plant species for the same major purpose. Accordingly, the FL of *Nauclea latifolia (*155.56%) and *Zingiber officinale* (154.55%) were very similar for two different ailments: one for eye problems and the other for bodily pain, while the FL of 100% each were calculated for *Gmelina arborea* and *Cassia occidentalis* for fever diseases. The FL of *Geophila obvallata* and *Citrus limon* was found to be 100% each for the treatment of malaria. Islam et al. (2014) and Malik et al. (2019) used the FL index to determine the relevance of medicinal species in their areas of research. They concluded that, the use value (UV) of *P. granatum* and *O. ferruginea* was higher (0.84), while *P. somniferum* had the highest FC value (98) with *V. thapsus* having the lowest FC (0.13). The RFC value of *P. somniferum* is highest (0.93) among other species. The higher RFC shows the importance of *P. somniferum* in local Piran community in the treatment of cough. Ugulu (2012) used Fidelity level index to determine that *Cucumis sativus* followed by *Rosmarinus officinalis* have the highest use among plant remedies in local communities in Turkey.

Preference ranking

Plant species of various types are used for the treatment of different ailments. In such cases, indigenous people show preference towards plant species on the basis of their healing power against a given disease. Preference ranking was applied to five medicinal plant species used to treat Diarrhea; *Musa sapientum* ranked first followed by *Anisophyllea laurina.* Informants further stated that *Musa sapientum* works best when it is roasted and mixed with honey. Ghani (2003); reported that all parts of the banana plant have medicinal uses, while flowers are used in treating bronchitis, dysentery, menorrhagia and ulcers. Rabbani et al. (2001) described the anti-diarrhoeal activity of green banana diet to be very effective in children with diarrhea, but fruits of *Musa sapientum* L. can also be consumed as a treatment for dysentery (Rahmatullah et al., 2017; Lavanya et al., 2016).

General features of home gardens in the study area

Home gardens vary a lot, but generally tend to be smaller at higher elevations in the Kasewe area due to the apparent high elevation gradient. Gardens are rain fed and are not under any irrigation apart from limited hand watering of vegetables in the dry season. Fongod et al. (2014) observed an increase in the domestication of some wild plants such as *Alstonia boonei* De Wild., *Baillonela toxisperma* Pierre*, Bidens pilosa* L.*, Cymbopgon citratus* (DC.) Stapf*, Senna alata* (Linn.) Roxb., *Eremomastax speciosa* (Hochst.) Cuf., *Centella asiatica* (L.) Urb., *Morinda lucida* Benth.*, Ricinus communis* Linn. by the indigenous people of southern Cameroon. Ibrahim et al. (2016) observed that a total number of 33 plant species were reportedly cultivated by the TMPs in Nasarawa state, Nigeria. Most gardens are dominated by perennials and species that can withstand a 6-month dry season. In the study area, many home gardens contain *Musa paradisiaca* L., *Musa sapientum* L., *Saccharum officinarum* L. and *Cola nitida* (Vent.) Schott and Endl. which were multi-use (medicinal, fruit and income generating) species. Other common crops noted were *Citrus limon* (Linn.) Burm.f.*, Citrus simensis* Osbeck*, Aframomum sp, Carica papaya* Linn., *Hibiscus esculenta* (L.) Moench.*, Capsicum annum* L.*, Allium sativum* L., *Zea mays* L. and *Sorghum bicolor* (L.) Moench*.* Most of the TMP gardens cultivate trees that are easy to propagate and fast growing (*Moringa oleifera* Lam, *Carica papaya* Linn) than other species that are slow growing (Kujawska et al., 2018; Peroni et al., 2016; Poot-Pool et al., 2015; Cheikhyoussef and Embashu 2013). Observed also were trees that were used for dual purposes as for food and medicine as in *Anacardium occidentale* L. (Cashew), *Citrus* spp and *Magnifera indica* L. (Ibrahim et al., 2016; Cheikhyoussef and Embashu 2013; Kumar and Jnanesha 2018).

In terms of home garden management studies in Tilzapotla (Mexico), Ortiz-Sánchez et al. (2015) reported that 84% of plants were cultivated, 17% were enhanced, 15% were tolerated and 4.2% were protected.

Conclusion

The current investigation demonstrates that traditional medicinal plants still form a fundamental part of health care in remote rural locations in Sierra Leone. Knowledge of medicinal plants is strongly associated with the elderly in secret societies (poro and bondo/sande) which are structured along gender lines. This societal delineation and secrecy might have limited the ability of informants in sharing information about the usefulness of some medicinal plants with outsiders. Plant use for medicinal reason actually addresses a significant part of the way of life and customs of the people living in this area. The investigation uncovered that there is still a higher floristic richness in the area, although this is recognized as being under threat by key informants. The forest patches have been impacted by agrarian activities, with logging and charcoal burning consisting of the two major threats to plant life in the forest. There is still a wealth of medicinal plant within the forest, but their long-term survival might be in question as the forces of exploitation collide with conservation needs, limiting future availability of such plants for traditional medicinal use.

As rural-urban development spreads and a growing decline in customary traditions prevails, there is the likelihood that most of the plant knowledge will also disappear as the forest continues to decline. Recording this information is important as the older people might eventually be gone in the near future and the knowledge of medicinal plant use held by them disappears. Medicinal plants in the Kasewe area are also confronted with the risk of destruction since the herbalists claimed to travel longer distances searching for certain medicinal plants that used to be close by. This examination similarly highlighted certain perils faced to the local flora including cultivation, deforestation, logging and charcoal burning that is affecting sustainability. Hence, sound management frameworks ought to be executed for the sustainable use of medicinal flora and safeguarding of traditional knowledge.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Abdurhman N (2010). Ethnobotanical study of medicinal plants used by local people in Ofla Wereda, Southern Zone of Tigray Regional State, Ethiopia, Master thesis, Addis Ababa University.

Abebe FB (2019). Ethnobotanical Studies of Medicinal Plants used to treat Human and Livestock Ailments in Southern Nations, Nationalities and Peoples' Region, Ethiopia: A Systematic Review. Journal of Plant Studies 8(1):1- 9.

Adefa M, Abraha B (2011). Ethnobotanical survey of traditional medicinal plants in Tehuledere district, South Wollo, Ethiopia, Journal of Medicinal Plants Studies 5(26):6233-6242.

Afolayan AJ, Grierson DS, Mbeng WO (2014). Ethnobotanical survey of medicinal plants used in the management of skin disorders among the Xhosa communities of the Amathole District, Eastern Cape, South Africa. Journal of Ethnopharmacology 153(1):220-232.

Agisho H, Osie M, Lambore TS (2014). Traditional medicinal plants utilization, management, and threats in Hadiya Zone, Ethiopia. Journal of Medicinal Plants Studies 2(2):94-108.

Ali R, Khan S, Khan M, Adnan M, Ali I, Khan TA, Haleem S, Rooman M, Norin S, Khan SN (2020). A systematic review of medicinal plants used against Echinococcus granulosus. PLoS ONE 15(10):1-25.

Amatya DM, Skaggs RW, Gregory JD (1996). Effects of controlled drainage on the Hydrology of a drained Pine Planation in Northern Carolina Plains. Journal of Hydrology 181(1-4):211-232.

Amjad MS, Zahoor U, Bussmann RW, Altaf M, Gardazi SMH, Abbasi AM (2020). Ethnobotanical survey of the medicinal flora of Harighal, Azad Jammu & Kashmir, Pakistan. Journal of Ethnobiology and Ethnomedicine 16(65):1-28.

Amsalu N, Bezie Y, Fentahun M, Alemayehu A, Amsalu G (2018). Use and Conservation of Medicinal Plants by Indigenous People of Gozamin Wereda, East Gojjam Zone of Amhara Region, Ethiopia: An Ethnobotanical Approach. Hindawi Evidence-Based Complementary and Alternative Medicine 23 p. https://doi.org/10.1155/2018/2973513

Asfaw ED. Mekuria BA (2016). Prevalence and Correlates of Complementary and Alternative Medicine Use among Hypertensive Patients in Gondar Town, Ethiopia," Evidence-Based Complementary and Alternative Medicine, vol.2016, Article ID 6987636.

Ayantunde AA, Briejer M, Hiernaux P. Udo HMJ, Tabo R (2008). Botanical Knowledge and its Differentiation by Age, Gender and Ethnicity in Southwestern Niger. Human Ecology 36(6):881-889.

Aziz MA, Adnan M, Khan AH, Shahat AA, Al-Said MS, Ullah R (2018). Traditional uses of medicinal plants practiced by the indigenous communities at Mohmand Agency, FATA, Pakistan. Journal of Ethnobiology and Ethnomedicine 14(2):1-16.

Bahadura S, Khan MS, Shah M, Shuaib M, Ahmad M, Zafara M, Begume N, Gula S, Ashfaqa S, Mujahidf I, Hussai F (2020). Traditional usage of medicinal plants among the local communities of Peshawar valley, Pakistan. Acta Ecologica Sinica 40(1):1-29.

Birhan W, Giday M, Teklehaymanot T (2011). The contribution of traditional healers' clinics to public health care system in Addis Ababa, Ethiopia: a cross-sectional study. Journal of Ethnobiology and Ethnomedicine 7(39):1-8.

Cheikhyoussef A, Embashu W (2013). Ethnobotanical knowledge on indigenous fruits in Ohangwena and Oshikoto regions in northern Namibia. J Ethnobiol Ethnomed. 9(1):34-41.

Chekole G (2017). Ethnobotanical study of medicinal plants used against human ailments in Gubalafto District, Northern Ethiopia. Journal of Ethnobiology and Ethnomedicine 13(1):1-29.

Chekole G, Asfaw Z, Kelbessa E (2015). Ethnobotanical study of medicinal plants in the environs of Tara-gedam and Amba remnant forests of Libo Kemkem District, northwest. Ethiopia Journal of Ethnobiology and Ethnomedicine 11(4):1-38.

Chetri BK, Ghalley LR, Penjor D, Dechen K, Gyeltshen T (2018). Ethnobotanical Study on Wealth of Homegardens in Gosiling Gewog of Tsirang District. Asian Journal of Research in Botany 1(2):1-11

Jusu A. Sanchez AC (2014). Medicinal plant trade in Sierra Leone: threats and opportunities for conservation. Economic Botany 68(1):16-29.

Diaz T, George AS, Rao SR, Bangura PS, Baimba JB, McMahon SA, Kabano A (2013). Healthcare seeking for diarrhoea, malaria and pneumonia among children in four poor rural districts in Sierra Leone in the context of free health care: Results of a cross-sectional survey. BMC Public Health 13(157):1-12

Emre G, Dogan A, Haznedaroglu MZ, Senkardes I, Ulger M, Satiroglu A, Emmez BC, Tugay O (2021). An Ethnobotanical Study of Medicinal Plants in Mersin (Turkey). Frontiers in Pharmacology 12(664500):1-20.

Erasto P, Adebola PO, Grierson DS, Afolayan AJ (2005). An ethnobotanical study of plants used for the treatment of diabetes in the Eastern Cape Province, South Africa. African Journal of Biotechnology 4(12):1458-1460

Eshete MA, Kelbessa E, Dalle G (2016). Ethnobotanical study of medicinal plants in Guji Agro-pastoralists, BuleHora district of Borana zone, Oromia region, Ethiopia. Journal of Medicinal Plants Studies

4(2):170-184.
Fongod AGN, Ngoh LM, Veranso MC (2014). Ethnobotany, indigenous knowledge and unconscious preservation of the environment: An evaluation of indigenous knowledge in South and Southwest Regions of Cameroon. International Journal of Biodiversity and Conservation. 6(1):85-99.
Friedman JZ, Dafni YA, Palewitch D (1986). A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among Bedouins in the Negev desert, Israel. Journal of Ethnopharmacology 16(2-3):275-87.
Gari A, Yarlagadda R, Wolde-Mariam M (2015). "Knowledge, attitude, practice, and management of traditional medicine among people of Burka Jato Kebele, West Ethiopia, Journal of Pharmacy and Bioallied Sciences 7(2):136-144.
Ghani A (2003). Chemical constituents and uses, medicinal plants of Bangladesh. Asiatic Society of Bangladesh 434 p.
Ghorbani A (2005). Studies on pharmaceutical ethnobotany in the region of Turkmen Sahra, north of Iran (Part 1): general results. Journal of Ethnopharmacology 102(1):58-68.
Giday M, Teklehaymanot T, Animut A, Mekonnen Y (2007). Medicinal plants of the Shinasha, Agew-awi and Amhara peoples in northwest Ethiopia. Journal of Ethnopharmacology 110(3):516-525.
Giday M (2001). An ethnobotanical study of medicinal plants used by the Zay people in Ethiopia. Journal of ethnopharmacology, 85(1):43-52..
Giday M, Asfaw Z, Elmqvist T, Woldu Z (2003). An ethnobotanical study of medicinal plants used by the Zay People in Ethiopia. Journal of Ethnopharmacology 85(1):43-52.
Gonfa N, Tulu D, Hundera K, Raga D (2020). Ethnobotanical study of medicinal plants, its utilization, and conservation by indigenous people of Gera district, Ethiopia. Cogent Food and Agriculture 6(1):185-201.
Gul F, Shinwari ZK, Afzal I (2012). Screening of indigenous knowledge of herbal remedies for skin diseases among local communities of North West Punjab, Pakistan. Pakistan Journal of Botany 5:1609-1616.
Guimbo DI, Muller J, Larwanou M (2011). Ethnobotanical Knowledge of Men, Women and Children in Rural Niger: A mixed-methods approach. Ethnobotany Research and Applications 9:235-242.
Gurib-Fakim A, Mahomoodally MF (2013). African flora as potential sources of medicinal plants: towards the chemotherapy of major parasitic and other infectious diseases- a review. Jordan Journal of Biological Sciences 147(624):1-8.
Hamilton AC (2004). Medicinal plants, Conservation and Livelihoods. Biodiversity Conservation 13(8):1477-517.
Hosseini SH, Bibak H, Ghara AR, Sahebkar A, Shakeri A (2021). Ethnobotany of the medicinal plants used by the ethnic communities of Kerman province, Southeast Iran. Journal of Ethnobiology and Ethnomedicine 17(31):1-35
Hunde D, Asfaw Z, Kelbessa E (2006). Use of traditional medicinal plants by people of 'Boosat' Sub district, central eastern Ethiopia," Ethiopian Journal of Health Sciences 16(2):141-155.
Hughes GD, Aboyade OM, Beauclair R, Mbamalu ON, Puoane TR (2015). Characterizing Herbal Medicine Use for Noncommunicable Diseases in Urban South Africa. Evidence-Based Complementary and Alternative Medicine Article ID 736074, 10 p. https://doi.org/10.1155/2015/736074
Ibrahim JA, Egharevba HO, Jegede AI, Ugbabe GE, Muazzam I, Kunle OF, Gamaniel KS (2016). Medicinal plants used and the perception of plant endangerment by the traditional medicine practitioners of Nasarawa State, Nigeria: A pilot study. International Journal of Biodiversity and Conservation 8(1):8-20.
Ibrahim JA, Muazzam I, Jegede IA, Kunle OF (2010). Medicinal plants and animals sold by the "YanShimfidas" of Sabo Wuse in Niger State, Nigeria. African Journal of Pharmacy and Pharmacology 4(6):386-394.
Islam MK, Saha S, Mahmud I, Mohamad K, Awang K, Uddin SJ, Rahman MM, Shilpi JA (2014). An ethnobotanical study of medicinal plants used by tribal and native people of Madhupur forest area, Bangladesh. Journal of Ethnopharmacology 151(2):921-30.
James PB, Bah AJ (2014). Awareness, use, attitude and perceived need for Complementary and Alternative Medicine (CAM) education among undergraduate pharmacy students in Sierra Leone: a descriptive cross-sectional survey. BMC complementary and alternative medicine 14(1):1-9.
James PB, Kamara H, Bah AJ, Steel A, Wardle J (2018). Herbal medicine use among hypertensive patients attending public and private health facilities in Freetown Sierra Leone. Complementary Therapies in Clinical Practice 31:7-15.
James PB, Bah AJ, Kondorvoh IM (2016). "Exploring self-use, attitude and interest to study complementary and alternative medicine (CAM) among final year undergraduate medical, pharmacy and nursing students in Sierra Leone: A comparative study," BMC Complementary and Alternative Medicine 16(1):1-8.
Jima TT, Megersa M (2018). Ethnobotanical Study of Medicinal Plants Used to Treat Human Diseases in Berbere District, Bale Zone of Oromia Regional State, South East Ethiopia. Hindawi. Evidence-Based Complementary and Alternative Medicine 2018:1-17.
Kabba M (2016). Ethnobotanical survey of medicinal plants used to treat illnesses by local people around Kasewe forest reserve, Moyamba district, Sierra Leone. Master thesis submitted to the Department of Biological Sciences, School of Environmental Sciences, Njala University.
Kadir MF, Bin Sayeed MS, Setu NI, Mostafa A, Mia MMK (2014). Ethnopharmacological survey of medicinal plants used by traditional health practitioners in Thanchi, Bandarban Hill Tracts, Bangladesh, Journal of Ethnopharmacology 155(1):1-16.
Kretchy IA, Owusu-Daaku F, Danquah S (2014). Patterns and determinants of the use of complementary and alternative medicine: a cross-sectional study of hypertensive patients in Ghana. BMC Complementary and Alternative Medicine 14(44):1-7.
Kujawska M, Zamudio F, Montit L, Carrillo VP (2018). Effects of Landscape Structure on Medicinal Plant Richness in Home Gardens: Evidence for the Environmental Scarcity Compensation Hypothesis Economic Botany 72(2):150-165.
Kumar A, Jnanesha AC (2018). Role and Cultivation of Important Medicinal Plants. In.Research Trends in Medicinal Plant Sciences. Eds. Manzoor Hussain. AkiNik Publications, Delhi, India 17(11):67-70
Kumar DS, Sharathnath KV, Yogeswaran P, Harani A, Sudhakar K, Sudha P, Banji D (2010). A Medicinal potency of *Momordica charantia.* International Journal of Pharmaceutical Sciences Review and Research 1(2):95-100.
Kumar A, Pandey VC, Singh AG, Tewari DD (2013). Traditional uses of medicinal plants for dermatological healthcare management practices by the Tharu tribal community of Uttar Pradesh, India. Genetic Resources and Crop Evolution 60(1):203-224.
Kyoshabire M, Katuura E, Cunningham AB, Hoeft R (2017). Medicinal plants and herbalist preferences around Bwindi Impenetrable National Park. Journal of Medicinal Plants Research 11(8):161-170.
Lagnika L, Djehoue R, Yedomonhan H, Sanni A (2016). Ethnobotanical survey of medicinal plants used in malaria management in South Benin. Journal of Medicinal Plants Research 10(41):748-756.
Langat D, Khalwale T, Kisiwa A, and Ongugo P (2021). Indigenous traditional knowledge on landscapes, Biodiversity use in mount Elgon Forest ecosystem and implications for conservation. East African Agricultural and Forestry Journal 84(1):101-112. Retrieved from https://www.kalro.org/www.eaafj.or.ke/index.php/path/article/view/352
Lautenschläger T, Mawunu M, Macuntima P, Mandombe JL, Makaya FB, Heinze C, Neinhuis C (2018). First large-scale ethnobotanical survey in the province of Uíge, Northern Angola. Journal of Ethnobiology and Ethnomedicine 14(51):1-73.
Lavanya K, Abi-Beaulah G, Vani G (2016). *Musa paradisiaca* – A Review on phytochemistry and pharmacology. World Journal of Pharmaceutical and Medical Research 2(6):163-173.
Lebbie AR, Guries RP (1995). Ethnobotanical value and conservation of Sacred groves of the Kpaa Mende in Sierra Leone. Economic Botany 49(3):297-308.
Lebbie AR, Turay M (2017). Prevalence of Snakebites and use of antivenom plants in Southern Sierra Leone. Sierra Leone Journal of Biomedical Research A publication of the College of Medicine and Allied Health Sciences, University of Sierra Leone. Sierra Leone Journal of Biomedical Research 9(1):7-13.

Lebbie A, Kouamé F, Kouassi E (2017). Specialization in ethnomedicinal plant knowledge among herbalists in the forest region of Rivercess County, Liberia. Journal of Medicinal Plants Research 11(14):264-274.

Luitel DR, Rokaya MB, Timsina B, Münzbergová Z (2014). Medicinal plants used by the Tamang community in the Makawanpur district of central Nepal. Journal of Ethnobiology and Ethnomedicine, 10(5):1-17.

Lytwyna J, Burkea K, Culver S (2006). The nature and location of the suture zone in the Rokelide orogen, Sierra Leone: Geochemical evidence. Journal of African Earth Sciences 46(5):439-454.

Malik K, Ahmad M, Zafar M, Ullah R, Mahmood HM, Parveen B, Rashid N, Sultana S, Shah SN, Lubna (2019). An ethnobotanical study of medicinal plants used to treat skin diseases in northern Pakistan BMC Complementary and Alternative Medicine 19(210):1-38.

Malik K, Ahmad M, Zafar M, Ullah R, Mahmood HM, Parveen B, Megersa M, Asfaw Z, Kelbessa E, Beyene A, Woldeab B (2013). An ethnobotanical study of medicinal plants in Wayu Tuka District, East Welega Zone of Oromia Regional State, West Ethiopia. Journal of Ethnobiology and Ethnomedicine 9(68):1-18.

Mbuni YM, Wang S, Mwangi BN, Mbari NJ, Musili PM, Walter NO, Hu G, Zhou Y, Wang Q (2020). Medicinal plants and their traditional uses in local communities around Cherangani Hills, Western Kenya. Plants 9(3):331.

Mesfin F, Seta T, Assefa A (2014). An Ethnobotanical Study of Medicinal Plants in Amaro Woreda, Ethiopia. Ethnobotany Research and Applications 12:341-354.

Morka AB (2021). Ethnobotanical Study of Medicinal plants by Shenasha People in Dibati District North West Ethiopia. International Journal of Advanced Research in Biological Sciences 8(5):116-137.

Morshed AJM, Nandni NC (2012). Indigenous Medicinal Plants Used by the Tribal Healers of Chittagong Hill Tracts to treat Diarrhoea and Dysentery. Hamdard Medicus 55(2):48-66.

Naghibi F, Esmaeili S, Malekmohammadi M, Hassanpour A, Mosaddegh M (2014). Ethnobotanical survey of medicinal plants used traditionally in two villages of Hamedan, Iran. Iranian Journal of Pharmaceutical Research 1(3):7-14.

Nankaya J, Gichuki N, Lukhoba C, Balslev H (2019). Medicinal Plants of the Maasai of Kenya: A Review. Plants 9(44):1-17

Ngbolua KTN, Inkoto CL, Mongo NL, Masengo A, Masens YB, Mpiana PT, Étude AD (2019). ethnobotanique et floristique de quelques plantes médicinales commercialisées à Kinshasa, République Démocratique du Congo. Revue Marocine des Sciences Agronomiques et Véterinaires 7(1):118-28.

OCHA (2015). Sierra Leone: Moyamba District Profile Published by the UN Office for the Coordination of Humanitarian Affairs. News and Press Release. Moyamba town, Sierra Leone.

Onyiapat JLE, Okoronkwo IL, Ogbonnaya NP (2011). Complementary and alternative medicine use among adultsin Enugu, Nigeria,"BMC Complementary and Alternative Medicine 11(19):1-6.

Opara ER, Osayi KK (2016). Factors Affecting Utilization of Herbal Medicine as Livelihood Alternatives among Residents of Imo State: The Role of Social Work Professionals," Journal of Humanities and Social Science 21(5):66-78.

Ortiz-Sánchez A, Monroy-Ortiz C, Romero-Manzanares A, Luna-Cavazos M, Castillo-España P (2015). Multipurpose functions of home gardens for family subsistence. Botanical Sciences 93(4):791-806.

Otang WM, Grierson DS, Ndip RN (2012). Ethnobotanical survey of medicinal plants used in the management of opportunistic fungal infections in HIV/AIDS patients in the Amathole District of the Eastern Cape Province, South Africa. Journal of Medicinal Plants Research. 6(11):2071-2080.

Peroni N, Hanazaki N, Begossi A, Zuchiwschi E, Lacerda VD, Miranda TM (2016). Home gardens in a microregional scale: Contribution to agrobiodiversity conservation in an urban-rural context. Ethnobiology and Conservation 5(6):110-123.

Poffenberger M, McGean B, Khare S, Campbell J (1992). Field Methods Manual, Vol II. Community Forest Economy and Use Pattern: Participatory and Rural Appraisal (PRA) Methods in South Gujarat India, Society for Promotion of Wastelands Development 2:1-56.

Poot-Pool WS, van der Wal H, Flores-Guido S, Pat-Fernández JM, Esparza-Olguín L (2015). Home garden agrobiodiversity differentiates along a rural –peri-urban gradient in Campeche, Mexico. Economic Botany 69(3):203-217.

Rabbani GH, Teka T, Zaman B, Majid N, Khatun M, Fuchs GJ (2001). Clinical studies in persistent diarrhea. Dietary management with green banana or pectin in Bangladeshian children. Gastroenterol. 121(3):554-560.

Rahmatullah M, Mukti IJ, Haque AKMF, Mollik MAH, Parvin K, Jahan R, Chowdhury MH, Regassa R, Bekele T, Megersa M (2017). "Ethnobotanical study of traditional medicinal plants used to treat human ailments by Halaba people, southern Ethiopia. Journal of Medicinal Plants Studies 5(4):36-47.

Ranasinghe S, Ansumana R, Lamin JM, Bockarie AS, Bangura U, Buanie JAG, Stenger DA, Jacobsen KH (2015). Herbs and herbal combinations used to treat suspected malaria in Bo, Sierra Leone, Journal of Ethnopharmacology 166:200-204.

Rokaya MB, Münzbergová Z, Timsina B (2010). Ethnobotanical study of medicinal plants from the Humla district of western Nepal. Journal of Ethnopharmacology 130(3):485-504.

Sanhokwe M, Mupangwa J, Masika PJ, Maphosa V, Muchenje V (2016). Medicinal plants used to control internal and external parasites in goats' Onderstepoort. Journal of Veterinary Research 83(1):1-7.

Sankoh L (2017). Assessment of the distribution and diversity of fodder tree graze by livestock around Tecko Livestock Research Center, Northern Sierra Leone**.** Dissertation submitted to the Department of Forestry, School of Natural Resources Management, Njala University.

Silva FS, Ramos MA, Hanazaki N (2011). Dynamics of traditional knowledge of medicinal plants in a rural community in the Brazilian semi-arid region. Revista Brasileira de Farmacognosia. Brazilian Journal of Pharmacognosy 21(3):382-391.

Soladoye MO, Adetayo MO, Chukwuma EC, Adetunji AN (2010). Ethnobotanical Survey of Plants Used in the Treatment of Haemorrhoids in South-Western Nigeria. Annals of Biological Research 1(4):1-15.

Song MJ, Kim H, Heldenbrand B, Jeon J, Lee S (2013). Ethnopharmacological survey of medicinal plants in Jeju Island, Korea. Journal of Ethnobiology and Ethnomedicine 9(48):1-8

Stangeland T, Alele PE, Katuura E, Lye KA (2011). Plants used to treat malaria in Nyakayojo sub county, Western Uganda. Journal of Ethnopharmacology 137(1):154-66.

Statistics Sierra Leone (2015). Population and Housing Census. Published by: Statistics Sierra Leone. P.M.B 595 A.J. Momoh Street, Tower Hill, Freetown. Sierra Leone. http://www.statistics.sl Accesséd August 2020.

Tabuti JRS, Dhillion SS, Lye KA (2003).Traditional medicine in Bulamogi county, Uganda: Its practitioners, users and viability. Journal of Ethnopharmacology 85(1):119 -29.

Tabuti JRS, Lye KA, Dhillion SS (2013). Traditional herbal drugs of Bulamogi, Uganda: plants, use and administration. Journal of Ethnopharmacology 88(2003):19-44.

Tardio J, Pardo-DE-Santayana M (2008). Cultural Importance Indices: A Comparative Analysis Based on the Useful Wild Plants of Southern Cantabria (Northern Spain) Economic Botany 62(1):24-39.

Tora A, Heliso T (2017). Assessment of the Indigenous Knowledge and Use of Traditional Medicinal Plants in Wolaita Zone, Southern Ethiopia. International Journal of Medicinal Plants and Natural Products 3(1):16-22.

Tounekti T, Mahdhi M, Khemira H (2019). Ethnobotanical Study of Indigenous Medicinal Plants of Jazan Region, Saudi Arabia Hindawi. Evidence-Based Complementary and Alternative Medicine 1-46.

Tsioutsiou EE, Giordani P, Hanlidou E, Biagi M, De Feo V, Cornara L (2019). Ethnobotanical Study of Medicinal Plants Used in Central Macedonia, Greece. Hindawi Evidence-Based Complementary and Alternative Medicine pp. 1-22. https://doi.org/10.1155/2019/4513792

Tsobou R, Mapongmetsem PM, Igor VK, Damme PV (2015). Phytochemical screening and antibacterial activity of medicinal plants used to treat typhoid fever in Bamboutos division, West Cameroon. Journal of Applied Pharmaceutical Science 5(6):34-49.

Ugulu I (2012). Fidelity Level and Knowledge of Medicinal Plants Used to Make Therapeutic Turkish Baths. Ethno-Medicine 6(1):1-9.

UNEP (2008). World Database on Protected Areas: Site Information, UN Environment Programme World Conservation Monitoring Centre. https://www.unep-wcmc.org 12 January 2020

Urso V, Signorini MA, Tonini M, Bruschi P (2016). Wild medicinal and food plants used by communities living in mopane woodlands of southern Angola: results of an ethnobotanical field investigation. Journal of Ethnopharmacology 177:126-39.

Van der Merwe D, Swan GE, Botha C J (2001). Use of ethnoveterinary medicinal plants in cattle by Setswana-speaking people in the Madikwe area of the North West Province. Journal of the South African Veterinary Association 72(4):189-196.

Voeks RA, Leony A (2004). Forgetting the forest: assessing medicinal plant erosion in eastern Brazil. Economic botany 58(supplement):294-306.

World Health Organization (WHO) (2008). Fact sheetN◦134, http://www.who.int/mediacentre/factsheets/2003/fs134/en/. www.iucnredlist.org Accesséd January 2020

Yineger H, Yewhalaw D (2007). “Traditional medicinal plant knowledge and use by local healers in Sekoru District, Jimma Zone, Southwestern Ethiopia,” Journal of Ethnobiology and Ethnomedicine, 3(24):1-7.