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FLORISTIC COMPOSITION AND COMMUNITY ANALYSIS OF MENAGESHA AMBA MARIAM FOREST (EGDU FOREST) IN CENTRAL SHEWA, ETHIOPIA

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ABSTRACT: This study was conducted in Menagesha Amba Mariam Forest (Egdu), a dry evergreen afro-montane forest in central highlands of Ethiopia. The aim of the study was to determine floristic composition, community types and phytogeographical similarity of the forest. Sixty-nine sample plots (20 x 20 m) were laid following altitudinal gradient and each qaudrat was established at a 125 m altitudinal drop. Herbaceous species were collected from five (1 x 1 m) sub-plots laid at four corners and a centre of each quadrat. All plant species found in each plot were recorded, collected, pressed and identified using Flora of Ethiopia and Eritrea. Vegetation classification was done using PC-ORD, Version 4.20 software programme. A total of 219 species belonging to 182 genera and 76 families were recorded (Appendix 1). Asteraceae was the most dominant family with 36 species and 29 genera. Poaceae was the second dominant family with 21 species and 17 genera followed by Fabaceae (17 species) and Lamiaceae (16 species). Among the identified plant species 15 are endemic to Ethiopia. Five community types were identified and each community was named after two dominant tree and/or shrub species. An excessive and destructive exploitation of resources is the greatest threat to the forest. Menagesha Amba Mariam Forest has the highest species similarity with the forest of Chilimo (41%) followed by Menagesha-Suba (40%) and the least resemblance to Dindin forest. Menagesha Amba Mariam Forest needs an immediate attention as the degree of anthropogenic impact is quite high.

Key words/phrases: Dry evergreen afro-montane forest, Phytogeography, Plant community.

INTRODUCTION

Ethiopia is found in the Horn of Africa and is located between $3^0 24'$ - $14^0 53'$N and $32^0 42'$ - $48^0 12'$E with a total area of 1,120,000 km^2 (MOA, 2000). Altitudinally, the country ranges from 126 m below sea level at Kobar Sink in Afar to 4620 m above sea level at the highest peak of Ras Dashen (Zerihun Woldu, 1999; EFPA, 1994). The great topographic diversity, vegetation types, soil types and diverse climatic conditions has led to the emergence of habitats that are suitable for the evolution and survival of various plant and animal species. As a result, Ethiopia has diverse flora

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and fauna (Tewolde Berhan Gebre Egziabher, 1991). The vegetation of the country is very heterogeneous and has a rich endemic element. Endemism is particularly high in the high mountains and in the Ogaden area, southeastern Ethiopia (Teshome Soromessa *et al.*, 2004) as well as in Borana and Bale lowlands (Vivero *et al*., 2006; Zerihun Woldu, 1999). Much of the country comprises highland plateaus and mountain ranges that are dissected by numerous streams and rivers. The flora of Ethiopia contains about 6,000 species of vascular plants, of which about 10% are endemic (Ensermu Kelbessa, Per.comm.).

Vegetation cover of an area has a definite structure and composition developed as a result of long-term interaction of biotic and abiotic factors (Peters, 1996). Several studies focusing on forests or vegetation of specific regions in Ethiopia were carried out (Hedberg, 1951 and 1957; Mooney, 1963; Gilbert, 1970; Coetzee, 1978; Friis *et al*., 1982; Hailu Sharew, 1982; Zerihun Woldu, 1985; Sebsebe Demissew, 1988; Uhlig, 1988; Zerihun Woldu *et al*., 1989; Uhlig and Uhlig, 1990; Zerihun and Backeus, 1991; Haugen, 1992; Mesfin Tadesse, 1992; Tamrat Bekele, 1993 and 1994; Miehe and Miehe, 1994; Kumlachew Yeshitila and Taye Bekele, 2003; Simon Shibru and Girma Balcha, 2004; Teshome Soromessa *et al*., 2004). Moreover, the vegetation resources of Ethiopia have been studied by different scholars (Logan, 1946; Pichi-Sermolli, 1957; von Breitenbach, 1961, 1963; Westphal, 1975; Chaffey, 1979; Tewolde Berhan Gebre Egziabher, 1986, 1988; Friis, 1986, 1992; Friis and Mesfin Tadesse, 1990; EFAP, 1994; Teshome Soromessa and Sebsebe Demissew, 2002; Friis *et al*., 1982). These researchers employed different methods of vegetation classification. Almost all of the aforementioned studies have made a pencil note about the intractable loss of this natural resource. The demand for versatile functions and outputs of forests are increasing with rapid population growth, whereas forest resources are shrinking (Birhanu Mengesha, 1997). Nevertheless, the current tree planting campaign started elsewhere is a promising venture to leverage degradation of forests.

In Ethiopia, forest cover has been declining rapidly. Most of the remaining forests of the country are confined to south and south- western parts of the country (Tesfaye Bekele, 2002). Loss of forest cover and biodiversity due to human-induced activities is a growing concern in many parts of the world including our country (Sebsebe Demissew, 1980). The reduction of forests in the tropics impairs important atmospheric functions such as carbon sinks and the combustion of forest biomass releases the atmospheric CO_2, contributing to the buildup of greenhouse gases and global warming. The rate of deforestation and loss of fertile topsoil results in massive environmental degradation (Tamrat Bekele, 1993). The climate of Ethiopia has been changing due to global and local effects of vegetation degradation. The ultimate cause that has to be addressed for the forest destruction in Ethiopia is poverty and rapidly growing population (Birhanu Mengesha, 1997; Demel Teketay, 2001). The pattern of distribution and vertical stratification of vegetation fluctuates due to different climatic zones, soil type, latitudes and topography of the country (Grub *et al*., 1963). Even though Menagesha Amba Mariam (hereafter referred to as MAM) Forest is now included in the well studied Menagesha-Suba State Forest, there was no research carried out in the forest previously. Therefore, in order to implement conservation and sustainable utilization that could minimize forest losses, adequate information on factors affecting natural forest and the rate at which they cause depletion have to be obtained. Research on their degree of exploitation and investigation of diversity, composition, species richness, species abundance and distribution of plant species in a given area are indispensable for conservation and management of the forest (Dereje Mekonnen, 2006). Hence, this study was conducted with the main objective of investigating floristic composition, plant diversity and community types in MAM Forest.

MATERIALS AND METHODS

Study site

The study was conducted in Welmera Wereda, Oromia National Regional State, central highlands of Ethiopia (Fig. 1). The study forest is located at about 30 km west of Addis Ababa, and has total area of 84 ha. The forest is known to have gradient of altitude and, consequently, contains variety of wildlife including mammals like *Menelik's bushbuck*, *Gelada baboon, Colobus guereza, Vervet monkey, Lepus starcki* and natural and planted plant species like *Pinus patula*, *Acacia mearnsii,* and *Cupressus lusitanica*. Menagesha Amba Mariam Forest (MAM Forest) is situated approximately between 9^0 01′- 09^0 03′ N and 38^0 35′ - 38^0 36′ E. The altitudinal range of the study area varies from 2574 - 2948 m above sea level.

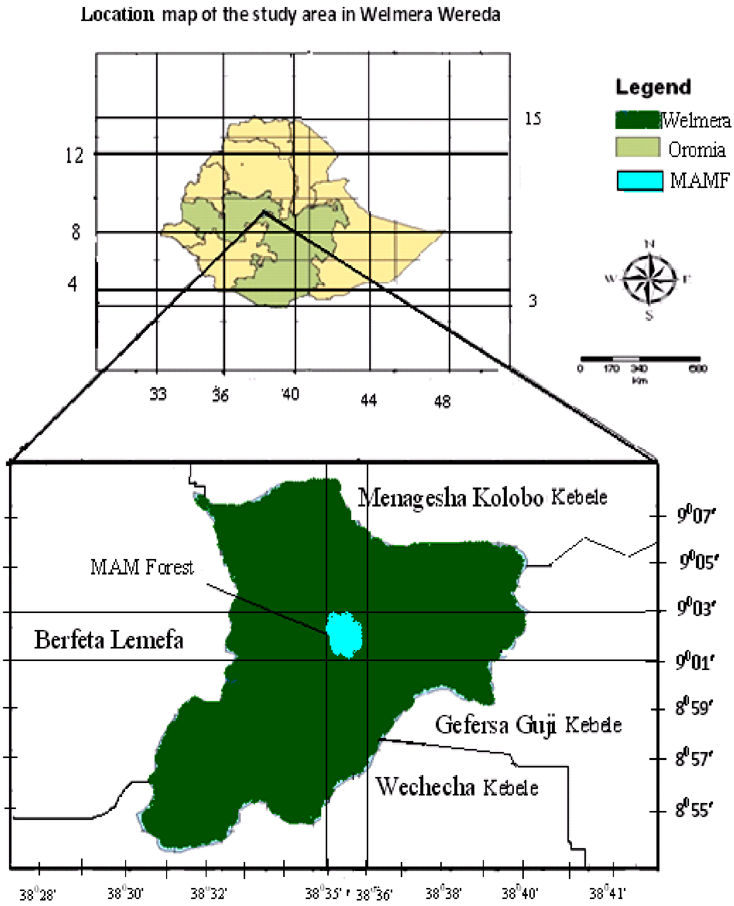

Fig. 1. Location map of the study site.

Methods

Reconnaissance survey was conducted in October, 2008 to collect baseline information, observe vegetation distribution, get an impression of the site conditions and identify the possible sampling sites and number of transect lines to be laid across the forest. Also, the altitudinal range of the forest area was determined. Systematic sampling was used for the current study. Sampling sites were arranged octagonally by eight line transects from the peak of the mountain to all directions covering the whole range of altitudes. Eight transects were laid at 200 m interval at the peak, 550 m at the middle of the mountain and 1.5 km at the bottom. This is because the study area has a shape like frustum of a cone. The transect lines radiate from the top of the mountain to eight directions and each of them contains different number of plots depending on the length of transect. Quadrats of 20 x 20 m (400 m^2) were placed at 125 m altitudinal drop between each quadrat for sampling woody species and five sub-plots (1 m x 1 m) within each corner and one at the centre of the main plot for herbaceous plants were used to gather vegetation data. Geographical coordinates of the transects were recorded within Magellan NAV5000 Pro GPS navigation system. A total of 69 quadrats (2.76 ha) were laid down to collect data on the vegetation.

Altitude was measured for each sample plot using 'Pretel' digital altimeter, and Magellan NAV5000 Pro GPS was used to record the latitude and longitude coordinates. Then a complete list of herbs, shrubs, lianas, epiphytes, and trees were made in each plot. Plant specimens were collected, pressed, dried, identified and checked at the National Herbar ium of Addis Ababa University using specimens in the Herbarium and published volumes of the Flora of Ethiopia and Eritrea. The 1-9 modified Braun-Blanquet scale (van der Maarel, 1979) was used to estimate the cover-abundance values of tree and shrub species (usually numbers) as follows: Scale1: rare, generally one individual, 2: sporadic, with less than 5% cover of the total area, 3: abundant, with less than 5% cover of the total area, 4: very abundant, with less than 5% cover of the total area, 5: 5-12% cover of the total area, 6: 12-25% cover of the total area, 7: 25-50% cover of the total area, 8: 50-75% cover of the total area, 9: 75-100% cover of the total area.

The two main techniques of measuring diversity are richness and evenness. Richness is a measure of the number of different species in a given site and can be expressed in a mathematical index to compare diversity between sites (Zerihun Woldu, 1985). Species richness index has a great importance in assessing taxonomic, structural and ecological value of a given habitat. Evenness is a measure of abundance of the different species that make up the richness of the area. Species diversity shows the product of species richness and evenness. Species diversity indices provide information about species endemism, rarity and commonness (Mueller-Dombois and Ellenberg, 1974). Thus, Shannon-Wiener Diversity Index (1949) was used to determine diversity of the forest. Sorensen's similarity index was used for comparison using a formula SI=2a / (2a + b + c) where, SI = Sorensen`s similarity coefficient, a = common to Menagesha Amba Mariam Forest and the forest in comparison, b = found only in Menagesha Amba Mariam forest, c = found only in the forest in comparison with MAM Forest.

RESULTS AND DISCUSSIONS

Floristic composition

A total of 219 species, 182 genera and 76 families of plants were recorded (Appendix 1). Asteraceae was the most dominant family with 36 species and 29 genera. Poaceae was the second dominant family with 21 species and 17 genera (Fig. 2). The third species-rich family was Fabaceae with 17 species and 12 genera followed by Lamiaceae with 16 species and 10 genera. Apiaceae and Rosaceae were the fourth species-rich families with six species each (Fig. 2).

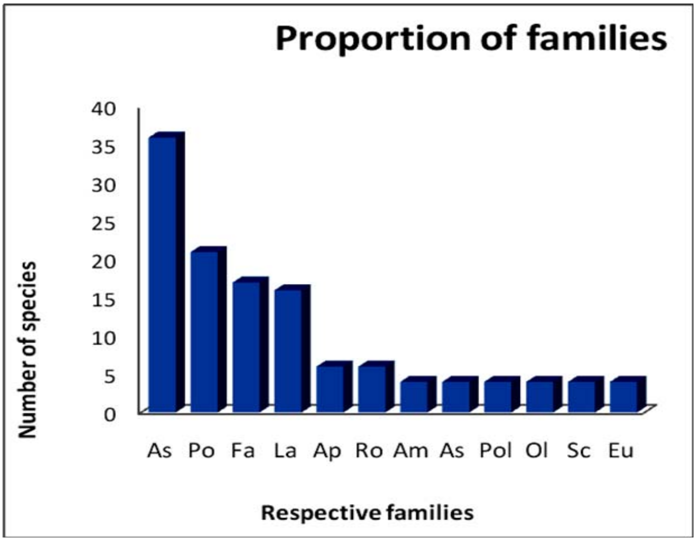

Fig. 2. Plant families having 4 or more species (As=Asteraceae, Po=Poaceae, Fa=Fabaceae, La=Lamiaceae, AP=Apiaceae, Ro=Rosaceae, Am=Amaranthaceae, Asc=Asclepiadaceae, Pol=Polygonaceae, Ol=Oleaceae, Sc=Scrophulariaceae and Eu=Euphorbiaceae).

The families, which contributed four species each, are Amaranthaceae, Asclepiadaceae, Euphorbiaceae, Oleaceae, Polygonaceae, Scrophulariaceae and Solanaceae, while the Acanthaceae, Brassicaceae, Cyperaceae, Ranunculaceae and Urticaceae contributed three species each. The following families had two representative species: Anacardiaceae, Celastraceae, Commelinaceae, Convolvulaceae, Crassulaceae, Cupressaceae, Dipsacaceae, Flacourtiaceae, Geraniaceae, Loganiaceae, Malvaceae, Myrsinaceae, Polygalaceae, Rhamnaceae, Rubiaceae and Sapotaceae and the rest 42 families contained only one species each.

Among the collected species 25 (11.7%) were trees, 34 (15.4 %) shrubs, 136 (61.5%) herbs, 7 (3.2 %) trees/shrubs, 15 (6.8%) climbers/liana, 1 (0.5%) epiphyte and 2 (0.9%) ferns. Herbs occupied the highest proportion followed by shrubs and trees (Table 1).

Table 1. Life form of plant species collected from Menagesha Amba Mariam Forest.

No	Life forms	Number of species	Percentage (%)
1	Trees	25	11.7
2	Tree/Shrub	7	3.2
3	Shrubs	34	15.4
4	Climbers/liana	15	6.8
5	Epiphytes	1	0.5
6	Herbs	136	61.5
7	Fern	2	0.9
	Total	219	100

Based on published Flora volumes and Ensermu Kelbessa *et al*. (1992) and Vivero *et al.* (2006), 16 endemic species were recorded in the study area (Table 2). This represented 7.03% of the total floristic composition of the forest. Of these, herbs accounted for 73.3%, shrubs 12.5%, trees 12.5%, and climbers 6.25%. The family with the most dominant of endemic species recorded in Menagesha Amba Mariam Forest was Asteraceae (50%) followed by Lamiaceae (18.75%).

Identification of plant communities

Five clusters were identified at 25% similarity scale from the output of PC-ORD computer programme, which represented the plant communities in the forest (Fig.3). Plant communities have been named by two dominant species based on highest mean cover/abundance value that appeared within a cluster (Table 3). Description of the plant community types with their altitudinal distribution is given below.

Table 2. Endemic taxa recorded from Menagesha Amba Mariam Forest: (SU = Shewa, IL = Ilubabor, WG = Welega, AR = Arsi, KF = Kefa, GG = Gamo Gofa, SD = Sidama, GD = Gonder, GJ = Gojam, WU = Wollo, BA = Bale, HA = Harar, TU = Tigray and S=Shrub, H=Herb, C=Climbing herb and T=Tree)

No	Endemic species	Family	Habit	Altitude (in m)	Distribution in Ethiopia
1	*Crassocephalum macropappum*	Asteraceae	H	1600-3270	GD, GJ, WU, SU, WG, IL, KF, GG, SD, BA, HA
2	*Leucas stachydiformis*	Lamiaceae	S	1700-3200	TU, GD, GJ, WU, SU, AR, SD, BA, HA
3	*Mikaniopsis clematoides*	Asteraceae	C	2000-3300	TU, GD, WU, SU, AR, KF, BA, HA
4	*Millettia ferruginea*	Fabaceae	T	1000-2500	HA.IL,TU,GDGJ,SU,WG
5	*Satureja paradoxa*	Lamiaceae	H	1350-3500	GD, GJ, SU, AR, WG, IL, KF, GG, SD, BA, HA
6	*Senecio myriocephallus*	Asteraceae	H	2250-3300	TU, GD, GD, WU, SU, AR, KF, SD, BA, HA
7	*Senecio ochrocarpus*	Asteraceae	H	2800-4300	GD, GJ, WU, SU, SD, BA, HA
8	*Solanecio gigas*	Asteraceae	H	1750-3350	GD, GJ, WU, SU, AR, SD, IL, KF, BA, HA
9	*Vernonia leopoldi*	Asteraceae	H	1850-2850	TU, GD, GJ,WU, SU,WG, KF, HA, GG
10	*Rhus glutinosa* subsp. *neoglutinosa*	Anacardiaceae	T	1500-2700	WU, SU, AR, BA, HA
11	*Inula confertiflora*	Asteraceae	H	2500-3730	WU, SU, AR, BA, HA
12	*Kniphofia foliosa*	Asphodelaceae	H	2500-4000	TU, GD, GJ, WU, SU, AR, BA, HA
13	*Urtica simensis*	Urticaceae	H	1500-3400	TU, GD, GJ, SU, AR, BA, SD
14	*Jasminum stans*	Oleaceae	S	2400-2900	SU, AR
15	*Conyza spinosa*	Asteraceae	H	2500-3800	GJ, WU, SU, BA
16	*Conyza abyssinica*	Asteraceae	H	1600-3300	TU, GD, GJ, SU, WG, KF, SD, GG, BA, HA

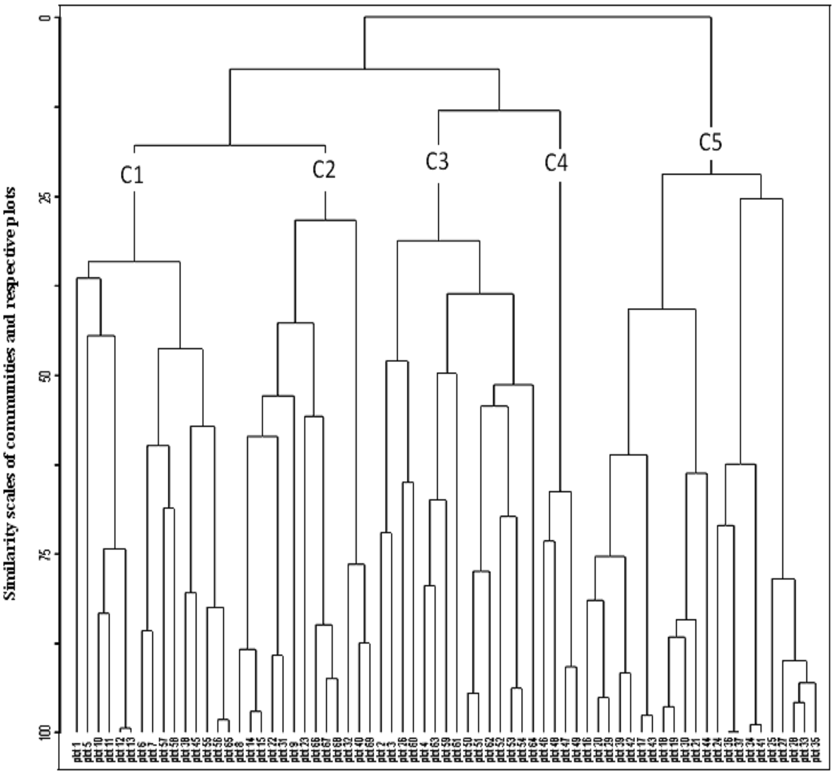

Fig. 3. Dendrogram showing plant community types of the study area: (C1-Community 1, C2-Community 2, C3-Community 3, C4-Community 4, and C5-Community 5).

I. *Olea europaea* subsp. cuspidata – *Rosa abyssinica* community type

The dominant taxa of this community type were *Olea europaea* subsp. *cuspidata*, *Rosa abyssinica*, *Juniperus procera*, *Rhus vulgaris, Sideroxylon oxyacanthum*, *Buddleja polystachya, Dombeya torrida*, *Hagenia abyssinica, Acacia abyssinica* and *Maytenus arbutifolia*. The dominant shrubs were *Carissa spinarum*, *Jasminum abyssinicum*, *Jasminum stans* and *Myrsine africana*. This community occurs in 15 quadrats (0.6 ha). The characteristic species were *Urtica simensis* and *Solanum indicum*. The altitudinal distribution of this plant community was between 2632-2887 m a.s.l. (Table 3). Indigenous tree species were mixed with planted species, which included *Eucalyptus globulus*, *Pinus patula*, *Acacia mearnsii*, *Casuarina cunninghamiana* and *Cupressus lusitanica*. This community type was one of the most disturbed parts by grazing, selective cutting, trampling and agricultural land expansion.

II. *Erica arborea-Juniperus procera* community type

This community type contained 13 quadrats (0.52 ha^{-1}) and was distributed between 2752-2894 m a.s.l. *Erica arborea, Juniperus procera, Olea europaea* subsp. *cuspidata, Acacia mearnsii, Nuxia congesta, Olinia rochetiana, Osyris quadripartita, Prunus africana* and *Sideroxylon oxyacanthum* are common species in this community. *Orobanche minor* was the characteristic species. *Smilax anceps* was the most dominant woody climber.

III. *Juniperus procera - Alchemilla pedata* community type

This community was located between 2574 to 2742 m a.s.l. and comprised 15 quadrats (0.6 ha) (Table 3). The dominant trees were *Juniperus procera, Olea europaea* subsp. *cuspidata, Prunus africana, Rhus vulgaris, Podocarpus falcatus, Olinia rochetiana, Osyris quadripartita, Croton macrostachyus, Cupressus lusitanica* and *Bersama abyssinica*. The characteristic species in this community type were *Ficus sur, Ocimum lamiifolium* and *Kniphofia foliosa*. Shrubs like *Vernonia leopoldi, Rosa abyssinica, Jasminum grandiflorum* subsp. *floribundum* and *Crotalaria distantiflora* were the most dominant.

IV. *Streblochaete longiarista - Alchemilla pedata* community type

This community type occured between 2625 and 2906 m a.s.l and consisted of 4 quadrats (0.16 ha). The upper canopy was dominated by *Juniperus procera* and *Podocarpus falcatus* with *Maytenus obscura* and *Olinia rochetiana* as a frequent admixture tree species in this type. The under storey consisted of *Rhus glutinosa, Myrsine africana, Dovyalis abyssinica* and *Nuxia congesta*. Climbers, like *Rubus steudneri, Mikaniopsis clematoides* and *Rosa abyssinica,* were common. *Arundinaria alpina* and *Millettia ferruginea* were the characteristic (unique) species at the peak of the forest. *Hypoestes forskaolii* was the most dominant herb in the lower storey.

V. *Myrsine africana - Rumex nervosus* community type

This community type is distributed betwwen 2624-2948 m a.s.l and is represented by 22 quadrats (0.88 ha). The dominant species were *Myrsine africana* and *Rumex nervosus. Juniperus procera, Olinia rochetiana, Carissa spinarum, Olea europaea* subsp. *cuspidata, Rosa abyssinica, Hagenia abyssinica, Cupressus lusitanica, Sideroxylon oxyacanthum* and *Erica arborea*. *Jasminum grandiflorum* subsp. *floribundum, Jasminum stans* and *Carissa spinarum* were the most dominant shrubs and *Apodytes* *dimidiata* was characteristic species.

Table 3. Synoptic cover-abundance value for species reaching a value of > 2.5 in at least one community type (value in bold refers to characteristic species C1-community 1, C2-community 2, C3-community 3, C4-community 4, C5-community 5).

Species and subspecies	Communities				
	C1	C2	C3	C4	C5
Olea europaea subsp. *cuspidata*	**6.73**	4.31	4.20	5.75	5.00
Rosa abyssinica	**5.07**	1.31	2.13	3.75	3.86
Osyris quadripartita	3.00	3.15	1.40	1.75	2.91
Rhus vulgaris	3.67	2.23	1.80	0.75	3.50
Prunus africana	2.33	1.92	0.60	0.00	1.64
Nuxia congesta	3.20	1.92	0.93	2.25	1.50
Sideroxylon oxyacanthum	3.07	2.31	1.27	2.50	2.59
Jasminum stans	4.40	4.46	1.67	0.00	3.68
Olinia rochetiana	4.33	3.85	4.20	2.00	4.64
Adiantum poiretii	2.47	2.77	1.53	1.25	1.91
Erica arborea	3.47	**5.69**	1.33	0.00	4.18
Bidens pilosa	3.53	5.23	3.07	1.50	3.23
Crassocephalum macropappum	2.13	2.85	1.27	0.00	1.23
Smilax anceps	0.93	1.77	3.87	0.00	2.32
Juniperus procera	5.20	**5.46**	**5.60**	4.00	5.14
Asparagus africanus	0.47	1.69	2.53	2.25	1.18
Podocarpus falcatus	0.60	0.46	3.47	0.00	0.00
Carissa spinarum	2.53	1.15	3.80	0.00	3.86
Alchemilla pedata	3.53	3.69	**5.33**	**5.50**	2.50
Streblochaete longiarista	0.00	0.00	0.00	**6.25**	0.00
Dovyalis abyssinica	2.40	1.38	1.60	3.25	2.27
Maytenus obscura	0.07	0.31	0.13	3.50	0.14
Galium simense	2.20	2.69	1.87	4.25	2.36
Bersama abyssinica	1.20	0.62	2.80	3.75	1.18
Buddleja polystachya	0.40	0.38	0.00	2.75	0.55
Myrsine africana	2.47	4.54	3.53	2.50	**5.64**
Rumex nervosus	2.13	0.85	0.27	0.00	**5.55**
Vernonia leopoldi	1.20	2.31	2.00	1.25	3.50
Lippia adoensis	0.00	0.46	1.40	1.25	3.59
Helichrysum odoratissimum	0.67	1.92	0.27	0.00	3.73
Festuca abyssinica	3.13	2.85	1.73	1.50	3.73
Andropogon abyssinicus	2.53	3.46	0.47	0.00	3.73

Community similarity analysis

The distribution of plant species among the communities in the forest showed significant dissimilarity. The overall similarity coefficient ranged from 30-64% among all the communities. The highest similarity (least dissimilarity) was observed between communities III and II (64%) (Table 4 and 5) since the two communities had plots, which are adjacent to each other that may indicate similar adaptation mechanisms and requirements. The lowest similarity was observed between communities IV and V (30%) followed by II and IV (32%). This is because of; community IV was found on the cliffy part of the forest and extensively exploited up to the foot of the escarpment. Its most part was covered by shrubs while community II was found on the level part that was occupied by most trees like *Juniperus procera, Olea europaea* subsp. *cuspidata*, *Jasminum stans, Smilax anceps* and *Carissa spinarum.*

Table 4. Jaccard's similarity coefficient among the five communities.

Communities	I	II	III	IV	V
I	1				
II	0.6	1			
III	0.54	0.64	1		
IV	0.35	0.32	0.33	1	
V	0.52	0.54	0.57	0.3	1

Table 5. Jaccard's similarity coefficient among communities along altitudinal gradient.

Communities	Altitudinal range	Similarity coefficient
I, II	2632-2887 / 2752-2894	60%
II, III	2752-2894 / 2574-2742	64%
I, V	2632-2887 / 2624-2948	52%
III, IV	2574-2742 / 2625-2906	32%
IV, II	2625-2906 / 2752-2894	32%
IV, V	2625-2609 / 2624-2948	30%
III, V	2574-2742 / 2624-2948	57%
I, III	2632-2887 / 2574-2742	54%

The results from pair wise comparison of communities were not close to each other along altitudinal gradient and the vegetations vary as altitude varies. This could be due to effects of human activities and environmental factors such as aspect slope, soil physical and chemical properties on community composition (Tamrat Bekele, 1993).

Species diversity (richness and evenness) of the plant communities

Community V and I had the highest species richness (35.2 and 34.4, respectively) and diversity (3.25 each) followed by community II (Table 6). Community IV had the lowest species diversity than others. Community V had the highest species richness while community IV exhibited the least species richness. The variability of each magnitude in each parameter for different community types may be due to difference in their species composition, number of plots included, cover abundance value, high degree of disturbance involved (anthropogenic activity such as selective cutting for charcoal and wood based industries).

Table 6. Shannon and Wiener diversity index.

Communities	Average altitude (m)	Species richness (S)	(E)Evenness (H'/ H'max)	Diversity index (H')
III	2658	31	0.92	3.17
I	2759.5	34.4	0.92	3.25
IV	2765.5	27.8	0.9	3.00
V	2786	35.2	0.91	3.25
II	2823	33.69	0.91	3.19

Community V and I had highest richness, evenness and diversity due to its proximity to a church and the high slope of the site, which is not easily accessible by local people to exploit through selective cutting and grazing. Community type V was the most diverse and had even distribution of species indicating that the vegetation is expected to be natural with less human intervention (Table 6). The value of species richness has a great importance in assessing taxonomic, structural and ecological value of the forest. Community IV shows the least amount of species richness, which may be due to pressure brought about by overgrazing in the lower part, rocky soil in the upper part of the forest.

Phytogeographical comparison

Menagesha Amba Mariam forest was compared with three dry evergreen afromontane forests (Chilimo, Dindin, and Menagesha-Suba). Chilimo forest is situated 90 km west of Addis Ababa close to Ginchi town. Its geographical location is $38^{0}10'$E, $9^{0}05'$ N. Altitudinaly it extends from 2400 - 2900 m a.s.l. (Tamrat Bekele, 1994). Dindin forest is located in southeastern Ethiopia with a geographical location of 08^{0} 37′ -$08^{0}39'$ N and 40^{0} 11′ - $40^{0}16'$E and its altitude ranges from 2150-3000 m a.s.l. (Kumlachew Yeshtila and Taye Bekele, 2003). Menagesha-Suba State forest is a well-protected state forest located about 30 km southwest of Addis Ababa. It is located between $38^{0}32'$ to $38^{0}34'$ E and $08^{0}56'$ - $9^{0}00'$N. Its northern and southern peaks are 2350 m and 3300 m respectively (Sebsebe Demissew, 1980). These forests were compared with Menagesha Amba Mariam forest based on similarities in species distribution.

Menagesha Amba Mariam Forest had the highest species similarity with Chilimo (41%) followed by Menagesha-Suba (40%) (Table 7). This may be due to their similar climatic zones and altitudinal range since all of them belong to the dry Afromontane forest category. The forest showed the least resemblance to Dindin forest. This dissimilarity may be due to differences in altitudinal range, species composition, amount of rainfall, climatic conditions and the levels of anthropogenic impact.

Table 7. Comparison and species composition similarities between MAM and other dry evergreen afromontane forests in Ethiopia

Forests used for comparison	Altitude (m)	Species richness	a	b	c	SI
Chilimo (Tamirat Bekele, 1993)	2000 – 2950	200	86	135	114	0.41
Menagesha-Suba (Abate Zewdie, 2007)	2350 – 3300	82	61	160	21	0.4
Dindin (KumlachewYeshtila and Taye Bekele, 2003)	2150-3000	81	50	171	31	0.33

Management and anthropogenic impacts on Menagesha Amba Mariam Forest

The complex nature of human activities has a tremendous impact in forests including grazing and selective tree cutting for wood-based industries and clearing for cultivation and settlements (Alemu Abebe, 2007). Among these, the major disturbances were selective tree cutting and clearing for cultivation, which seriously affected both the structure and species composition of the forest. Eyewitness, interview with local people and forest guards revealed that most of the people always clear the vegetation for cultivable land expansion and to procure essential forest products. Information obtained from interviews of local people revealed that *Hagenia abyssinica* is mainly used by the local communities for medicinal purpose. As a result, the species is currently found in some inaccessible parts of the forest.

Hagenia abyssinica, *Juniperus procera*, *Olea europaea* subsp.*cuspidata*, *Olinia rochetiana*, and *Erica arborea* are locally threatened and require a serious remedy and priority for conservation. Most of the new stumps left after tree harvesting were observed from these species (Table 8). Most local farmers sell firewood and charcoal due to the proximity of the forest to urban centers like Addis Ababa, Menagesha and Holeta. The local women and men frequently take charcoal and fire wood to the urban centers using donkeys mainly at night. Human disturbances are the most significant types of disturbance indicated by the left-over stumps, fences of surrounding farms, footpaths and charcoal kilns. Due to the high dependency on natural resources and lack of proper alternatives, the local people are not able to change their present forest resource use patterns.

Table 8. The number of stumps in the study site.

Species name	No. of stumps
Olinia rochetiana	150
Juniperus procera	149
Erica arborea	137
Olea europaea subsp.*cuspidata*	94
Acacia abyssinica	43
Osyris quadripartita	33
Myrica salicifolia	28
Rhus vulgaris	28
Podocarpus falcatus	16
Prunus africana	14
Dovyalis abyssinica	10
Pittosporum viridiflorum	8
Nuxia congesta	6
Sideroxylon oxyacanthum	5
Hagenia abyssinica	5
Hypericum revolutum	5

The most important plant species of the forest (*Juniperus procera, Olea europaea* subsp. *cuspidata*, *Podocarpus falcatus*, *Olinia rochetiana* and *Erica arborea*) have been exposed to anthropogenic impacts (Table 8). Furthermore, these species show large number of new stumps and dead and standings trees. Generally, this study attempted to provide new insights concerning the extent and status of forest in relation to anthropogenic, natural and environmental factors.

CONCLUSIONS

The analysis of floristic data on vegetation of the forest indicated the presence of high species diversity.The forest was grouped into five community types. These community types included *Olea europaea* subsp. *cuspidata – Rosa abyssinica*, *Erica arborea- Juniperus procera, Juniperus procera - Alchemilla pedata*, *Streblochaete longiarista - Alchemilla pedata* and *Myrsine africana - Rumex nervosus* community types. The communities at the bottom and middle of the altitudinal gradient were found richer in species composition due to the presence of dense *Carissa spinarum, Rosa abyssinica* and *Myrsine africana* while the community at the top was poor in species composition. For example, community V and I had highest richness, evenness and diversity due to their proximity to the church and the high slope of the site, which is not easily accessible by local people to exploit through selective cutting and grazing. Phytogeographical comparison of Menagesha Amba Mariam Forest showed that the forest has the species similarity with the forest of Chilimo followed by Menagesha-Suba and least resemblance to Dindin forest.

The result of this study indicated that the forest is under threat due to anthropogenic disturbances. Thus, it needs intervention from the responsible government body for promoting the sustainable management and conservation of the forest. Therefore, the current situation of the forest depletion demands urgent efforts to combat the situation and to design an integrated approach for sustainable forest resource management, utilization and conservation of species having low importance value index and poor regeneration status with the participation of the community to mitigate the existing anthropogenic problems.

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Appendix 1. List of plant species collected from Menagesha Amba Mariam Forest.

No	Scientific Name	Family	Habit	Coll. No
1	*Hypoestes forskaolii* (Vahl) Soland.ex Roem. and Schult.	Acanthaceae	H	A121
2	*Justicia ladanoides* Lam.	Acanthaceae	H	A121
3	*Justitia schimperiana* (Hochst ex Nees) T.Anders.	Acanthaceae	S	A189
4	*Adiantum poiretii* Wikstr.	Adiantaeae	F	A168
5	*Achyranthes aspera* L.	Amaranthaceae	H	A104
6	*Amaranthus graecizans* L.	Amaranthaceae	H	A210
7	*Amaranthus hybridus* L.	Amaranthaceae	H	A1
8	*Cyathula uncinulata* (Schrad.) Schinz.	Amaranthaceae	S	A205
9	*Rhus vulgaris* Meikle	Anacardiaceae	T	A38
10	*Rhus glutinosa* Gilbert	Anacardiaceae	T	A140
11	*Chlorophytum gallabatense* Schweinf ex. Baker	Anthericaceae	H	A94
12	*Agrocharis melanantha* Hochst.	Apiaceae	H	A84
13	*Anethum graveolens* L.	Apiaceae	H	A207
14	*Anthriscus sylvestris* L.	Apiaceae	H	A134
15	*Conium maculatum* L.	Apiaceae	H	A137
16	*Heracleum abyssinicum* (Boiss.) Norman.	Apiaceae	H	A132
17	*Sanicula elata* Buch.-Ham.ex D.Don	Apiaceae	H	A132
18	*Carissa spinarum* L.	Apocynaceae	S	A8
19	*Arisaema schimperianum* Schott	Araceae	H	A185
20	*Cynanchum abyssinicum* Decne.	Asclepiadaceae	C	A151
21	*Dregea abyssinica* (Hochst.) K.Schum.	Asclepiadaceae	H	A201
22	*Gomphocarpus purpurascens* A.Rich.	Asclepiadaceae	S	A139
23	*Periploca linearifolia* A. Rich and Quart.-Dill.	Asclepiadaceae	L	A37
24	*Asparagus africanus* Lam.	Asparagaceae	S	A54
25	*Kniphofia foliosa* Hochst.	Asphodelaceae	H	A175
26	*Asplenium aethiopicum* (Burm.f.) Bechereer	Aspleniaceae	F	A113
27	*Artemisia abyssinica* Sch.Bip. ex A.Rich.	Asteraceae	H	A87
28	*Bidens pilosa* L.	Asteraceae	H	A68
29	*Cineraria deltoidia* Sond.	Asteraceae	H	A141
30	*Conyza abyssinica* Sch.Bip. ex A.Rich..	Asteraceae	H	A165
31	*Conyza hypoleuca* A. Rich.	Asteraceae	H	A46
32	*Conyza spinosa* Sch-Bip. ex Oliv. and Hiern	Asteraceae	H	A161
33	*Conyza steudelii* Sch.-Bip ex A.Rich.	Asteraceae	H	A206
34	*Cotula abyssinica* Sch.-Bip.ex.A.Rich.	Asteraceae	H	A203

Appendix 2. contd.

N**o**	Scientific Name	Family	Habit	Coll. No
35	*Crassocephalum macropappum* (Sch.-Bip ex A.Rich.) S.Moore	Asteraceae	H	A119
36	*Crepis rueppellii* Sch.-Bip.	Asteraceae	H	A197
37	*Crepis* sp cf *foetida* L.	Asteraceae	H	A169
38	*Dicrocephala integrifolia*(L.f.)Kuntze	Asteraceae	H	A147
39	*Echinops macrochaetus* Fresen.	Asteraceae	H	A177
40	*Felicia dentata* (A.Rich) Dandy	Asteraceae	H	A194
41	*Galinsoga quadriradiata* Ruiz and Pavon.	Asteraceae	H	A116
42	*Gerbera piloselloides* (L.) Cass.	Asteraceae	H	A100
43	*Guizotia scabra* (Vis) Chiov.	Asteraceae	H	A120
44	*Haplocarpha schimperi* (sch.-Bip) Beauv.	Asteraceae	H	A33
45	*Helichrysum odoratissimum* (L.) Less.	Asteraceae	H	A194
46	*Helichrysum schimperi* (Sch.-Bip ex A.Rich).	Asteraceae	H	A20
47	*Inula confertiflora* A. Rich.	Asteraceae	H	A65
48	*Laggera crispata* (Vahl) Hepper and Wood	Asteraceae	H	A148
49	*Mikaniopsis clematoides* (A.Rich.) Milne-Redh.	Asteraceae	C	A78
50	*Vernonia amygdalina* Del.	Asteraceae	T	A201
51	*Pentas schimperiana* (A.Rich.) Vatke	Asteraceae	H	A15
52	*Phagnalon abyssinicus* Sch.-Bip ex A.Rich.	Asteraceae	H	A32
53	*Plectocephalus varians* (A.Rich.) Jeffery	Asteraceae	H	A66
54	*Senecio lyratus* Forssk.	Asteraceae	H	A102
55	*Senecio myriocephallus* Sch .Bip.	Asteraceae	H	A62
56	*Senecio ochrocarpus* Oliv. and Hiern	Asteraceae	H	A75
57	*Silybum marianum* (L.) Gaertn.	Asteraceae	H	A217
58	*Solanecio gigas* (Vatke) C. Jeffery	Asteraceae	H	A88
59	*Sonchus asper* (L.) Hill	Asteraceae	H	A170
60	*Sonchus bipontini* Aschers	Asteraceae	H	A58
61	*Tagetes minuta* L.	Asteraceae	H	A86
62	*Vernonia leopoldi* (Sch-Bip.)	Asteraceae	H	A28
63	*Impatiens hochstetteri* Warb.	Balsaminaceae	H	A179
64	*Cynoglossum coeruleum* Hochst.ex A.DC.	Boraginaceae	H	A149
65	*Capsella bursa-pastoris* (L) Medic.	Brassicaceae	H	A204
66	*Cardamine trichocarpa* Hochst. ex A.Rich.	Brassicaceae	H	A111
67	*Coronopus didymus* (L.) Smith.	Brassicaceae	H	A202
68	*Opuntia ficus-indica* (L.) Miller	Cactaceae	S	AA91

Appendix 3. contd.

No	Scientific Name	Family	Habit	Coll. No
69	*Cerastium indicum* Wight and Arn.	Caryophylaceae	H	A162
70	*Casuarina cunninghamiana* Miq.	Casuarinaceae	T	A216
71	*Maytenus arbutifolia* (A.Rich.) Wilczek	Celastraceae	T	A5
72	*Maytenus obscura* (A.Rich.) Cuf.	Celastraceae	T	A43
73	*Chenopodium ambrosioides* L.	Chenopodiaceae	H	A122
74	*Commelina benghalensis* L.	Commelinaceae	H	A131
75	*Cyanotis barbata* D. Don.	Commelinaceae	H	A61
76	*Convolvulus kilimandschari* Engl.	Convolvulaceae	H	A187
77	*Dichondra repens* J.R. and G. Forst	Convolvulaceae	H	A125
78	*Crassula alsinoides* (Hook.f.) Engl.	Crassulaceae	H	A202
79	*Kalanchoe petitiana* A. Rich	Crassulaceae	H	A51
80	*Zehneria scabra* (L.f.) Sond.	Cucurbitaceae	C	A158
81	*Cupressus lusitanica* Mill.	Cupressaceae	T	A173
82	*Juniperus procera* Hochst ex Endl.	Cupressaceae	T	A9
83	*Carex steudneri* Böck.	Cyperaceae	H	A62
84	*Cyperus fischerianus* A.Rich.	Cyperaceae	H	A52
85	*Kyllinga odorata Vahl.*	Cyperaceae	H	A163
86	*Pterocephalus frutescens* Hochst. ex.A.Rich.	Dipsacaceae	H	A103
87	*Scabiosa columbaria* L.	Dipsacaceae	H	A144
88	*Erica arborea* L.	Ericaceae	S	A13
89	*Euphorbia prostrata* Ait.	Euphorbaceae	H	A60
90	*Clutia lanceolata* Forssk.	Euphorbiaceae	S	A51
91	*Croton macrostachyus* Del.	Euphorbiaceae	T	A155
92	*Ricinus comminus* L.	Euphorbiaceae	S	A192
93	*Acacia abyssinica* Hochst.ex Benth.	Fabaceae	T	A2
94	*Acacia mearnsii* De Wild.	Fabaceae	T	A50
95	*Acacia melanoxylon* R.Br	Fabaceae	T	A184
96	*Argyrolobium ramosissimum* Bak	Fabaceae	H	A67
97	*Astragalus atropilosus* subsp *atropilosus* (Hochst.)	Fabaceae	H	A168
98	*Calpurnia aurea* (Ait.) Benth.	Fabaceae	S	A31
99	*Colutia abyssinica* Kunth and Bouche	Fabaceae	S	A61
100	*Crotalaria laburnifolia* L.	Fabaceae	S	A11
101	*Crotalaria distantiflora* Bak.f.	Fabaceae	H	A134
102	*Crotalaria incana* L.	Fabaceae	S	A138

Appendix 4. contd.

No	Scientific Name	Family	Habit	Coll. No
103	*Crotalaria mildbraedii* Bak.f	Fabaceae	S	A157
104	*Eriosema jurionianum* Staner and De Craeme	Fabaceae	H	A49
105	*Medicago polymorpha* L.	Fabaceae	H	A133
106	*Millettia ferruginea* (Hochst) Bak.	Fabaceae	T	A186
107	*Rhynchosia densiflora* (Roth) DC	Fabaceae	H	A48
108	*Trifolium simense* Fresen.	Fabaceae	H	A82
109	*Lotus discolor* E.mey.	Fabaceae	H	A178
110	*Dovyalis abyssinica* (A. Rich.) Warb.	Flacourtiaceae	S	A10
111	*Scolopia theifolia* Gilg.	Flacourtiaceae	T	A164
112	*Swertia abyssinica* Hochst.	Gentianaceae	H	A59
113	*Geranium aculeolatum* Oliv.	Geraniaceae	H	A181
114	*Pelargonium alchemilloides* (L.) Ait.	Geraniaceae	H	A56
115	*Hypericum revolutum* Vahl.	Hypericaceae	S	A21
116	*Apodytes dimidiata* E.Mey.ex.Arn	Icacinaceae	T	A154
117	*Achyrospermum schimperi* (Hochst. ex Briq.)	Lamiaceae	H	A196
118	*Ajuga integrifolia* Buch.-Ham. ex D.Don	Lamiaceae	H	A105
119	*Clerodendron alatum* Guerke	Lamiaceae	S	A40
120	*Clerodendrum myricoides* (Hochst.) Vatke.	Lamiaceae	S	A45
121	*Leucas martinicensis* (Jack) R.Br.	Lamiaceae	H	A169
122	*Leucas stachydiformis* (Hochst ex Benth.) Briq.	Lamiaceae	S	A39
123	*Lippia adoensis* Hochst .ex Walp.	Lamiaceae	S	A24
124	*Ocimum lamiifolium* Hochst. ex Benth.	Lamiaceae	S	A135
125	*Plectranthus assurgens* (Backer) J.K. Morten	Lamiaceae	H	A196
126	*Plectranthus lanunginosus* Benth.) Agnew	Lamiaceae	H	A142
127	*Plectranthus punctatus* L.Herit	Lamiaceae	H	A135
128	*Pycnostachys meyeri* Güerke	Lamiaceae	S	A47
129	*Salvia nilotica* Juss.ex Jacq.	Lamiaceae	H	A182
130	*Satureja paradoxa* (Vatke) Engl.	Lamiaceae	H	A98
131	*Satureja punctata* (Benth.) Briq.	Lamiaceae	H	A145
132	*Thymus schimperi* Ronniger	Lamiaceae	H	A57
133	*Linium trigynum* L.	Linaceae	H	A102
134	*Buddleja polystachya* Fresen.	Loganiaceae	T	A42
135	*Nuxia congesta* R. Br. ex Fresen.	Loganiaceae	T	A10
136	*Malva verticillata* L.	Malvaceae	H	A130

Appendix 5. contd.

No	Scientific Name	Family	Habit	Coll. No
137	*Sida schimperiana* Hochst ex.A.Rich.	Malvaceae	H	A37
138	*Ekebergia capensis* Sparrm.	Meliaceae	T	A23
139	*Bersama abyssinica* Fresen.	Melianthaceae	S	A23
140	*Stephania abyssinica* (Dill. Rich.) Walp.	Menispermaceae	C	A174
141	*Ficus sur* Forssk.	Moraceae	T	A195
142	*Myrica salicifolia* Hochst ex.A.Rich.	Myricaceae	T	A14
143	*Maesa lanceolata* Forssk.	Myrsinaceae	T	A19
144	*Myrsine africana* L.	Myrsinaceae	S	A5
145	*Eucalyptus globulus* Labill.	Myrtaceae	T	A3
146	*Jasminum grandiflorum* subsp. *floribundum* (R.Br ex Fresen) P.S.Green.	Oleaceae	S	A159
147	*Jasminum abyssinicum* Hochst.ex DC.	Oleaceae	C	A37
148	*Jasminum stans* Pax.	Oleaceae	S	A18
149	*Olea europaea* subsp. *cuspidata* (Wall.ex.G.Don.) cif.	Oleaceae	T	A6
150	*Olinia rochetiana* A. Juss.	Oliniaceae	T	A12
151	*Diaphananthe schimperiana* (A.Rich.) Summerh.	Orchidaceae	H	A29
152	*Orobanche minor* Smith.	Orobanchaceae	H	A146
153	*Oxalis obliquifolia* A.Rich.	Oxalidaceae	H	A177
154	*Argemone mexicana* L.	Papaveraceae	H	A94
155	*Phytolacca dodecandra* L "Herit	Phytolaccaceae	C	A38
156	*Pinus patula* D.Don.	Pinaceae	T	A214
157	*Pittosporum viridiflorum* Sims	Pittosporaceae	T	A7
158	*Plantago lanceolata* L.	Plantaginaceae	H	A81
159	*Agrostis quingueseta* (Hochst. ex Steud.) Hochst.	Poaceae	H	A99
160	*Andropogon abyssinicus* (Fresen.) R.Br.	Poaceae	H	A72
161	*Arundinaria alpina* K. Schum	Poaceae	S	A160
162	*Bromus leptoclados* Nees	Poaceae	H	A106
163	*Cynodon dactylon* (L.) Pers	Poaceae	H	A64
164	*Digitaria abyssinica* (Hochst ex.A.Rich.) Stapf.	Poaceae	H	A123
165	*Eleusine floccifolia* (Forssk.) Spreng.	Poaceae	H	A147
166	*Festuca abyssinica* Hochst. ex A.Rich.	Poaceae	H	Acc
167	*Harpachne schimperi* A.Rich.	Poaceae	H	A140
168	*Hyparrhenia hirta* (L.) Stapf.	Poaceae	H	A127
169	*Microchloa kunthii* Desv.	Poaceae	H	A114
170	*Pennisetum sphacelatum* (Nees) Th. Dur. and Schinz	Poaceae	H	A80

Appendix 6. contd.

No	Scientific Name	Family	Habit	Coll. No
171	*Pennisetum thunbergii* Kunth.	Poaceae	H	A161
172	*Pennisetum polystachion* (L.) Schult	Poaceae	H	A168
173	*Poa annua* L.	Poaceae	H	A117
174	*Poa leptoclada* A.Rich.	Poaceae	H	A152
175	*Snowdenia polystachya* (Fresen.) Pilg.	Poaceae	H	A167
176	*Sporobolus africanus* (Poir.) Robyns and Tournay	Poaceae	H	A76
177	*Sporobolus pectinellus* Mez.	Poaceae	H	A113
178	*Streblochaete longiarista* (A.Rich.) Pilger	Poaceae	H	A183
179	*Vulpia bromoides* (L.) J.E.Grey	Poaceae	H	A150
180	*Podocarpus falcatus* (Thunb.) Mirb.	Podocarpaceae	T	A191
181	*Polygala abyssinica* Fresen.	Polygalaceae	H	A143
182	*Polygala steudneri* Chod.	Polygalaceae	H	A178
183	*Persicaria nepalensis* (Meisen.) Miyabe	Polygonaceae	H	A156
184	*Rumex abyssinicus* Jacq.	Polygonaceae	H	A124
185	*Rumex nepalensis* Spreng.	polygonaceae	H	A129
186	*Rumex nervosus* Vahl	Polygonaceae	S	A39
187	*Anagalis arvensis* L.	Primulaceae	H	A106
188	*Lysimachia ruhmeriana* Vatke	Primulaceae	H	A166
189	*Clematis simensis* Perr. and Guill.	Ranunculaceae	C	A25
190	*Delphinium dasycaulon* Fresen.	Ranunculaceae	H	A109
191	*Thalictrum rhynchocarpum* Qu.-Dill.CHEK	Ranunculaceae	H	A156
192	*Caylusea abyssinica* (Fresen.) Fisch. and Mey	Resedaceae	H	A151
193	*Rhamnus prinoides* L'Her.	Rhamnaceae	S	A192
194	*Rhamnus staddo* A.Rich.	Rhamnaceae	S	A30
195	*Alchemilla pedata* A.Rich.	Rosaceae	H	A56
196	*Hagenia abyssinica* (Bruce) J.F.Gmel.	Rosaceae	T	A172
197	*Prunus africana* (Hook.f) Kalkm.	Rosaceae	T	A22
198	*Rosa abyssinica* Lindley	Rosaceae	S	A27
199	*Rubus steudneri* Schweinf.	Rosaceae	C	A175
200	*Rubus volkensii* Engl.	Rosaceae	C	A40
201	*Galium simense* Fresen.	Rubiaceae	H	A96
202	*Rubia cordifolia* L.	Rubiaceae	H	A65
203	*Osyris quadripartita* Decn.	Santalaceae	S	A4
204	*Sideroxylon oxyacanthum* Baill.	Sapotaceae	S	A16

Appendix 7. contd.

No	Scientific Name	Family	Habit	Coll. No
205	*Bartsia trixago* L.	Scrophulariaceae	H	A105
206	*Craterostigma plantagineum* Hochst.	Scrophulariaceae	H	A70
207	*Halleria lucida* L.	Scrophulariaceae	T	A128
208	*Verbascum sinaiticum* Benth.	Scrophulariaceae	H	A176
209	*Cheilanthes farinosa* (Forssk) Kaulf	Sinopteridaceae	H	A97
210	*Smilax anceps* Willd.	Smilacaceae	C	A17
211	*Datura stramonium* L.	Solanaceae	H	A36
212	*Discopodium penninervium* Hochst.	Solanaceae	S	A171
213	*Solanum marginatum* Jacq.	Solanaceae	S	A34
214	*Solanum indicum* L.	Solanaceae	H	A35
215	*Dombeya torrida* (J.F. Gmel) P. Bamps	Sterculiaceae	S	A165
216	*Sparmannia ricinocarpa* (Eckl. and Zeyh) O.Ktze.	Tiliaceae	H	A44
217	*Laportea aestuans* (L.) Chew.	Urticaceae	H	A79
218	*Urera hypselodendron* (A.Rich.) Weed.	Urticaceae	C	A164
219	*Urtica simensis* Steudel	Urticaceae	H	A206

(Ha=habit, T=tree, S=shrub, H=herb, T/S=tree/shrub, C=climber, SCs=scandent shrub, C=climbing herb, L=Liana, E=epiphyte, F=fern and V.N=vernacular name).