



Floristic Composition and Herbaceous Aboveground Dry Weight Biomass of Afroalpine Vegetation in Guassa Community Conservation Area, North Shewa, Ethiopia

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Abstract

*In this research, the floristic composition and aboveground dry weight biomass of the vegetation of Guassa Community Conservation Area was described. The sample plots were 3 m x 3 m for shrubs and 1 m x 1 m for herbaceous plants species. Herbaceous plant species for aboveground biomass estimation was clipped from three 25 cm x 25 cm quadrat of the main quadrat. The result of this study showed that a total of 82 species in 60 genera and 27 plant families were recorded. Eleven of them are endemic and three of them are nearly endemic to Ethiopia. Of the 27 plant families, the family Asteraceae has the highest number of species (20) followed by Poaceae with nine species, Cyperaceae and Scrophulariaceae with six species each. Of the total species, nine (11%) were shrubs, 71 (86.5%) were herbs and two (2.4%) were ferns. Six community types were identified and described from the area. The net aboveground biomass of the area is 480.38 g m⁻². More than 52% of the biomass was contributed by six species. The most frequently occurring species are *Alchemilla abyssinica* and *Thymus schimperi* with relative frequency of 11.2% and 9.2% respectively.*

Keywords: Biomass, Endemic, Floristic Composition, community, Guassa.

Introduction

Ethiopia is a country with great geographical diversity ranging from 126 m below sea-level (Afar depression) to 4,620 m above sea level (Ras Dejen) comprising highland plateaus, mountain ranges, streams and rivers. These geographical diversities have given Ethiopia a wide spectrum of habitats and a large number of endemic plants and animals^{1,2}. Research indicated that these habitats have high diversity of vegetation types, ranging from afroalpine vegetation to desert vegetation³.

High lands are favorable and hospitable for habitation and agricultural activities. As a result of this, most people live in the fertile highlands of the 'WOINA DEGA' (midlands, 1,500 - 2,300m) and 'DEGA' (highlands, 2,300 - 3,200) agro-climatic zones. Afroalpine areas, which cover 2% of the total land of Ethiopia, the largest area from Afrotropical area, are mostly unfavorable and inhospitable for habitation and crop production but they harbor a number of plant and animal species of which some are endemic to Ethiopia⁴. However, as a result of an increase in population, human settlements extended up to WURCH zone, which is an Afroalpine zone^{5,6}. As a result, afroalpine ecosystems are seriously affected by human interference. This is mainly due to high human population pressure and unregulated human activities⁷⁻¹⁰. Therefore, afroalpine habitats need special attention to protect the biodiversity that exist there.

Local communities, although can be the cause for threats to biodiversity, in different parts of Ethiopia, they have also different traditional methods by which they protect biodiversity. For example, in the southwest parts of Ethiopia, different traditional forest management arrangements have been used¹¹⁻¹³. North Shewa Zone of Amhara Regional State, the Guassa area of Menz, the site of this study, is part of the country where local people have contributed to the conservation of biodiversity using the traditional conservation system known as Qero. Under this system, the area has been closed and opened for use within some years for about hundreds of years since the 17th century¹⁴.

The Guassa community conservation area of Menz, one of the afroalpine habitats in Ethiopia, needs scientific management systems that strengthen the traditional one. Therefore, this study was initiated to understand the vegetation of the area, which in turn is important in conservation and management of the vegetation resource of the area in line with the traditional method of conservation and management system that existed there for centuries.

Materials and Methods

The Study Area: The study site of this research, the Guassa area, is located in the central highlands of Ethiopia at latitudinal range of 10^o15' - 10^o27'N and longitude 39^o45' - 39^o49'E^{15,16}. It is located 265 km NE of Addis Ababa, in North Shewa Zone of Amhara National Regional State. The total area of the Guassa is

111 km² with altitudes ranging from 3200 up to 3700 m a. s. l. forming part of the high-altitude plateau of the central Ethiopian highlands¹⁴⁻¹⁶.

The communities around Guassa have been implementing a traditional conservation system for hundreds of years, known as the “QERO” system. It is an indigenous institution adopted by those peoples that were influential in the area at the time. These influential peoples were members of the land holding group in the ASTME IRST land tenure system to manage and protect the common property resources of the Guassa area. The system was started by the pioneer fathers (AQGNI ABAT), ASBO and GERA, in the 17th Century¹⁶. It is indicated the primary purpose of the two fathers to set the Guassa area aside was for livestock grazing and use of the guassa (*Festuca*) grass for making different household and agricultural materials.

Under this system, an area has been protected from all types of interference for 4–5 years until the community elders allowed the people to cut the grass such as *Festuca* grass for thatching, collect fuel wood and graze livestock. After this, all the communities around Guassa enter the site freely until the community elders close the site again on 12 July (‘HAMLE ABO’).

Therefore, this ancient indigenous common property resource management system, although it was not designed to conserve the biodiversity of the ecosystem, it has enabled sustainable utilization, effective protection and fair distribution of the biodiversity of the Afroalpine ecosystem of the area for around 400 years.

Guassa area harbor endemic species of fauna and flora^{14,17}. The vegetation of the Guassa area is characterized by high altitude Afroalpine communities. The commonly observed afroalpine vegetation communities in the area are *Euryops* shrubland, *Festuca* grassland, *Helichrysum-Fesutca* grassland, and *Erica* shrubland. The name of the area (Guassa area) is derived from the commonly known and very useful grass called “Guassa grass”. The area also contains animals like threatened Ankober Serin (*Serinus ankoberensis*), Ethiopian wolf (*Canis simensis*) and Gelada (*Theropithecus gelada*).

Data Collection and Analysis: Data were collected between 26 October 2008 and 22 November 2008. Fifteen sample sites were purposively selected based on variation in vegetation and homogeneity and representativeness of the sample site¹⁸. Each site received from 5 to 15 quadrats based on the size of the site. For this research, a total of 147 quadrats with a size of 3 m x 3 m (9 m²) for shrubby species and three subplots of 1 m x 1 m for herbaceous species were laid out along a transect at an interval of 25 m between each quadrat. Herbaceous aboveground biomass was assessed by harvesting samples from three 25 cm x 25 cm subplots of each main plot.

All the plant species in the quadrat were collected and recorded for the vegetation analysis. The collected plant specimens were pressed properly and brought to the National Herbarium (ETH), Addis Ababa University for identification of species type. The specimens were dried and identified by using authenticated specimens, consulting experts and referring to the Flora of Ethiopia and Eritrea.

Visual estimates of percent cover for each plant species were recorded. The visually estimated percent cover at field then rated according to 1-9 scale of modified Braun Blanquet approach for classification¹⁹. Hierarchical cluster analysis was used to identify plant communities using PC-ORD, version 4.2 computer program.

Each of the herbaceous plant species clipped at ground level, sorted in to species and separately collected in paper bag and brought to the Eco-Physiology of the College of Natural Science. The species were first air-dried and then oven-dried at 80°C for 24 hr and weighed.

Shannon-Wiener index of species diversity was applied to quantify species diversity. Sørensen’s similarity coefficient, $S_s = 2C/A + B \times 100$ was used to assesses similarity between communities as discussed in Muller-Dombois D. et. al.¹⁸.

Results and Discussion

Floristic Composition: The result of this research showed that, a total of 82 plant species in 60 genera and 27 plant families were recorded from the Guassa Community Conservation Area including species recorded outside the quadrat (Appendix 1). Of these 76 species were recorded within the sampling units. Of the total species, nine (11%) were shrubs, 71 (86.6 %) were herbs including grasses and sedges and 2 species (2.4 %) were ferns.

Eleven of the taxa are endemic to Ethiopia. These are *Chiliocephalum tegetum*, *Cineraria abyssinica*, *Cynoglossum coeruleum* subsp. *coeruleum*, *Euryops pinifolius*, *Festuca macrophylla*, *Kniphofia foliosa*, *Lobelia rhynchopetalum*, *Peucedanum mattirolii*, *Senecio schultzii*, *Senecio steudelii* and *Urtica simensis*. In addition there are also three near-endemic species to Ethiopia which are also found in Eritrea. These are *Anchusa affinis*, *Plectocephalus varians* and *Thymus schimperi*. The endemic species account for 13.4 % of the total species, which is higher than the 10% endemism of the Ethiopian Flora. This indicates that the area is rich in endemic species of plants. Some of the endemic taxa like *Festuca macrophylla*, *Kniphofia foliosa*, *Urtica simensis* and *Cynoglossum coeruleum* subsp. *coeruleum* are in the IUCN Red list categories.

The area had mean species richness of seven species per plot, and the highest was 11 species per plot. Of the 27 plant families, Asteraceae has the highest number of species (20) followed by Poaceae with nine species, Cyperaceae and Scrophulariaceae were represented with six species each. These four families

contained 50% of the total species recorded in the study area and 13 families were represented only by one species each (Table 1). Of the total families, the dicots constituted 70.4%, monocots 22.2% and pteridophytes 7.4 %.

From the results of the composition of plants, it is possible to say that the area contains all the five “typical” afroalpine Life-forms (as defined by Hedberg), namely Giant Rosette Plants (e.g. *Lobelia rhynchopetalum*), Tussock Grasses (and Sedges) (e.g. *Agrostis gracilifolia*, *Carex monostachya*, *Festuca abyssinica*, *Festuca macrophylla*) Acaulescent Rosette Plants (e.g. *Haplocarpha rueppellii*), Sclerophyllous (and Dwarf-Shrubs) (e.g. *Erica* spp., *Bartsia longiflora*), and Cushion Plants (e.g. *Helichrysum* spp., *Haplocarpha rueppellii*, occasionally)

Plant communities: The result of this research showed that there are six plant communities in the Guassa community

conservation area. These six plant communities were derived from the hierarchical cluster analysis using Distance measure of Euclidian distance and similarity analysis of minimum variance or error sums of squares cluster analysis (Ward’s method) (Figure-1). The hierarchical cluster analysis was based on cover abundance data of 76 species in 147 plots. The decision on the number of groups was based on 38% similarity level.

The identified communities were shown in a synoptic table so as to recognise the community and characterize them. In the table, each column represents a community type, and each row represents species with synoptic value. The values are the products of average cover abundance value and frequency in the type. The synoptic values were used to clearly determine the dominant species in the community. From the synoptic value of each species in each cluster, plant community types were recognized. Table-2 shows the community types along with the synoptic values of the species.

Table-1
List of plant families with number of genera, species and percentage

Family	Genera	Species	Percentage
Asteraceae(Compositae)	13	20	24.4
Boraginaceae	2	3	3.7
Crassulaceae	2	2	2.4
Cyperaceae	3	6	7.3
Dipsacaceae	2	2	2.4
Ericaceae	1	2	2.4
Fabaceae(Leguminosae)	2	4	4.9
Gentianaceae	1	2	2.4
Lamiaceae (Labiatae)	4	4	4.9
Poaceae(Gramineae)	5	9	11.0
Polygonaceae	1	2	2.4
Rosaceae	2	4	4.9
Scrophulariaceae	6	6	7.3
Apiaceae(Umbelliferae)	3	3	3.7
Others	13	13	15.6

Table-2
Synoptic value of species with at least one value ≥ 1.0 in one of the communities. Values in bold indicate the species used in the naming of community types

Communtiy type	C-1	C-2	C-3	C-4	C-5	C-6
No. of quqadrats	32	23	16	17	30	29
<i>Alchemilla abyssinica</i>	6.2	4.3	0.5	5.5	0.4	4.3
<i>Euryops pinifolius</i>	5.6	0.9	0.0	0.1	0.1	0.1
<i>Rytidosperma subulata</i>	0.2	6.2	0.0	0.0	0.2	0.1
<i>Festuca abyssinica</i>	0.1	4.3	0.0	0.0	0.2	0.0
<i>Festuca richardii</i>	0.0	3.4	0.0	0.0	0.0	0.0
<i>Alchemilla ellenbecki</i>	0.0	0.0	5.8	0.0	0.0	0.0
<i>Carex monostachya</i>	0.0	0.0	5.1	0.0	0.0	0.0
<i>Kniphofia foliosa</i>	0.6	0.0	1.5	0.1	0.0	0.2
<i>Hypericum revolutum</i>	0.1	0.0	0.0	6.8	0.0	0.1
<i>Veronica glandulosa</i>	0.5	0.0	0.1	5.5	0.0	0.3
<i>Andropogon lima</i>	0.0	0.0	0.0	3.6	0.7	0.5
<i>Rubus volkensii</i>	0.0	0.0	0.0	3.6	0.0	0.0
<i>Dicrocephala chrysanthemifolia</i>	0.0	0.0	0.0	1.2	0.0	0.0
<i>Thymus schimperii</i>	0.7	5.7	0.0	0.0	6.4	4.6
<i>Erica arborea</i>	0.0	0.0	0.0	0.0	6.2	0.0
<i>Festuca macrophylla</i>	0.0	0.0	0.0	0.2	1.7	7.3
<i>Helichrysum splendidum</i>	0.0	2.5	0.4	0.0	3.8	4.6

The six types of classified communities are described below and the letters C1 up to C6 represents the community type.

Alchemilla abyssinica- Euryops pinifolius (C1): This community is dominated by *Alchemilla abyssinica*, and *Euryops pinifolius*. *Veronica glandulosa*, *Kniphofia foliosa* and *Thymus schimperii* are also found in association with in this community. This community type consists of 36 species in 32 quadrats.

Rytidosperma subulata- Festuca abyssinica (C2): This community is dominated by *Rytidosperma subulata* and *Festuca abyssinica*. *Festuca richardi* is the characteristic species in this community. *Alchemilla abyssinica*, *Helichrysum splendidum*

and *Thymus schimperii* are common in this community. It consists of 16 species in 23 quadrats.

Alchemilla ellenbecki- Carex monostachya (C3): This community type is dominated by *Alchemilla ellenbecki* and *Carex monostachya*, which are the characteristic species. *Kniphofia foliosa* is also common in this community. This community type dominantly covered the swamps and boggy areas that occur on entirely flat or only slightly sloping ground. The community consists of 28 species in 16 quadrats.

Hypericum revolutum- Veronica glandulosa (C4): In this community type, *Hypericum revolutum* and *Veronica*

glandulosa are the dominant species. *Andropogon lima*, *Rubus volkensii*, *Dicrocephala chrysanthemifolia* and *Alchemilla abyssinica* are common species in this community. *Rubus volkensii* and *Dicrocephala chrysanthemifolia* are characteristic species as well. This community consists of 23 species in 17 quadrats.

Thymus schimperi- Erica arborea (C5): In this community type, *Thymus shimperi* and *Erica arborea* are the dominant species. *Erica arborea* is the characteristic species. *Festuca macrophylla* and *Helichrysum splendidum* are common in this community. It consists of 35 species in 30 quadrats. This community type dominantly covered the upper parts of hills. All *Erica arborea* species individuals are shrubby. This may be due to continuous collection of the species by local people because of high demand for fuelwood and construction.

Festuca macrophylla- Helichrysum splendidum (C6): *Festuca macrophylla* and *Helichrysum splendidum* are the dominant species in the community. *Alchemilla abyssinica* and *Thymus schimperi* are also common in this community. The community consists of 31 species in 29 quadrats. This community type dominantly covered the lower parts of hills and flat ground. Local peoples give less value for *Helichrysum splendidum* to collect for fuel wood and construction and hence it is highly dominant in the area.

Festuca species are highly valued by the local people because of their multipurpose uses, serving as raw material to make various equipment and providing income from sell of the grass. Even though that is the case, *Festuca macrophylla* is highly dominant in the area. This is because of the most distinctive features of this life form system (Hedberg, 1964) as an adaptation for Afroalpine environment.

Species Diversity, Richness and Evenness: The diversity of each community was calculated using Shannon diversity index based on cover abundance value of each species as input source. The Shannon Diversity computed for the six communities (Table 3) shows that community types one, five and six have high species diversity and richness while community types two, three and four have relatively low diversity and richness. Generally, community type five is the most diverse whereas community type two is the least diverse. Species in community four are more evenly distributed than the others whereas species in community three are less evenly distributed. Differences in the diversity of species among the community may be related with nature of the soil, altitude, slope and disturbance.

Table-3
 Diversity indices of the six communities

Community type	Species richness	Species diversity	Species evenness
C1	35	3.23	0.91
C2	17	2.54	0.89
C3	29	2.97	0.88
C4	22	2.87	0.93
C5	37	3.24	0.90
C6	33	3.20	0.91

Table-4
 Similarity between the six communities using Sorensen's similarity coefficient

		C1	C2	C3	C4	C5	C6		
Dissimilarity	C1		50	37.5	44.1	53.5	65.5	Similarity	
	C2	50		31.8	27.6	43.1	59.6		
	C3	62.5	68.2		15.7	22.2	30.5		
	C4	55.9	72.4	84.3		48.3	55.5		
	C5	46.5	56.9	77.8	51.7		69.7		
	C6	34.5	40.4	69.5	44.5	30.3			

Dissimilarity

Similarity between Communities: The results from Sorensen’s similarity coefficient showed that the most similar communities are communities five and six with 69.7% similarity coefficient, whereas the most dissimilar communities are communities three and four with 84.3% dissimilarity coefficient. The similarity between communities one and two is 50%. The higher similarity may be due to their proximity, climatic and edaphic condition and degree of anthropogenic interferences. The table below (Table 4) shows the result of Sorensen’s similarity and dissimilarity coefficients.

Aboveground Biomass Contribution of Herbaceous Species: The results from biomass measurements showed that, the net aboveground biomass of the study area is 480.38 g m⁻². Determination of this biomass is important for ecological and management process in vegetation. It helps to determine fertility and carrying capacity of the area. At species level, *Alchemilla abyssinica*, *Festuca macrophyla*, *Rytidosperma subulata*, *Thymus schimperii*, *Andropogon lima* and *Carex monostachya*, are the six top biomass contributors in the area, providing more than 52% of the biomass. Of these, the first four species account for more than 39% of the biomass.

At family level, Poaceae is the top biomass contributor of the area (33.6%) followed by Rosaceae (14.2%), Lamiaceae (11%) and Asteraceae (9.9%). The family Onagraceae, Crassulaceae, Iridiaceae and Juncaceae are the least biomass contributors of

the area, less than 1% altogether (Table-5).

Conclusion

A total of 82 species were identified from the afroalpine vegetation of Guassa area. Of these, eleven taxa are endemic to Ethiopia and three species are near endemic. The study area has net aboveground biomass of 480.38 g m⁻². Even though the area is composed of such very important and endemic plant species, the researcher observed and different studies indicated that, even though the local people preserved the area until today with its biological resource with the help of the traditional management system (QERO system), now it is under pressure. Human encroachment has been progressively increasing in this area especially within the last few years. Thus, one of the country’s natural resource centres is in danger of destruction if the trend continues unabated. Hence, measures by the concerned bodies that assist the traditional method of managing the area will be decisive in conserving and rationally utilizing this fragile high plateau ecosystem.

Finally, as this study is a preliminary investigation, it is recommended that the area be further investigated for its biological resources to conserve and sustainably utilize the afroalpine ecosystem based on the experience of local people management system that has been exercised for centuries.

Table-5
List of families with percent biomass contribution

Families	Percent biomass	Families	Percent biomass
Apiaceae (Umbelliferae)	1.2	Iridiaceae	0.1
Asphodelaceae	4.4	Juncaceae	0.0
Asteraceae(Compositae)	9.9	Lamiaceae(Labiatae)	11.0
Boraginaceae	2.6	Onagraceae	0.3
Caryophyllaceae	0.8	Poaceae (Gramineae)	33.6
Crassulaceae	0.2	Polygonaceae	1.2
Cyperaceae	6.7	Ranunculaceae	1.3
Dipsacaceae	3.1	Rosaceae	14.2
Fabaceae(Leguminosae)	2.9	Rubiaceae	0.6
Gentianaceae	1.0	Scrophulariaceae	4.8

Appendix-1
List of species with their family and habit recorded from Guassa area

Scientific name of species with authority name(s)	Family name	Habit
<i>Aeonium leucoblepharum</i> A. Rich.	Crassulaceae	H
<i>Agrocharis melanantha</i> Hochst.	Apiaceae (Umbelliferae)	H
<i>Agrostis gracilifolia</i> C. E. Hubb	Poaceae (Gramineae)	H
<i>Agrostis quinqueseta</i> (Hochst. ex Steud.) Hochst.	Poaceae (Gramineae)	H
<i>Alchemilla abyssinica</i> Fresen.	Rosaceae	H
<i>Alchemilla ellenbecki</i> Engl.	Rosaceae	H
<i>Alchemilla kiwuensis</i> Engl.	Rosaceae	H
<i>Anchusa affinis</i> R.Br. ex DC.	Boraginaceae	H
<i>Andropogon lima</i> (Hack.) Stapf	Poaceae	H
<i>Andropogon amethystinus</i> Steud.	Poaceae	H
<i>Anthemis tigreensis</i> J. Gay ex A. Rich.	Asteraceae (Compositae)	H
<i>Argyrolobium ramosissimum</i> Bak.	Fabaceae (Leguminosae)	H
<i>Argyrolobium rupestre</i> (E. Mey.) Walp.	Fabaceae (Leguminosae)	H
<i>Artemisia abyssinica</i> Sch. Bip. ex A. Rich.	Asteraceae (Compositae)	H
<i>Bartsia longiflora</i> Hochst.ex Benth.	Scrophulariaceae	SH
<i>Carduus schimperi</i> Sch. Bip. ex A. Rich.	Asteraceae (Compositae)	H
<i>Carex conferta</i> Hochst. ex A. Rich	Cyperaceae	H
<i>Carex monostachya</i> A. Rich.	Cyperaceae	H
<i>Cineraria abyssinica</i> Sch. Bip. ex A. Rich.	Asteraceae (Compositae)	H
<i>Conyza pyrrophappa</i> Sch. Bip. ex A. Rich.	Asteraceae (Compositae)	SH
<i>Conyza stricta</i> Willd	Asteraceae (Compositae)	H
<i>Crassula alba</i> Forssk.	Crassulaceae	H
<i>Cynoglossum amplifolium</i> Hochst. ex A. DC.	Boraginaceae	H
<i>Cynoglossum coeruleum</i> Hochst. ex A. DC.	Boraginaceae	H
<i>Cyperus elegantulus</i> Steud.	Cyperaceae	H
<i>Cyperus rigidifolius</i> Steud.	Cyperaceae	H
<i>Dicrocephala chrysanthemifolia</i> DC.	Asteraceae (Compositae)	H

Scientific name of species with authority name(s)	Family name	Habit
<i>Dipsacus pinnatifidus</i> Steud. ex A. Rich.	Dipsacaceae	H
<i>Dryopteris athamantica</i> (Kunze) Kunze	Dryopteridiaceae	F
<i>Epilobium stereophyllum</i> Fresen.	Onagraceae	H
<i>Erica arborea</i> L.	Ericaceae	SH
<i>Erica tenuipilosa</i> (Engl. ex Alm & Fries) Cheek	Ericaceae	SH
<i>Erigeron alpinus</i> L.	Asteraceae (Compositae)	H
<i>Euryops pinifolius</i> A. Rich.	Asteraceae (Compositae)	SH
<i>Festuca abyssinica</i> , Hochst. ex A. Rich.	Poaceae (Gramineae)	H
<i>Festuca macrophylla</i> Hochst. ex A. Rich.	Poaceae (Gramineae)	H
<i>Festuca richardii</i>	Poaceae (Gramineae)	H
<i>Galium simense</i> Fresen.	Rubiaceae	H
<i>Hebenstretia angolensis</i> Rolfe.	Scrophulariaceae	SH
<i>Hedbergia abyssinica</i> (Hochst. ex Benth.	Scrophulariaceae	H
<i>Helichrysum formosissimum</i> Sch. Bip. ex A. Rich.	Asteraceae (Compositae)	H
<i>Helichrysum stenopterum</i> DC.	Asteraceae (Compositae)	H
<i>Helichrysum forsskahlii</i> (J.F. Gmel.) Hilliard & Burt	Asteraceae (Compositae)	H
<i>Helichrysum splendidum</i> (Thumb.) Less	Asteraceae (Compositae)	SH
<i>Helictotrichon elongatum</i> (Hochst. ex. A. Rich.) C. E. Hubb.	Poaceae (Gramineae)	H
<i>Hesperantha petitiana</i> (A. Rich.) Baker	Iridiaceae	H
<i>Hypericum revolutum</i> Vahl	Hypericaceae	SH
<i>Isolepis costata</i> A. Rich.	Cyperaceae	H
<i>Kniphofia foliosa</i> Hochst.	Asphodelaceae	H
<i>Lobelia rhynchopetalum</i> Hemsl.	Lobeliaceae	H
<i>Luzula abyssinica</i> Parl.	Juncaceae	H
<i>Nepeta azurea</i> R.Br. ex Benth.	Lamiaceae (Labiatae)	H
<i>Pelea quadripitata</i> (Forssk) Pranti	Sinopteridaceae	F
<i>Peucedanum mattirolii</i> Chiov.	Apiaceae (Umbelliferae)	H
<i>Pimpinella oreophila</i> Hook.	Apiaceae (Umbelliferae)	H

Scientific name of species with authority name(s)	Family name	Habit
<i>Plectocephalus varians</i> (A.Rich.) C. Jeffrey ex. Cufod.	Asteraceae (Compositae)	H
<i>Ranunculus multifidus</i> Forssk.	Ranunculaceae	H
<i>Rhabdotosperma scrophularifolia</i> (Hochst. ex A. Rich.) Hartle	Scrophulariaceae	H
<i>Rubus volkensii</i> Engl.	Rosaceae	SH
<i>Rumex abyssinicus</i> Jacq.	Polygonaceae	H
<i>Rumex nepalensis</i> Spreng.	Polygonaceae	H
<i>Rytidosperma subulata</i> (A. Rich.) Cope	Poaceae (Gramineae)	H
<i>Salvia merjamie</i> Forssk.	Lamiaceae (Labiatae)	H
<i>Satureja pseudosimensis</i> Brenan	Lamiaceae (Labiatae)	H
<i>Scabiosa columbaria</i> L.	Dipsacaceae	H
<i>Senecio ragazi</i> Chiov.	Asteraceae (Compositae)	H
<i>Senecio schulzii</i> Hochst. ex. A. Rich.	Asteraceae (Compositae)	H
<i>Senecio steudelii</i> Sch. Bip. ex A. Rich.	Asteraceae (Compositae)	H
<i>Senecio subsessilis</i> Oliv. & Hiern	Asteraceae (Compositae)	H
<i>Silene macrosolen</i> A. R.ich.	Caryophyllaceae	H
<i>Swertia kilimandscharica</i> Engl.	Gentianaceae	H
<i>Trifolium polystachyum</i> Fresen.	Fabaceae (Leguminosae)	H
<i>Trifolium usambarense</i> Taub.	Fabaceae (Leguminosae)	H
<i>Urtica simensis</i> Steudel	Urticaceae	H
<i>Verbascum sinaiticum</i> Benth.	Scrophulariaceae	H
<i>Veronica glandulosa</i> Hochst .ex Benth.	Scrophulariaceae	H

(Note: H = Herb, SH = Shrub, F = Fern)

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