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# Plant Woody Diversity of the Highest Summit Forest (1156 m), in the Kala Massif, Western Yaoundé

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## Abstract

The purpose of this study was to evaluate the floristic affinities and the phytogeographical spread of the woody vegetation on the Kala summit in the Kala massif and to establish their qualitative and quantitative differences by comparing with other forested areas of the tropical regions of the world. Different analysis were based on a comparison of lists of tree species with dbh ≥10cm, inventoried in 1.5-ha rectangular plots established in the submontane forest at altitudes ≥1000m. Woody plants of diameter lower than 10cm were maintained to be used later for comparison. The floristic list for Kala summit used for this analysis contained 4411 individuals dbh ≥1cm belonging to 210 species and regrouped into 46 families. Among this 1843 trees dbh ≥10cm belonging to 194 species and 44 families. The parameters of floristic diversity were calculated using the standard methodology.The total basal area was 78.45m$^2$/ha. Most of the trees (1116) (dbh ≥10cm) had diameters between 10cm and 20cm and a few had class of dbh ≥ 90cm. The 7 most important families in terms of density, diversity and dominance were *Leguminosae, Clusiaceae, Myristicaceae, Burseraceae, Sterculiaceae, Annonaceae* and *Rubiaceae*. They reach 151.32 of the Family Importance Value (FIV). The specific composition reveals that a small number of common species dominate the forest: 38 (or 18%) species reach 150.31 of the Index Value Importance (IVI). The most important are *Allanblackia gabonensis, Tabernaemontana crassa, Santiria trimera, Ceolocaryon preussii, Pycnanthus angolensis, Cola attiensis* var. *bodardii, Aulacocalyx jasmiflora.* A small fraction of the species(14 either (6.66%) is represented by 1 individual. In conclusion, the diversity, the density and dominance of the woody vegetation of the Kala summit submontane forest are higher than those obtained in most forests of tropical regions of the world. The *Leguminosae* have the highest FIV in the Nkol Nlong submontane forest. The *Rubiaceae* that displaced the family *Leguminosae* in the high altitude come in second position in terms of the FIV. Thus the forest shows really the submontane parameters.

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## Keywords

Cameroon
Flora diversity
Kala massif
Kala summit
Woody structure

## Introduction

Phytodiversity refers to the set of the living things, their gene pool, inheritance patterns and surroundings (ecological systems) in which they evolve. It is often studied according to two parameters: the specific richness quantified by the Shannon and Waiver index and the regularity of the individuals between species, estimated by the Piélou equitability index. Earlier works have often described submontane formations of massifs from 1000m of altitude in the Guinean type forests (Aubréville, 1955; SchnelL, 1952; Jaeger and Adam, 1975; Noumi, 1998). This altitude also correspond to the rainforest mountain region of Sao Tomé which occurs at an altitude of 800-1400 m (Exell, 1952); to the foothills zone (800-1500 m) described in Nigeria (Boughey (1955); to the submontane zone of Malaysia (1000-1500 m) (Van Steennis, 1934). In Cameroon, Portere (1946) had described on the Bamboutos a differentiated submontane storey between 800-1600 m of altitude.

Letouzey (1968) also observed a similar formation with respect to Mount Koupé from 1000m and above as well as on the flanks of Mount Cameroon from 1000-1200 and 1600-1800m of altitude. Achoundong (1996) thus wrote: "The Yaoundé massif in effect contains a transition zone around 1000m of altitude – a transition zone that one can classify as a submontane storey". Very few work has been done in the submontane forests of Africa in general and that of Kala massif in particular (Achoundong, 1985). This survey of diversity and floristic structure was therefore undertaken to determine the floristic composition of Kala summit of the Kala massif so as to compare the results obtained with other submontane flora of the Guinean fortest types.

## Materials and methods

### Study site location

Cameroon is situated in the Central African subregion between 1°40' and 13°05' N latitudes; and 8°30' and 16°10' E longitudes, with a total land surface area of 475 000 $Km^2$. It shares a 4700Km long border with Nigeria, Equatorial Guinea, Gabon, Congo, Central African Republic and Tchad. (Fig.1). The Yaoundé massif extends from North to South and from East to West accross just 1°: 3°42' and 4°05' North latitude; 11°17' and 11°35' East longitude. It has a fairly irregular topography constituting an orographic barrier which represents very significant opposing phenomena of the flank from the point of view of Botany. To the South-West of Yaoundé, the Kala massif forms a complex at 1156m metres of altitude that culminates in the Kala summit. It has a WS-NE orientation.

According to Champetier (1959), the rock outcrops around Yaoundé and more particularly the hills of the entire region are made up of imbricate gneiss of two micas or just of biotite alone. The Yaoundé climat and its surroundings is the equatorial type with four seasons: the first is the long rainny season (march to june); the second is the short rainy season (september to november). December, January and February form the long dried season, while july and august constitute the two monthsof short dry season. Precipitation is fairly abundant with an annual average surpassing 1.500mm. The mean annual temperature stands at 28.32° C. The hottest month is february and the coldest is august. The mean annual relative humidity is 79.5%. the two air masses that affront the Intertropical Front (ITF) are influenced by the geographical substratum that conditions the seasonal cycles as commented by Schnell (1972), Mahailet (1972), Villiers (1981).

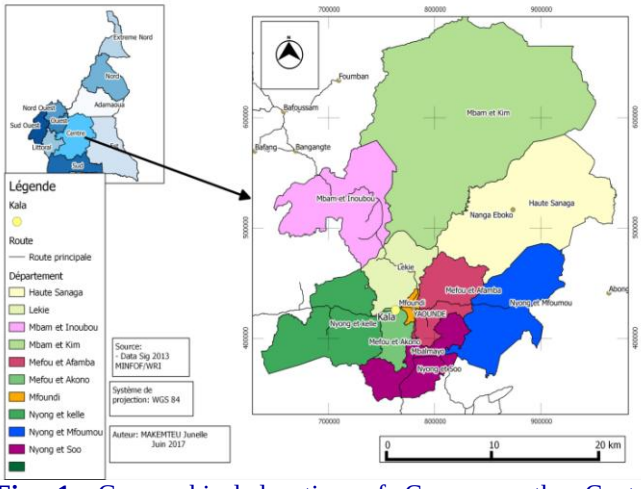


**Fig. 1:** Geographical location of Cameroon the Central African Subregion (A); Map of the Republic of Cameroon (B); Map of the Geographical location of the Kala massif (C), (Extract of the map of Yaoundé 3 d xxvi, CGN).

### Methodology

The present work was carried out in 2014-2015 in the submontane forest of Kala summit that culminates in 1156 m of altitude in the south-west region of Yaoundé with a WSW orientation. The study was realized with the aid of paths between plots that were traced in advance in homogenous vegetation surfaces. Records

were taken in plots of 0.25 hectare. The locations of the plots were obtained with the aid of a GPS (Geographic Positioning System). The inventories were conducted on straight bands of 100 m girth by 25 m breath (subscribing an area of 2500 $m^2$). All woody trees at dbh ≥ 1cm were identified and their diameters noted. The estimation of the dbh was done at 1.30m above soil surface. On the other hand, the characterization of large and inaccessible trees was done on the spot with the aid of manuals of tropical forest flora (Normand, 1965; Vivien and Faure, 1985). Specimens of unidentified species were collected, pressed, dried in the Laboratory of plant Biology of the Higher Teachers' Training College of the University of Yaoundé I, and taken to the National Herbarium (YA) for identification by comparison with existing identified species of the herbarium.
From the original data, we calculated the density of trees and basal area. To assess forest structure, (a) all vascular plant were grouped in families and (b) trees were grouped in diameter classese. The results were plotted in histograms.

Using standard methodology (Curtis and McIntosh, 1951; Cottam and Curtis, 1956; Mori et al., 1983), the following parameters were calculated. At specific and family level: relative density and relative dominance; at specific level only: relative frequency; at the family level only: relative diversity. From those data , Impartance Value Index (IVI) and Family Imporiance value (FIV) were calculated for species and families respectively.

In order to construct species-area curve, the number of additional species occuring in each consecutive sub-sample unit (40 x 50 m, five times on each summit) was plotted against surface increment. The sampling in the larger rain forest was terminated when the species-accumulation curve reached an asymptote. It has clearly been demonstrated that of the comparisons of diversity between strata must take in account the sampling effort expressed in terms of number of tallied individuals (Condit et al., 1996).

Species-individual curves were constructed exactly as were species-area curves: the number of additional available species count in all the plots was plotted on Y-axis, but instead of the horizontal axis (X-axis) we used the cumulative number of individual increasing order.

The floristic diversity was considered in a synthetic manner through the main physiognomic and phytogeographic spectres.

The Biologic Types (BT) were distinguished according to the classification of Raunkiaer (1934), done by Schnell (1970) and the species were designated as: mésophanerophyte, 10-30 m high (Msph), microphanerophyte, 2-10 m (Mcph), nanophanerophyte, 0.4-2 m (Nnph), phanerophyte ligneux grimpant (Phgr).

Information pertaining to the geographical distribution of each species was obtained from the literature (Schnell, 1970; Letouzey, 1985; White, 1986) and the species were designated as: Pantropical (Pan), Paleotropical (Pal), Afro-American (Aam), Afro-Malagasy (Am), Afro-Tropicale (At), Guineo-Sudano-zambezian (G-Sz), Centro-Guinéo-congolian (Cg), omni or sub-omni Guineo-congolian (G).

The altitude components of the species were established according to the characteristics of the species vis-à-vis of the pressure gradient (Senterre, 2005) and the followed categories were educted: species located in low and middle altitudefloor (Bm and Bm + Sm), species located in submountane floor (Sm and Sm + Mi), species of lower mountane floor or humid mountane floor (hM). Only the intermediate combinations between two successive types of the pressure gradient (non disconnected) are generally feasible.

## Data analysis

For the floristic analyses, all the data were pooled and the total number of species and individuals were tallied. Using the pooled data the overall species richness, genera and family level richness, were calculated. For 1 <dbh< 10cm, stem densities 1.5-$ha^{-1}$, species diversity and basal area ($m^2$ $ha^{-1}$) were calculated. The dominant species were considered to be those that were the most abundant in the inventory, and the dominant family was that represented by the most number of stems.

Basal area was calculated using the formula:

$$(Dbh)^2 * (\pi/4).$$

To measure the specific diversity from a list of species, the Shannon diversity index (H') was then used (Shannon and Weaver, 1948).

$$H' = \sum [Ni/N \log_2 Ni/N$$

Where, Ni is the strength of the species ''i'' and n the strength of all species. It is expressed in bits.

## Results

### Floristic composition

The flora list consists of 210 species inventoried at dbh ≥ 1cm ), including 3 non identified species, of which:

- 207 are identified entirely up to the specific level and 3 are only identified up to the generic level;
- 2568 are the bushes with 1cm ≤ dbh< 10cm;
- 1843 are the trees with 10cm ≤ dbh

Naming is according to Lebrun and Stork (1991-1997). Authors of scientific names used in this work are presented in Appendix I. The authors of scientific name appear in the Appendix 1. These species are regrouped in 32 genera and 95 families. The richest families are *Leguminosae* (*Fabaceae*, *Caesalpiniaceae* and *Mimosaceae* together) represented by 34 species, *Euphorbiaceae* (22 species), *Rubiaceaes* (15), *Annonaceae* (14), *Sterculiaceae* (13) and *Meliaceae* (12) (Fig. 2).

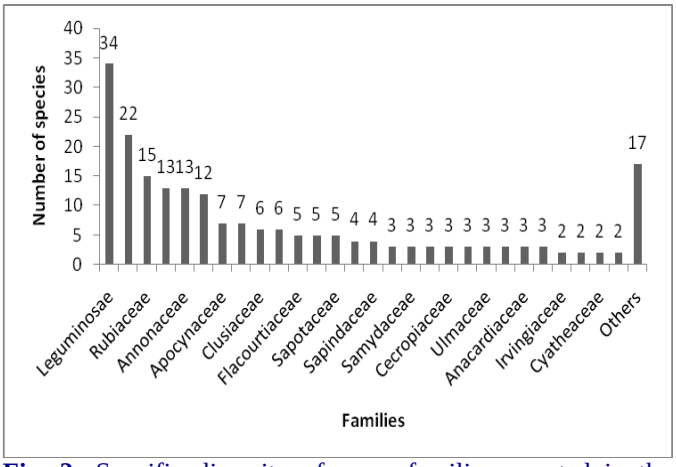


**Fig. 2:** Specific diversity of some families counted in the survey of the Kala hill submountain forest. The numbers of recorded species are indicated for every family. Other = 17 families with 1 species each.

**Table 1.** Inventory of all plants (dbh ≥ 1cm) in 21 forest plots of total area 1.5-ha in Kala hill submountain forest.

| Variables | All ligneous species | | |
|---|---|---|---|
| | Dbh ≥1 cm | Shrubs, 1≤ dbh<10 cm | dbh ≥10 cm |
| Species richness | 210 | 170 | 194 |
| Number of genera | 153 | 122 | 144 |
| Number of families | 46 | 40 | 44 |
| Shannon index (*H'*) | 6.85 | 6.75 | 6.55 |
| Total area sampled (ha) | 1.5 | 1.5 | 1.5 |
| Number of individuals | 4411 | 2568 | 1843 |
| Stem density (stems ha-1) | 2879.33 | 1672 | 1207.33 |
| Basal area of main trunk ($m^2$ ha-1) | 78.45 | 3.28 | 75.17 |

### Sampling (1≤ dbh < 10 cm) on 1.5-ha

The number of species (1 ≤ dbh<10 cm) taken in the inventory on 1.5-ha is 2568 ( 95 families), with 2568 individuals (at least 1712-$ha^{-1}$) (Table 1). The basal area is 4.92 $m^2$ (at least 3.28 $m^2$-$ha^{-1}$). Among them 16 species don't have any representatives in the category dbh ≥ 10 cm. The most abundant are *Tabernaemontana crassa* (85, at least 3.3% of bushes), *Coelocaryon preusii* 66 (at least 2.5%) *Aulacocalyx jasmiflora* 64 (at least 2.49%), *Allanblackia gabonensis* 62 (at least 2.4%) *Guarea thompsonii* 60 (at least 2.3%) . In the category dbh> 10 cm, 40 species don't have any representatives among the bushes, contrary to the 114 others that have at least a representative among the bushes.

The inventory inform on regeneration of the main forest species, throughout the young plants 1cm ≤ dbh < 10 cm and also the tendency to the gregariousness in that forest storey. The species individual curves were constructed for the 4 categories of the dbh: 1cm ≤ dbh ≤ 10 cm for the bushes and 3 others for the trees (Fig. 3). The observation of the slope at the origin of the curve shows a faster growth of the number of all strata. The woody curve 70 cm ≤ dbh did not reach a level of landing, hardly reached by the curve 30 cm ≤ dbh < 70 cm. The curve of the bushes presents a transverse growth that cuts the curve 30 cm ≤ dbh < 70 cm and that cannot reach the specific richness of the curve 10 cm ≤ dbh < 30 cm.

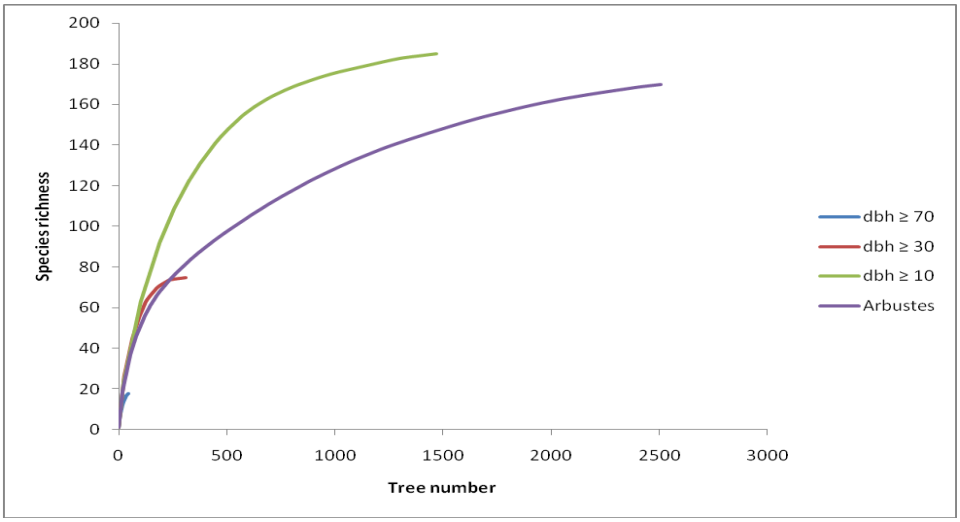


**Fig. 3:** The species individual curves drawn for the bushes (1cm ≤ dbh < 10 cm) and for the category of dbh ≥ 10 cm, on the entirety of inventories relative to those two categories.

## Sampling (10 ≤ dbh) on 1.5-ha

In all, 1843 individuals at dbh ≥ 10 cm belonging to 194 species distributed into 44 families were inventoried in an area of 1.5-ha. The number of species (10 ≤ dbh) taken in the inventory on a 0.25-ha plot, varied from 83 to 96 with a mean value of 87.67 species per plot. The basal area is 112.755 $m^2$ (at least 75.17 $m^2$/ha). Considering tree diameters, the maximum dbh are 132 cm (attained by *Celtis zenkeri*), 135cm (*Celtis zenkeri* and *Scottellia minfiensis* respectively) and 137 cm (*Aningeria altissima* and *Celtis tessmannii* respectively). However, such values are reached in the sampling by the fact that there is no woody exploitation in that forest. In the 1.5-ha taken in the inventory, 1116 individual trees occur in the 10 to 20 cm dbh class-size. Altoghether, 99 6% of trees are less than 100 cm dbh (Appendix 1). 44 individuals belonging to 18 species had a dbh ≥ 70 cm. The graphical representation of the distribution of individuals into classes according to their diameters, shows an inversed J-shaped curve (Fig. 4).

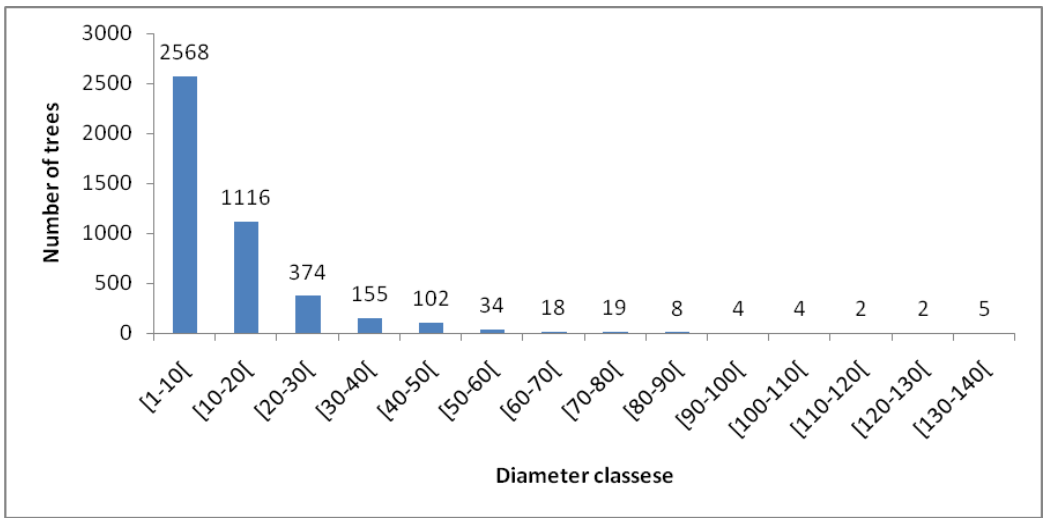


**Fig. 4:** Graphical distribution of individuals by class according to diameter on Mount Nkol Nlong; the numbers of recorded individuals are indicated for every size class.

The graph showing a distribution into classes according to diameter revealed a general down-slooping repartition. Such down-sloping represents a classical model identified for the less disturbed (almost virgin) dense humid forests as described by Rollet (1984).

## Floristic composition

### At the family level

A total of 46 families were recognised in the rule. The full results for each family are presented in Appendix I.

Table 1 is a synthesis of the 10 most important families with precisions on their centisimal proportions of each relative parameter. They are classifiecd according to reducing FIV. The different values for each relative parameter as well as the FIV for the 10 principal families are giving (Table 2) and represented in Fig. 5.

**Table 2.** Families with the highest values of relative density, relative dominance, relative diversity and FIV in descending order.

| **Relative density [x 100]** | | **Relative dominance [x 100]** | | **Relative diversity [x 100]** | | **FIV [x 300]** | |
|---|---|---|---|---|---|---|---|
| *Leguminosae* | 13.9384 | *Clusiaceae* | 14.8046 | *Leguminosae* | 16.1905 | *Leguminosae* | 39.6894 |
| *Rubiaceae* | 11.0674 | *Leguminosae* | 9.5605 | *Euphorbiaceae* | 10.9524 | *Rubiaceae* | 25.3748 |
| *Annonaceae* | 7.6638 | *Apocynaceae* | 7.8853 | *Rubiaceae* | 7.1429 | *Euphorbiaceae* | 24.3106 |
| *Apocynaceae* | 7.5480 | *Euphorbiaceae* | 7.5466 | *Annonaceae* | 6.6667 | *Clusiaceae* | 23.0565 |
| *Sterculiaceae* | 7.2007 | *Tiliaceae* | 7.3948 | *Sterculiaceae* | 6.1905 | *Sterculiaceae* | 20.1303 |
| *Euphorbiaceae* | 5.8115 | *Rubiaceae* | 7.1646 | *Meliaceae* | 5.7143 | *Apocynaceae* | 18.7667 |
| *Clusiaceae* | 5.3948 | *Sterculiaceae* | 6.7391 | *Apocynaceae* | 3.3333 | *Annonaceae* | 18.7403 |
| *Tiliaceae* | 5.1864 | *Meliaceae* | 4.7402 | *Flacourtiaceae* | 3.3333 | *Tiliaceae* | 15.4383 |
| *Meliaceae* | 4.8391 | *Annonaceae* | 4.4099 | *Clusiaceae* | 2.8571 | *Meliaceae* | 15.2936 |
| *Olacaceae* | 3.1257 | *Combretaceae* | 3.8342 | *Tiliaceae* | 2.8571 | *Moraceae* | 8.0806 |

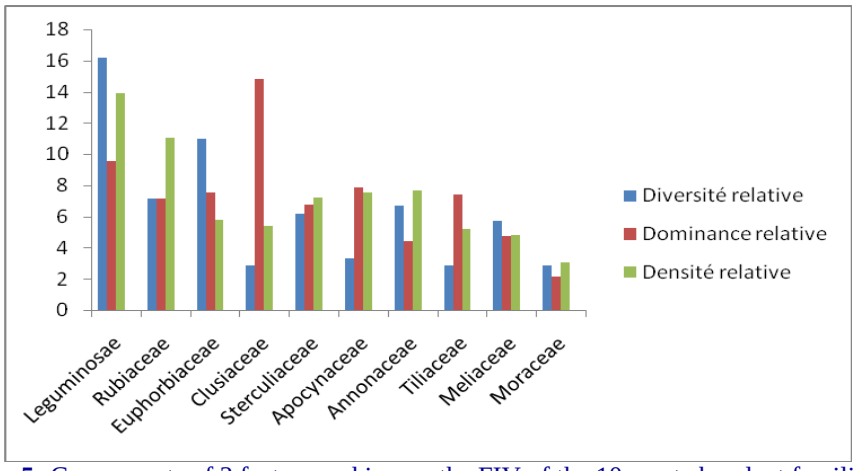


**Fig. 5:** Components of 3 factors making up the FIV of the 10 most abundant families.

The most denseamilies are the *Leguminosae, Rubiaceae, Annonaceae,, Apocynaceae, Sterculiaceae, Euphorbiaceae, Clusiaceae, Tiliaceae, Meliaceae, Olacaceae. Leguminosae, Rubiaceae, Annonaceae, Apocynaceae, Sterculiaceae, Euphorbiaceae, Clusiaceae* and *Tiliaceae* families exceed 60% and clearly dominate the series. They make up 63.81% of the woody flora.

The most dominant families are the *Clusiaceae, Leguminosae, Apocynaceae, Euphorbiaceae, Tiliaceae, Rubiaceae, Sterculiaceae, Meliaceae, Annonaceae* and *Combretaceae.* It appears clearly that the families of the *Clusiaceae, Leguminosae, Apocynaceae, Euphorbiaceae, Tiliaceae* and *Rubiaceae* and *Sterculiaceae* predominante clearly. These families take up 61.09% of the land surface area studied.

The most diversified families are the *Leguminosae, Euphorbiaceae, Rubiaceae, Annonaceae, Meliaceae, Sterculiaceae, Flacourtiaceae, Clusiaceae, Moraceae, Tiliaceae.* It is obvious to mention here that the *Leguminosae* and the *Euphorbiaceae* each with 16% and 10% respectively are the richest. They make up 27.14% of the woody flora. 19 families are represented by a single species, 5 by 2 species, 6 by 3 species, 1 by 4 species, 2 by 5 species, 4 by 6 species, 2 by 7 species, 1 by 12 species, 1 by 13 species, 1 by 14 species, 1 by 15 species, 1 by 23, and 1 by 34 species.

When we consider the FIV, the *Leguminosae* family is the most abundant with an FIV value of 39.68. They also have large values in density and diversity. By comparing the FIV with 3 other relative parameters it is observed that: the *Leguminosae, Rubiaceae,*

*Euphorbiaceae, Clusiaceae, Sterculiaceae, Apocynaceae, Annonaceae, Tiliaceae* and *Meliaceae* appear among the 10 most abundant families for all the relative parameters. *Clusiaceae* is ranked 9th in terms of relative diversiy, and is in the 7th position with respect to the relative density values though it comes among the 5 most abundant families when considering the FIV due to its relative dominance. The *Euphorbiaceae* occupies the 3rd position as a result of its high relative diversity. The *Moraceae* occupies the last positions (10th) in FIV as a result of its absence in the ten first position in the relative density, dominance and diversity. The *Olaceae* and *Combretaceae* families occupy the last positions (10th) in relative density and relative dominance, make up 3% respectively but they are represented by weak basal area. It is to be remarked that these two families do not feature among the 10 most abundant families with high FIV. It is the same to the *Flacourtiaceae* (8th) in relative diversity, absent in the Ten high FIV.

## Species level

We censused 210 species at dbh ≥ 10cm. the full results for each species are presented in annex II. Table 3 is a list of the 10 most abundant species for each relative parameter. A small group of species are dominant in the 1.5-ha area studied. 4 species (representing 2 % of total species censused account for 14.40 % of total individuals censused. An appreciable quantity of species (13.66%) are represented by less than 5 individuals, 14 species are represented by 2 individuals, and 15 species represented by just a single individual.

When we consider relative dominance, we realised that about 2% of species contribute to 35.77% of the total land surface area. High levels of dominance can be obtained by a large number of small individuals or by a small number of large individuals. *Allanblackia gabonensis* comes first in relative occurency, relative density and relative dominance. It is interesting to note that *Celtis zenkeri* and *Musanga cecropioides* occupy the two positions (7th and 10th) in terms of relative dominance. *Cola acuminata, Dacryodes macrophylla, Dalium bipindense, Diospyros longiflora* and *Garcinia smeathmannii* have the same value in term of relative occurency as *Allanblackia gabonensis.* These 7 species interestingly do not feature among the species with elevated IVI. Fig. 6 illustrates the 10 most abundant species of Kala summit forest.

**Table 3.** IVI values for the 10 principal species of Kala summit forest.

| **Relative occurency [x 100]** | | **Relative density [x 100]** | | **Relative dominance [x100]** | | **IVI [x 300]** | |
|---|---|---|---|---|---|---|---|
| *Allanblackia gabonensis* | 0.8658 | *Allanblackia gabonensis* | 4.4455 | *Allanblackia gabonensis* | 14.1089 | *Allanblackia gabonensis* | 19.4201 |
| *Tabernaemontana crassa* | 0.8658 | *Tabernaemontana crassa* | 3.8666 | *Santiria trimera* | 4.7886 | *Tabernaemontana crassa* | 7.6806 |
| *Santiria trimera* | 0.8658 | *Aulacocalyx jasmiflora* | 3.2878 | *Pycnanthus angolensis* | 3.4204 | *Santiria trimera* | 7.2751 |
| *Pycnanthus angolensis* | 0.8658 | *Coelocaryon preussii* | 2.8016 | *Desbordesia glaucescens* | 3.1785 | *Coelocaryon preussii* | 6.5680 |
| *Cola acuminata* | 0.8658 | *Cola attiensis* var. bodardii | 2.1764 | *Cola verticillata* | 3.1017 | *Pycnanthus angolensis* | 6.3700 |
| *Dacryodes macrophylla* | 0.8658 | *Pycnanthus angolensis* | 2.0838 | *Coelocaryon preussii* | 3.0450 | *Cola attiensis* var. bodardii | 5.5559 |
| *Dialum bipendense* | 0.8658 | *Guarea thompsonii* | 2.0607 | *Celtis zenkeri* | 2.9850 | *Aulacocalyx jasmiflora* | 5.3725 |
| *Diospyros longiflora* | 0.8658 | *Garcinia smeathmannii* | 2.0375 | *Tabernaemontana crassa* | 2.9482 | *Cola verticillata* | 5.3120 |
| *Garcinia smeathmannii* | 0.8658 | *Cola verticillata* | 1.9217 | *Cola attiensis* var. bodardii | 2.9466 | *Anonidium mannii* | 4.7189 |
| *Aulacocalyx caudata* | 0.8658 | *Anonidium mannii* | 1.8291 | *Musanga cecropioides* | 2.8782 | *Desbordesia glaucescens* | 4.7049 |

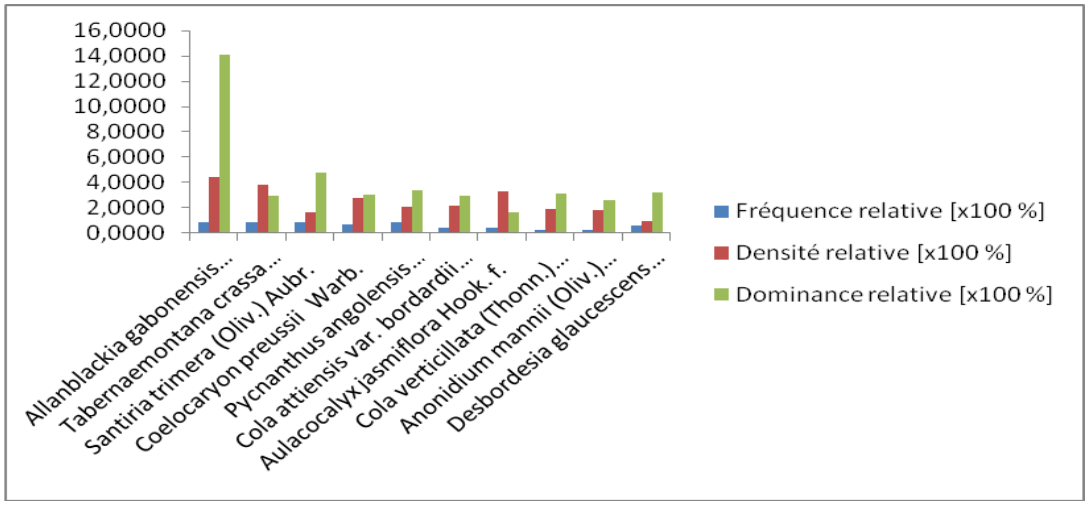


**Fig. 6:** Composition of the three IVI factors for the ten most abundant species, species occurency, stem density and basal area in the Kala hill forest.

The frequency distribution of species among samplings revealed the majority occurring in a large number of samplings, and some species in a limited number. The high number of species were recorded in 3 on 4 submountain summit forests. 16 species (13.33%) were recorded in only one submountain summit forest. 36 species (30%) occurred at landscape densities >1 stem 1.5-ha$^{-1}$.

Stem density was 1228.66 stems ha-1 and basal area 75.17m$^2$ ha$^{-1}$ for the ≥10 cm dbh classes. 6species, *Allanblackia gabonensis (*14.1089) *Santiria trimera* (4.7886), *Pycnanthus angolensis* (3.4204), *Desbordesia glaucescens* (3.1785), *Cola verticillata* (3.1017) and *Coelocaryon preussii* (3.0450) were dominants and comprised over 31 % of the stems sampled (Table 3). They have the 6 first values in IVI. The species having the highest value being Allanblackia *gabonensis* (at least 14) The genus *Cola* had the most species (7 species) followed by *Diospyros* (4), *Caloncoba* (3), *Celtis* (3), *Dacryodes* (3), *Garcinia* (3), *Macaranga* (3).

## Spectres des caractéristiqye synthétiques

### Biological type spectra

The results of the analysis of the biological types of the forest (Appendix 1), are taken in the Table 4. The importance of the mesophanerophytes (57.14%) for the raw spectrum is put in evidence. This group is followed of microphytes (33.33%). Also the weighted spectrum is dominated by the mesophaneropytes that reaches 70.54% of the relative dominance. The Liana-phanerophytes and erected Chamephyte are least represented in terms of relative dominance.

**Table 4.** Biological types spectra.

| **Life-form types** | **Raw spectrum** | | **Weighted spectrum** | |
|---|---|---|---|---|
| **TB** | **Number of species** | **Percentage** | **Basal area** | **Relative dominance** |
| Mesophanerophytes (Meso) | 120 | 57.1428 | 101.7444 | 70.5480 |
| Microphanerophytes (Micro) | 70 | 33.3333 | 23.9978 | 16.6397 |
| Megaphanerophytes (Mega) | 8 | 3.8095 | 13.1534 | 9.1204 |
| Nanophanerophytes (Nano) | 7 | 3.3333 | 4.2018 | 2.9135 |
| Liana-phanerophytes (Ph-L) | 4 | 1.9047 | 1.0897 | 0.7556 |
| Chamephyte erected (Chame) | 1 | 0.4761 | 0.0353 | 0.0245 |
| Total | 210 | 100 | 144.2226 | 100 |

## Spectrum of diaspore types

Table 5 summarizes the results of the analysis of the types of diaspores as presented in the Appendix 1. The importance of the sarcochores for the raw specter (59.04%) and the weighted specter (69.72%) are put in evidence. The pogonochores with only one species are the less represented with only 0.47% in the raw specter. The majority of the species is susceptible to be scattered by the animals.

**Table 5**. Spectre diaspore types.

| Types of diaspores | Raw spectrum | | Weighted spectrum | |
|---|---|---|---|---|
| | Number of species | Percentage | Basal area | Relative dominance |
| Sarcochore (Sarco) | 124 | 59.0476 | 100.5623 | 69.7284 |
| Ballochore (Ballo) | 43 | 20.4761 | 27.9758 | 19.3980 |
| Pterochore(Ptero) | 22 | 10.4761 | 11.8261 | 8.2000 |
| Barochore (Baro) | 16 | 7.61904 | 2.5800 | 1.7889 |
| Sclerochore (Sclero) | 4 | 1.9047 | 0.1452 | 0.1007 |
| Pogonochore (Pogo) | 1 | 0.47619 | 1.1329 | 0.7855 |
| Total | 210 | 100 | 144,2226 | 100 |

## Spectrum of leafy types

The results of the analysis of the foliar size types of the Kala summit forest species are presented in Table 6. The raw spectrum is largely dominated by mesophyll species (82.38%). The macrophylls coming in 3rd position (5.71% for the raw spectrum) come in second position for the relative spectrum of the basal area with 12.5%.

**Table 6.** Leaf size spectra.

| Leaf size types | Raw spectrum | | Weighted spectrum | |
|---|---|---|---|---|
| | Number of species | Percentage | Basal area | Relative dominance |
| Mesophyll (Meso) | 173 | 82.3809 | 118.2436 | 81.9883 |
| Leptophyll (Lepto) | 16 | 7.6190 | 5.4212 | 3.7589 |
| Macrophyll (Macro) | 12 | 5.7142 | 18.0307 | 12.5022 |
| Microphyll (Micro) | 6 | 2.8571 | 2.1598 | 1.4976 |
| Nanophyll (Nano) | 2 | 0.9523 | 0.3180 | 0.2205 |
| Megaphyll (Mega) | 1 | 0.4761 | 0.04908 | 0.0340 |
| Total | 210 | 100 | 144.2226 | 100 |

## Distribution types

## Phytogeographic groups

The distribution of species on the 1.5-ha area surveyed was done according to Schnell (1970) and White (1983) classification. Differents groups based on this classification were distinguished (Table 7). in all, we observed a great predominance of the Guinean species in the raw spectrum (77.6%) and the weighted spectrum (80.32%). Then followed the Afro-tropical (At) (8.09% of species, a liaison species, and the Sudano-Zambezean species (7.14%). Species with a wide geographical distribution constitute about 21.88% and are thus less represented. Species repartition is therefore discontinuous throughout the world.

## Ecosociologic units

The results of the analysis of the ecosociological unit types of the species of the plant formation are presented to the Table 8. The grouping of the semperviren ombrophile forests of the Table 8 totals 109 species (51.9%). They are followed by the grouping of the mesophile semi-caducifolious forests that present 55 species that is 26.19% of the set of the species.

In the weighted spectrum, the species of ombrophile and secondary forests reach a relative dominance of 78.63% of the total average dominance of the study area. They largely determine the physionomy of the Kala summit forest.

**Table 7.** Phytogeographical groups spectra.

| Geographical distribution | Phytogéographical groups | Raw spectrum | | Weighted spectrum | |
|---|---|---|---|---|---|
| | | Number | % | Basal area | % |
| Whidespread species | Afro-Malagasy (Am) | 2 | 0.95 | 0.39 | 0.27 |
| | Afro-American (Aam) | 5 | 2.38 | 5.63 | 3.90 |
| | Afro-tropical (At) | 17 | 8.09 | 4.31 | 2.99 |
| | Guineo-Sudano- Zambezian (G-Sz) | 15 | 7.14 | 14.97 | 10.38 |
| | Paleotropical (Pal) | 4 | 1.90 | 1.17 | 0.81 |
| | Pantropical (pan) | 2 | 0.95 | 0.98 | 0.68 |
| | Pluri-regional-African (Pra) | 1 | 0.47 | 0.76 | 0.53 |
| | **Total** | **46** | **21.88** | **28.21** | **19.56** |
| Guinean-congolian species | Guineo- Congolese (G) | 91 | 43.33 | 82.73 | 57.36 |
| | Omni or subomni-Guineo-Congolese (Cg) | 66 | 31.42 | 25.04 | 17.36 |
| | Lower-Guinean (Lg) | 4 | 1.90 | 7.64 | 5.30 |
| | Cameroonian (Ca) | 2 | 0.95 | 0.43 | 0.30 |
| | **Total** | **163** | **77.6** | **115.84** | **80.32** |
| Indeterminated species | | 1 | 0.4761 | 0.11 | 0.08 |
| **Total** | | 210 | 100 | 144.22 | 100 |

**Table 8.** Ecosociological groups spectra.

| Ecosociological groups | Raw spectrum | | Weighted spectrum | |
|---|---|---|---|---|
| | Number of species | Percentage | Basal area | Relative dominance |
| **Rainfall forests** | **109** | **51.9** | **81.5929** | **56.5752** |
| *Strombosio-parinarietea* Lebrun and Gilbert (1954) (Str) | 16 | 7.6190 | 12.1913 | 8.4532 |
| *Ficalhoeto-podocarpetalia* Lebrun and Gilbert (1954) (Fic) | 3 | 1.4285 | 1.4902 | 1.0333 |
| *Gilbertiodendretalia dewevrei* Lebrun and Gilbert (1954) (Gilb) | 65 | 30.9523 | 30.1848 | 20.9297 |
| *Garcinetalia* Noumi 1998 (Gar) | 25 | 11.9047 | 37.7266 | 26.1590 |
| **Semi-caducifolious forests** | **55** | **26.1904** | **31.8164** | **22.0610** |
| *Piptadeniastro-Celtidetalia* Lebrun and Gilbert (1954) (Pip) | 55 | 26.1904 | 31.8164 | 22.0610 |
| **Edaphic forests bound to the hydromorphe soils** | **10** | **4.76190** | **6.4657** | **4.4832** |
| *Mytraginetea* Schmitz (1963) (Mitra) | 10 | 4.76190 | 6.4657 | 4.4832 |
| **Secondary forest** | **24** | **11.4284** | **19.78015** | **13.7152** |
| *Musango-terminalietea* Lebrun and Gilbert (1954) (Mus) | 23 | 10.9523 | 19.3796 | 13.4375 |
| *Polyscietalia fulvae* Lebrun and Gilbert (1954) (Pol) | 1 | 0.4761 | 0.40055 | 0.2777 |
| **Gallery forests** | **8** | **3.8095** | **3.7895** | **2.6276** |
| *Pterygotetalia* Lebrun and Gilbert (1954) (Ptery) | 8 | 3.8095 | 3.7895 | 2.6276 |
| **Sclerophyll highlander forests** | **2** | **0.9523** | **0.1806** | **0.1252** |
| *Oleo-jasminetalia* Lebrun and Gilbert (1954) (Oleo) | 2 | 0.9523 | 0.1806 | 0.1252 |
| **Vegetation of non stepped savannas** | 1 | 0.4761 | 0.5458 | 0.3784 |
| *Hyparrhenietea* Schmitz (1963) (Hypar) | 1 | 0.4761 | 0.5458 | 0.3784 |
| Ind | 1 | 0.4761 | 0.0510 | 0.0353 |
| **Total** | **210** | **100** | **144.2226** | **100** |

## Altitudinal variation affinities

The heights establish the altitudinal preferendum of the species. They are divided into Low and middle altitudes (Bm), Submontane altitude (Sm) and humid Montane altitude (hM). Only the intermediate combination between two successive types of the pressure gradient is generally feasible for species of liaison (Senterre, 2005; Noumi, 2012). In the Kala summit sub-mountane floor, some of the species (5 species; at least 2%) are highlander and 25 others (at least 11%) are submountane; this later covering 37.47m$^2$ of basal area reaching 25.98% of relative dominance (Table 9).

**Table 9.** Altitudinal variation types.

| Altitudinal variation types | Main patterns | Raw spectrum | | Weighted spectrum | |
|---|---|---|---|---|---|
| | | Number of species | % | Basal area | Relative dominance |
| Lowland and average altitude species | Bm | 124 | 59.0476 | 82.4353 | 57.1594 |
| | Bm + Sm | 54 | 25.7142 | 22.1246 | 15.3409 |
| | Total | 178 | 84.7618 | 104.5599 | 72.5003 |
| Submountain species | Sm | 21 | 10 | 36.3619 | 25.2128 |
| | Sm + hM | 4 | 1.9047 | 1.1152 | 0.7733 |
| | Total | 25 | 11.9047 | 37.4771 | 25.9861 |
| Mountain species | hM | 5 | 2.3809 | 2.0165 | 1.3982 |
| | indet | 2 | 0.9523 | 0.1688 | 0.1170 |
| | Total all | 210 | 100 | 144.2226 | 100 |

Bm (lower and middle altitudes), Bm + Sm (low and medium altitudes going up to Sm), Sm (Submountane altitude), Sm + hM (Submountane going up to hM), hM (lower highlander, with strong hygrometry).

## Discussion

### Structure of the forest

A density of 1207.33 trees ≥ 10cm dbh on the Kala hill forets, is within the range of 167 to 1947 individuals/ha has been repatorted by Gentry (1982) for neotropical forests. Rollet (1993) estimates that the relative density is 552 individuals/ha in the tropical forest. Boom (1996) in Bolivia obtained a density of 649 individualss/ha in Alto Ivon. This value is very close to that obtained by Millet (2003) in the Tan Phu forest of Vietnam. Rakokomalaza and Messmer (1999) inventoried at DBH ≥ 10cm between 542 and 1223 individuals/ha in a series of 1ha plots in elevation forests in Madagascar. A density comparison of the flora on Kala summit forest with what obtained elsewhere in the world is provided in Table 3.

**Table 10.** Number of individuals/ha (dbh ≥ 10 cm) in Kala hill forest and other sites in Africa, Madagascar, Asia and neoptropical regions in descending order.

| Site | Country | References | Number of individuals/ha |
|---|---|---|---|
| Andranomintno | Madagascar | Rabevohitra et al. (1996) | 1223 |
| Kala summit | Cameroon | Present work | 1207 |
| Shala montane evergreen forest | Nilgiri, India | Mahadass and Davidar (2009) | 832 |
| Mount manegouba (Mbouroukou) | Cameroon | Noumi (2010) | 763 |
| Yasuni (unflooded forest) | Ecuator | Balslev et al. (1987) | 728 |
| Tan Phu (L6) | Vietnam | Millet (2003) | 684 |
| Alto Ivon | Bolivia | Boom (1996) | 649 |
| Forest of N'gotto | Central African Republic | Lejoly (1995) | 549 |
| Oveng | Gabon | Reitsma (1988) | 485 |
| Janeiro Herrera | Peru | Spichiger etal. (1996) | 482 |
| Yapo classified forest | Côte d'Ivoire | Nusbaumer et al. (2005) | 413 |
| Lopé (Site 1) | Gabon | White (1992) | 304 |

In the light of the different results as presented in Table 10, it is easy to note that a higher density is recorded on the Kala summit forest (1207. Rabevohitra et al. (1996) in Madagascar censused 1223 individuals/ha. This is one of the highest densities ever recorded. However, similar values are recorded in different forests: 763 in Mount Manegouba (Noumi, 2010); 728 in Yasuni (Balslev et al., 1987); 684 in Tan Phu (Millet, 2003); 649 in Alto Ivon (Boom, 1996); 485 at Oveng (Reitsma, 1988); 482 in Janeiro Herrera (Spichiger et al. , 1996) and 413 in Yapo classified forest (Nusbaumer et al. , 2005). The lowest value is recorded at Lopé in Gabon (White, 1992).

**Table 11.** Basal area ($m^2$) in Kala summit and in other sites in Africa, Madagascar, Asia and Neotropical regions in decreasing order of dominance.

| Sites | Countries | References | Basal area ($m^2$) |
|---|---|---|---|
| Kala summit | Cameroon | Present work | 75.17 |
| Mount Manegouba | Cameroon | Noumi (2010) | 61.69 |
| Shala montane evergreen forest | Nilgiri, India | Mahadass and Davidar (2009) | 53.55 |
| Babia | Brazil | Mori et al. (1983) | 51.90 |
| Zaïre central basin | Democratic Republic of Congo | Wolter (1993) | 46.90 |
| Yapo classified forest | Côte d'Ivoire | Corthay (1996) | 40.00 |
| Lopé (Site 4) | Gabon | White (1992) | 40.00 |
| Odzala National Park | Congo – Brazzaville | Koubouama (1993) | 37.50 |
| Oveng | Gabon | Reitsma (1988) | 36.40 |
| N'Gotto forest | RCA | Lejoly (1995) | 34.40 |
| La Selva | Costa Rica | Licherman (1994) | 29.15 |
| Tan Phu (L9) | Vietnam | Millet (2003) | 22.77 |

The first remark to make from the results in Table 11 is that the land surface area (75.17$m^2$) obtained in Kala summit forest is the highest compared to 61.69 $m^2$ found by Noumi (2010) in Mount Manegouba. From the point of view of dominance, we observe that these two values are the highest ever recorded: 53.55 at Shala montane evergreen forest in India (Mahadass and Davidar, 2009); 51.90 at Babia in Brazil (Mori et al., 1983); 46.90 in the central cuvette of Zaïre (Democratic Republic of Congo) (Wolter, 1993); 40.00 at Yapo in the classified forest of Côte d'Ivoire. In the same way, a similar value is found in Lopé (Site 4) in Gabon by White (1992); 37.50 in the Odzala National Park in Congo-Brazzaville (Koubouama, 1993). It is remarked that these different values are very close to one another. In other sites low values for land surfance are also observed: 36.40 at Oveng in Gabon (Reitsma, 1988); 34.40 in the N'Gotto forest in Central African Republic (Lejoly, 1995).

## Floral composition

The floral list is made up of 210 species (Annexe I). Nomenclature is according to Lebrun and Stork (1991-1997).

## Family level

In the 1.5-ha area studied, 63.81% individuals are represented by 8 families. Similar results have been obtained in the littoral forest along the coast of Madagascar where more than 50% of all individuals are represented by 4, 5 or 6 families (Rabevohitra, 1996). Table 12 compares Kala summit with other montane and submontane forests in Cameroon. It is interesting to note that the *Apocynaceae*, *Moraceae*, *Euphorbiaceae*, *Leguminosae*, *Meliaceae*, *Rubiaceae* are almost present everywhere on the four sites.

**Table 12.** The 10 most abundant families in Kala and three other mountains in Cameroon.

| Mount Messa | Kala summit | Kouoghap Sacred Forest | Mount Manengoumba |
|---|---|---|---|
| Tagne (2007) | Present work | Noumi (2012) | Noumi (2010) |
| Altitude : 900-1156 m | Altitude : 1000-1156 m | Altitude : 1400-1550 m | Altitude : 2200-2396 m |
| *Sterculiaceae* | *Leguminosae* | *Rubiaceae* | *Rubiaceae* |
| *Moraceae* | *Rubiaceae* | *Meliaceae* | *Euphorbiaceae* |
| *Euphorbiaceae* | *Euphorbiaceae* | *Moraceae* | *Araliaceae* |
| *Leguminosae* | *Clusiaceae* | *Bignoniaceae* | *Moraceae* |
| *Meliaceae* | *Sterculiaceae* | *Apocynaceae* | *Myrsinaceae* |
| *Apocynaceae* | *Apocynaceae* | *Sapotacea* | *Meliaceae* |
| *Caricaceae* | *Annonaceae* | *Leguminosae* | *Rutaceae* |
| *Myristicaceae* | *Tiliaceae* | *Euphorbiaceae* | *Cyatheaceae* |
| *Lauraceae* | *Meliaceae* | *Araliaceae* | *Sapindaceae* |
| *Ulmaceae* | *Moraceae* | *Clusiaceae* | *Opiliaceae* |

According to Gentry (1988), comparison of the floristic composition in terms of families in tropical non-marshy forests is similar. He listed 11 families (*Leguminosae*, *Lauraceae*, *Annonaceae*, *Rubiaceae*, *Moraceae*, *Myristicaceae*, *Sapotaceae*, *Meliaceae*, *Arecaceae*, *Euphorbiaceae* and *Bignoniaceae*) which constitute half of the species richness in a 1-ha area in non-marshy neotropical forest. The *Leguminosae* (*Fabaceae*, *Caesalpiniaceae*, *Mimosaceae* together), *Rubiaceae* as well as the *Annonacea*e were cited among the richest families in the SCIO classic forest of Madagascar (Gautier, 2005). Nevetheless, it is not the same in Kala summit where only six (6) families (*Leguminosae*, *Annonaceae*, *Rubiaceae*, *Euphorbiaceae*, *Meliaceae Sterculiaceaea*) constitute 52.85% of the species richness in a 1.5-ha study area. A similar observation had earlier been made by Noumi (2013) with respect to Mount Manenegouba. Among the 11 families herein mentioned, seven (7) amongst them *Leguminosae*, *Annonaceae*, *Rubiaceae*, *Moraceae*, *Meliaceae*, *Euphorbiaceae* and *Bignoniaceae* are among the 10 most abundant families with respect to their relative diversities and the FIV (Table 2). The dominance of *Leguminosae* in the neotropical region of Africa is always justified when individuals are considered at dbh ≥ 10cm (Gentry, 1988). The *Leguminosae* are among the first 5 most abundant families in terms of their FIV in non-marshy and submontane forests (Table 13).

It is remarkable that the *Rubiaceae* occupy an important place in the tropical forests of Africa, Madagascar and the neotropical regions. They are in the 1st position (FIV: 56.19) in the Manegoumba forest (Noumi, 2013); 4th (FIV: 21.23) in Manongarivo (D'Amico and Gautier, 2000); 6th (FIV: 14.71) in Yasuni (Balslev et al., 1987); 10th (FIV: 8.3) in Alto Ivon (Boom, 1986). The abundance of the *Rubiaceae* has been cited in the submontane forests of Cameroon. Actually they are among the five most abundant in the Kouoghap Sacred Forest (Noumi, 2012); whereas on Kala summit, they are among the first 2 richest families. Achoundong (1996) had cited the abundance of the *Rubiaceae* with respect to the Yaoundé submontane massif. In this study the *Leguminosae* are the most abundant, the *Clusiaceae* are the most dominant while the *Leguminosae* and *Euphorbiaceae* are the most diversified.

**Table 13.** The 15 most abundant families in the submontane forests of Cameroon and in 7 tropical forests in Africa, Madagascar and neotropical regions.

| **Kouoghap Sacred Forest (Cameroon)** Noumi (2012) | | **Summit Kala (Cameroon)** Noumi (2012) | | **Mount Messa (Cameroon)** Tagne (2007) | | **Mount Manengouba (Cameroon)** Noumi (2013) | |
|---|---|---|---|---|---|---|---|
| **Families** | **FIV** | **Families** | **FIV** | **Families** | **FIV** | **Families** | **FIV** |
| *Meliaceae* | 33.38 | *Leguminosae* | 31.006 | *Leguminosae* | 47.60 | *Rubiaceae* | 56.19 |
| *Leguminosae* | 32.63 | *Rubiaceae* | 27.900 | *Sterculiaceae* | 33.17 | *Euphorbiaceae* | 55.71 |
| *Moraceae* | 31.81 | *Euphorbiaceae* | 26.804 | *Moraceae* | 28.96 | *Araliaceae* | 51.03 |
| *Sapotaceae* | 26.83 | *Clusiaceae* | 21.774 | *Euphorbiaceae* | 26.11 | *Myrsinaceae* | 49.52 |
| *Rubiaceae* | 26.12 | *Sterculiaceae* | 21.41 | *Meliaceae* | 17.26 | *Meliaceae* | 16.06 |
| *Bignoniaceae* | 21.16 | *Apocynaceae* | 18.246 | *Apocynaceae* | 1390 | *Moraceae* | 8.33 |
| *Apocynaceae* | 19.49 | *Annonaceae* | 17.967 | *Myristicaceae* | 12.59 | *Rutaceae* | 7.95 |
| *Euphorbiaceae* | 15.74 | *Tiliaceae* | 17.838 | *Ulmaceae* | 12.26 | *Cyatheaceae* | 7.40 |
| *Verbenaceae* | 12.51 | *Meliaceae* | 15.780 | *Caricaceae* | 10.57 | *Opliaceae* | 6.66 |
| *Annonaceae* | 11.23 | *Moraceae* | 13.765 | *Rubiaceae* | 10.12 | *Sapindaceae* | 6.19 |
| *Burseraceae* | 9.65 | *Combretaceae* | 8.18 | *Bombacaceae* | 7.44 | *Thymelaeaceae* | 5.59 |
| *Sterculiaceae* | 9.33 | *Sapotaceae* | 8.13 | *Cecropiaceae* | 7.38 | *Rosaceae* | 5.14 |
| *Araliaceae* | 7.70 | *Olacaceae* | 7.92 | *Combretaceae* | 7.37 | *Melianthaceae* | 4.26 |
| *Agavaceae* | 6.83 | *Cecropiaceae* | 7.43 | *Lauraceae* | 7.19 | *Asteraceae* | 3.14 |
| *Clusiaceae* | 6.66 | *Myristicaceae* | 7.38 | *Olacaceae* | 6.85 | *Alangiaceae* | 3.10 |
| **Yapo (Côte d'Ivoire)** Corthay (1996) | | **Manongarivo (Madagascar)** D'Amigo and Gautier (2000) | | **Yasuni (Ecuador)** Balslev et al. (1987) | | **Alto Parana (Paraguay)** Spichiger et al. (1992) | |
| **Families** | **FIV** | **Families** | **FIV** | **Families** | **FIV** | **Families** | **FIV** |
| *Sapotaceae* | 34.15 | *Clusiaceae* | 40.78 | *Arecaceae* | 55.66 | *Meliaceae* | 44.4 |
| *Leguminosae* | 32.27 | *Euphorbiaceae* | 29.09 | *Moraceae* | 36.48 | *Lauraceae* | 42.4 |
| *Burseraceae* | 24.83 | *Myrtaceae* | 27.17 | *Leguminosae* | 23.73 | *Sapotaceae* | 39.4 |
| *Euphorbiaceae* | 18.88 | *Rubiaceae* | 21.23 | *Bombacaceae* | 19.66 | *Leguminosae* | 31.9 |
| *Meliaceae* | 18.70 | *Myristicaceae* | 19.04 | *Myristicaceae* | 19.59 | *Rutaceae* | 25.4 |
| *Sterculiaceae* | 18.57 | *Lauraceae* | 16.32 | *Rubiaceae* | 14.73 | *Moraceae* | 20.4 |

| **Families** | **FIV** | **Families** | **FIV** | **Families** | **FIV** | **Families** | **FIV** |
|---|---|---|---|---|---|---|---|
| *Ebenaceae* | 15.49 | *Burseraceae* | 13.17 | *Meliaceae* | 11.62 | *Boraginaceae* | 14.7 |
| *Clusiaceae* | 14.85 | *Sapotaceae* | 10.48 | *Euphorbiaceae* | 8.15 | *Arecaceae* | 11.1 |
| *Olacaceae* | 15.780 | *Erythroxylaceae* | 9.51 | *Cecropiaceae* | 7.86 | *Annonaceae* | 10.1 |
| *Chrysobalanaceae* | 12.02 | *Annonaceae* | 9.37 | *Lecythidaceae* | 7.54 | *Bignoniaceae* | 8.2 |
| *Flacourtiaceae* | 11.91 | *Sarcolaenaceae* | 8.27 | *Arecaceae* | 7.37 | *Solanaceae* | 4.6 |
| *Combretaceae* | 8.75 | *Asteraceae* | 8.22 | *Sterculiaceae* | 6.72 | *Myrtaceae* | 3.5 |
| *Lecythidaceae* | 6.64 | *Leguminosae* | 7.71 | *Flacourtiaceae* | 6.18 | *Sapindaceae* | 3.2 |
| *Irvingiaceae* | 6.37 | *Ebenaceae* | 7.57 | *Polygonaceae* | 6.07 | *Flacourtiaceae* | 2.7 |
| *Scytopetalaceae* | 6.35 | *Arecaceae* | 7.17 | *Sapotaceae* | 5.59 | *Euphorbiaceae* | 2.5 |
| **Alto Ivon (Bolivia)** Boom (1986) | | **Bahia (Brazil)** Mori et al. (1983) | | | | | |
| **Families** | **FIV** | **Families** | **FIV** | | | | |
| *Moraceae* | 53.3 | *Myrtaceae* | 52.2 | | | | |
| *Myristicaceae* | 41.1 | *Sapotaceae* | 39.4 | | | | |
| *Palmae* | 35.7 | *Caesalpiniaceae* | 28.5 | | | | |
| *Leguminosae* | 30.1 | *Lauraceae* | 20.8 | | | | |
| *Melastomataceae* | 20.1 | *Chrysobalanaceae* | 154 | | | | |
| *Cecropiaceae* | 15.3 | *Euphorbiaceae* | 12.1 | | | | |
| *Vochysiaceae* | 13.9 | *Bombacaceae* | 11.9 | | | | |
| *Annonaceae* | 8.7 | *Lecythidaceae* | 9.5 | | | | |
| *Chrysobalanaceae* | 8.3 | *Melastomataceae* | 9.4 | | | | |
| *Rubiaceae* | 8.3 | *Moraceae* | 9.4 | | | | |
| *Lauraceae* | 7.2 | | | | | | |
| *Burseraceae* | 6.8 | | | | | | |
| *Euphorbiaceae* | 5.7 | | | | | | |
| *Flacourtiaceae* | 5.2 | | | | | | |
| *Myrtaceae* | 4.5 | | | | | | |

## Species level

In all 210 species were censused in the 1.5-ha delimitation with 194 at dbh > 10cm. High values results were obtained in Central Africa for the same types of inventories at dbh ≥ 10: Sonké (1998**)** obtained 372 species/ha in the Dja Biosphere Reserve in Cameroon; Kouka (1994) listed 238 species/ha in the Odzala National Park in Congo-Brazzaville; Phillips et al. (1995) inventoried 283 species /ha in tropical America.

In the study area 50.49 % of individuals are represented by 30 species, while 50 % of individuals are represented by 20 species in the undisturbed lowland forest of Amazonia in Venezuela (Rolle, 1983). In the highlander forests in Cameroun, few species give reach a relative density of 50% due to grgarism and results are pretty similar to one another: 7 species on Mount Kala; 5 species in the Kouoghgap sacredf forest (Noumi, 2012); 4 species on Mount Manegoumba (Noumi, 2013); 17 species in Mount Messa (Tagne, 2007). Similar values were also signaled in Madagascar: 11 species/ha in Manongarivo (D'Amico and Gautier, 2000); 12 species in Andahahela (Rakotomalaza and Messmer, 1999). Mori et al. (1983) considered that species cited only once are rare. In a study completed by Baslev et al . (1987), the percentage of individuals cited only once represent 55% in the unflooded forest and 62% in the forested floodplain of Ecuador. Similar values (55%) were recorded in Peru by Spichiger et al. (1996). Rakotomalaza and Messmer (1999) found a value of 38.8% at Andohahela in Madagascar. In this study the percentage of species encountered only once is 13.4%. In Mount Manegoumba, the value is 9.47% (Noumi, 2013) and 28 % on Mount Messa (Tagne, 2007). A value of 21.1% was signaled in Manongarivo by D'Amico and Gautier (2000), and 22% in Alto Parana by Spichiger et al. (1992).

The ratio of individuals/species is 22.26 by the rule. Similar high results were found in some submontane forests: 33.4% in the Kouoghap sacred forest in Cameroon (Noumi, 2012). 8.03 (Tagne, 2007); 9.17 at 22.1 (Rabavohitra et al., 1996); 6.1 (Rakotomalaza and Messmer, 1999); 7.96 and 8.42 (Cortthay, 1996). Work on forest inventory in neotropical forest regions have

given the following values: 8.42 in Braszil (Mori et al., 1983); 7.37 in Paraguay (Spichiger et al., 1992). Low values obtained include: 2.05 in Janeiro Herrera (Spichiger et al., 1996) and 2.79 in Ecuador (Balslev et al., 1987). The IVI value of 21.15% for *Allanblackia gabonensis* is the highest by the rule. Similar values were found: 16.37 (Tagne, 2007); 28.7 (Mori et al., 1983); 19.7 (Rakotomalaza and Messmer, 1999). High values of the IVI have been mentioned in several studies: 37.7 and 43.5 on the Mogi-Guaçu in Brazil (Gibbs et al., 1980); 37.35 on Mount Manengoumba (Noumi, 2013).

## Altitudinal affinities

A comparison of the work effected on the hills of Yaoundé revealed that there is clearly a transition forest around the 1000m of altitude (Achoundong, 1996). More and more we find, at this altitude, species characteristic of montane forests which include: *Carapa grandiflora, Massularia acuminate, Memecylon polyanthemos.*

Globally speaking, on the Yaoundé massifs the most diversified families are: *Annonaceae, Apocynaceae, Euphorbiaceae, Flacourtiaceae, Leguminosae, Meliaceae, Rubiaceae, Sterculiaceae*. Abundant species among others are: *Allanblackia gabonensis, Tabernaemontana crassa, Santiria trimera, Coelocaryon preussii, Pycnanthus angolensis, Cola attiensis* var. *bordardii, Aulacocalyx jasmiflora* and *Cola verticillata.* Letouzey (1968) mentioned the transitional characteristic of the vegetation around the 1000m altitude of Cameroon Mountains.

The lesson that can be drawn on the Yaoundé hills is in congruence with those made by Aubreville (1932) and de Schnell (1952) on the West African mountains. In Yaoundé as on Mount Nimba in Côte d'Ivoire, a submontane unit is distinguished around the 1000 m of altitude by the remarkable abundance of certain species: *Allanblackia gabonensis, Leplaea mayombensis, Myrianthus libericus, Aulacocalyx jasmiflora, Garcinia smeathmannii, Aulacocalyx caudate, Aulacocalyx preussii, Garcinia mannii, Beilschmiedia grandifolia, Penianthus longifolius, Cyathea camerooniana* and *Xylopia rubescens.*

## Phytogeographical position of Cameroon

According to White (1983) the Cameroon forest from the phytogeographical point of view is classified in the Guineo-Congolese type. Of the 210 species censused, 77.6% are distributed in the Guineo-Congolese zone. 8.093% have an Afro-tropical (At) and 7.14 a Soudano-Zambezian repartitions. 21.88% are species of wide geographical distribution.

## Conclusion

The strong dominance of the Guinean species as a rule in this study bears witness to fact that the study area belongs to the Guineo-Congolese region. From the diversity point of view,the Kala forest is botanically rich just like those of lowland and average altitudinal regions of the world. Physionomically, the forest is of the dense humid equatorial type. Floristic affifinitie enables the classifying of summit Kala forest among the ombrophilic submontane massifs. From the qualitative point of view the forest is characterised by submontane and montane species, 3 orophytes were also encountered. Comparison of the floristic compositions at the species and family levels on Kala summit forest with African, Madagascan, Asian and neotropical regions present similar results. More and more the FIV and IVI values compared are close to one another. The dominant flora is therefore similar to those of lowland regions of the world. Nonetheless, we observe net differences on Kala summit forest due to the predominance of the *Rubiaceae* and *Clusiaceae* families. One remarkably important diversification noted, is that of the *Cola* genus. It can thus be concluded that the summit Kala forest is characterised as a forest of "*Cola* and *Clusiaceae* dominance" due to their great abundance.

## Conflict of interest statement

Authors declare that they have no conflict of interest.

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**Appendix 1. Floristic list of the submontane Kala hill forest, xith the number of individual by class averageof diameter (dbh ≥ 1cm)**

| Species | Famillies | TB | TP | Etage | UP | TF | TD | 1-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 | 100-110 | 110-120 | 120-130 | 130-140 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Celtis zenkeri* Engl. | *Ulmaceae* | Mcph | Aam | Bm | Gilb | Méso | Baro | 29 | 9 | 1 | 4 | | | | | | | | | | 2 | 45 |
| *Celtis tessmannii* Rendle | *Ulmaceae* | Msph | G-Sz | Bm | Pip | Méso | Sarco | 13 | 2 | 4 | | | | | | | | | | 1 | 1 | 21 |
| *Aningeria altissima* (A. chev.) Aubr. & Peller. | *Sapotaceae* | Msph | G-Sz | Sm | Gar | Méso | Sarco | 15 | 1 | 1 | | | | | | 1 | | | | 1 | 1 | 20 |
| *Scottellia minfiensis* Gilg. | *Flacourtiaceae* | Msph | G | Bm/Sm | Gar | Micro | Sarco | | 2 | | 1 | | | | | | | | | | 1 | 4 |
| *Santiria trimera* (Oliv.) Aubr. | *Burseraceae* | Msph | G-sz | Mi | Fic | Méso | Sarco | 30 | 17 | 11 | 1 | 3 | 4 | | 1 | | | 2 | 1 | | | 79 |
| *Pycnanthus angolensis* (Welw.) Warb. | *Myristicaceae* | Mcph | Cg | Bm | Mus | Méso | Sarco | 38 | 32 | 11 | 1 | 3 | 1 | 3 | | | | | 1 | | | 90 |
| *Desbordesia glaucescens* (Engl.) Vans Tiegh | *Irvingiaceae* | Mcph | Cg | Bm/Sm | Fag | Méso | Baro | 17 | 13 | 4 | 1 | 2 | | | | 2 | | 2 | | | | 41 |
| *Musanga cecropioides* R. Br. | *Cecropiaceae* | Mcph | G | Bm | Mus | Macro | Sarco | | 2 | 3 | 1 | 2 | 1 | | | 2 | 2 | | | | | 13 |
| *Bombax buonopozense* P. Beauv. | *Bombacaceae* | Msph | Cg | Bm | Pip | Méso | Ballo | | | | | 2 | | | 2 | | 1 | | | | | 5 |
| *Cylicodiscus gabunense* Harms | *Leguminosae* | Msph | Cg | Bm | Gilb | Nano | Sarco | | | | | | | | | | 1 | | | | | 1 |
| *Allanblackia gabonensis* (Pellegr.) Bamps | *Clusiaceae* | Msph | G | Sm | Gar | Méso | Sarco | 62 | 31 | 2 | 3 | 26 | 1 | 4 | 7 | 2 | | | | | | 192 |
| *Cola verticillata* (Thonn.) stapf ex A. chev | *Sterculiaceae* | Phgr | Ind | Ind | Pip | Méso | Ptéro | 31 | 18 | 24 | 3 | 5 | | | 1 | 1 | | | | | | 83 |
| *Coelocaryon preussii* Warb. | *Myristicaceae* | Nnph | Cg | Bm | Mus | Méso | Ballo | 66 | 19 | 22 | 12 | | | | 2 | | | | | | | 121 |
| *Isolana hexaloba* Engl. | *Annonaceae* | Msph | G | Bm/Sm | Ptery | Méso | Ballo | | 7 | 1 | | | | | 2 | | | | | | | 10 |
| *Antrocaryon klaineanum* Pierre | *Anacardiaceae* | Msph | Cg | Bm | Gilb | Lepto | Sarco | 4 | 1 | | | | | | 1 | | | | | | | 6 |
| *Triplochiton scleroxylon* K. Schum. | *Sterculiaceae* | Mgph | G | Bm | Pip | Méso | Ptéro | 3 | 2 | | 3 | 1 | | | 1 | | | | | | | 10 |
| *Parkia bicolor* A. Chev. | *Leguminosae* | Msph | Cg | Bm | Gilb | Méso | Ballo | 2 | 3 | | | | | | 1 | | | | | | | 6 |
| *Terminalia superpa* Engl. & Diels | *Combretaceae* | Mgph | G | Bm | Pip | Méso | Ptéro | 1 | | | | | | | 1 | | | | | | | 2 |
| *Carapa grandiflora* (Pax) Hutch | *Meliaceae* | Msph | Cg | Mi | Fic | Méso | Sarco | 4 | | | | | | 2 | | | | | | | | 6 |
| *Tabernaemontana crassa* Benth. | *Apocynaceae* | Msph | G | Bm | Mus | Macro | Sarco | 85 | 61 | 13 | 3 | 1 | 2 | 2 | | | | | | | | 167 |
| *Turraeanthus africanus* (Welw. ex DC.) | *Meliaceae* | Mcph | G | Bm | Ptery | Méso | Ballo | 14 | 20 | 1 | 2 | | | 1 | | | | | | | | 47 |
| *Uapaca guineensis* Müell. Arg. | *Euphorbiaceae* | Msph | G | Sm | Gar | Méso | Sarco | 8 | 5 | 1 | 2 | | | 1 | | | | | | | | 17 |
| *Alstonia boonei* De Willd. | *Apocynaceae* | Msph | G | Bm | Pip | Méso | Pogo | 17 | 1 | 2 | | 2 | | 1 | | | | | | | | 23 |
| *Hylodendron gabunense* Taub. | *Leguminosae* | Msph | G | Bm | Pip | Micro | Ballo | 6 | 2 | 2 | | 1 | | 1 | | | | | | | | 12 |
| *Hypodaphnis zenkeri* ( Engl.) Stapf | *Lauraceae* | Mcph | Cg | Bm | Gilb | Méso | Sarco | 42 | 5 | | | | | 1 | | | | | | | | 48 |
| *Leea guineensis* G. Don | *Leeaceae* | Msph | Cg | Sm | Gar | Méso | Sarco | 17 | 1 | | 1 | | | 1 | | | | | | | | 20 |
| *Diospyros longiflora* R. Let. | *Ebenaceae* | Mcph | G | Bm | Gilb | Méso | Sarco | 14 | 1 | | | | | 1 | | | | | | | | 16 |
| *Cola attiensis* var. bordardii (Pellegr.) N. Halle | *Sterculiaceae* | Mcph | G-Sz | Bm/Sm | Gilb | Méso | Ballo | 55 | 18 | 7 | | 8 | 6 | | | | | | | | | 94 |
| *Trilepisium madagascariensis* DC. | *Moraceae* | Msph | G | Bm | Mus | Méso | Sarco | 32 | 5 | 2 | 3 | 2 | 2 | | | | | | | | | 46 |
| *Leplaea mayombensis* (Under.) Alst. | *Meliaceae* | Msph | Cg | Sm | Gar | Lepto | Ballo | 20 | 5 | 1 | 4 | 2 | 2 | | | | | | | | | 43 |
| *Alchornea floribunda* Müll. Arg. | *Euphorbiaceae* | Mcph | At | Bm/Sm | Str | Méso | Ballo | 16 | 3 | | | 1 | 1 | | | | | | | | | 21 |
| *Anonidium mannii* (Oliv.) Engl. & Diels. | *Annonaceae* | Msph | G | Bm | Gilb | Méso | Sarco | 38 | 18 | 4 | 1 | 8 | 1 | | | | | | | | | 79 |
| *Anthonotha macrophylla* P. Beauv. | *Leguminosae* | Mcph | At | Bm | Gilb | Méso | Ballo | 15 | 3 | 4 | | 3 | 1 | | | | | | | | | 26 |
| *Entandrophragma cylindricum* Sprague | *Meliaceae* | Msph | Cg | Bm/Sm | Pip | Méso | Ptéro | | | | | | 1 | | | | | | | | | 1 |
| *Klainedoxa gabonensis* Pierre ex Engl. | *Irvingiaceae* | Phgr | G-Sz | Bm/Sm | Pip | Méso | Sarco | 10 | 5 | | 1 | 2 | 1 | | | | | | | | | 19 |
| *Nauclea diderrichii* ( De Wild. & Th. Dur .) Merrill | *Rubiaceae* | Mcph | G | Bm | Pip | Méso | Sarco | 1 | | | | 1 | 1 | | | | | | | | | 3 |
| *Strombosia grandifolia* Hook. f. ex Benth. | *Olacaceae* | Msph | Cg | Bm/Sm | Str | Méso | Sarco | 29 | 30 | 6 | 3 | 4 | | | | | | | | | | 72 |
| *Erythrina mildbraedii* Harms | *Leguminosae* | Mcph | G | Mi | Gar | Méso | Sarco | 16 | | 2 | | 3 | | | | | | | | | | 21 |
| *Cola ballayi* M. Cornu | *Sterculiaceae* | Msph | Cg | Bm | Gilb | Méso | Sarco | 11 | 7 | 6 | 1 | 2 | | | | | | | | | | 27 |
| *Ficus exasperata* Vahl. | *Moraceae* | Mcph | G | Bm | Mitra | Méso | Sarco | 14 | 4 | | 2 | 2 | | | | | | | | | | 22 |
| *Guarea thompsonii* Harms. | *Meliaceae* | Msph | G | Bm | Pip | Méso | Sarco | 60 | 23 | 4 | | 2 | | | | | | | | | | 89 |

| Species | Famillies | TB | TP | Etage | UP | TF | TD | 1-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 | 100-110 | 110-120 | 120-130 | 130-140 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Greenwayodendron suaveolens Engl.* & Diels | *Annonaceae* | Msph | Am | Bm | Gilb | Méso | Ptéro | | | | | 2 | | | | | | | | | | 2 |
| *Pterocarpus mildbreadii* Engl. | *Leguminosae* | Msph | G | Bm | Pip | Micro | Ptéro | 4 | 2 | | | 2 | | | | | | | | | | 8 |
| *Ricinodendron heudelotii* (Baill.) Pierre ex pax . | *Euphorbiaceae* | Nnph | G | Bm/Sm | Str | Méso | Ballo | | | 3 | 2 | 2 | | | | | | | | | | 7 |
| *Antidesma mambranaceum* Müll. Arg. | *Euphorbiaceae* | Mcph | G | Bm/Sm | Gilb | Méso | Sarco | 4 | 2 | | | 1 | | | | | | | | | | 7 |
| *Drypetes klainei* Pierre ex Pax | *Euphorbiaceae* | Msph | G | Bm | Pip | Méso | Sarco | 29 | 4 | 1 | | 1 | | | | | | | | | | 35 |
| *Homalium letestui* Pellgr. | *Samydaceae* | Mgph | G | Bm | Pip | Méso | Sarco | 1 | 5 | 2 | | 1 | | | | | | | | | | 9 |
| *Sterculia rhimopetala* K. Schum. | *Sterculiaceae* | Msph | Pra | Bm/Sm | Mus | Méso | Ballo | 24 | 4 | 1 | | 1 | | | | | | | | | | 30 |
| *Sterculia tragacantha* Lindl. | *Sterculiaceae* | Msph | G-Sz | Bm/Sm | Str | Méso | Sarco | 13 | 3 | 1 | 5 | 1 | | | | | | | | | | 23 |
| *Syzygium rowlandii* Sprague | *Myrtaceae* | Msph | G | Bm | Pip | Méso | Sarco | 22 | 32 | 9 | 1 | 1 | | | | | | | | | | 65 |
| *Tetraberlinia bifoliolata* (harms) Hauman | *Leguminosae* | Msph | Cg | Bm | Gilb | Méso | Ballo | | 2 | | | 1 | | | | | | | | | | 3 |
| *Zanthoxylum gillettii* De Willd. | *Rutaceae* | Msph | G | Bm/Sm | Ptery | Méso | Baro | 11 | 2 | | | 1 | | | | | | | | | | 14 |
| *Albizia adianthifolia* (Schum.) W. F. Wight | *Leguminosae* | Msph | At | Bm/Sm | Mus | Lepto | Ballo | 6 | 2 | | 3 | | | | | | | | | | | 11 |
| *Strombosia pustulata* Oliv. | *Olacaceae* | Mcph | Cg | Bm | Mitra | Méso | Sarco | 17 | 5 | | 3 | | | | | | | | | | | 25 |
| *Symphonia globulifera* L. f. | *Clusiaceae* | Msph | Pan | Bm | Str | Méso | Sarco | 3 | 7 | 3 | 3 | | | | | | | | | | | 16 |
| *Scottellia coreacea* A. Chev. | *Flacourtiaceae* | Mcph | G | Bm | Gilb | Méso | Ballo | 4 | 4 | 2 | 3 | | | | | | | | | | | 13 |
| *Grewia coriacea* Mast. | *Tiliaceae* | Msph | G | Bm/Sm | Gilb | Méso | Ballo | 23 | 9 | 3 | 3 | | | | | | | | | | | 38 |
| *Staudtia kamerunensis* Warb. | *Myristicaceae* | Mcph | Cg | Bm | Pip | Méso | Ballo | 9 | 23 | 9 | 2 | | | | | | | | | | | 43 |
| *Albizia glaberrima* (schum. & thonn.) Benth. | *Leguminosae* | Msph | Cg | Bm/Sm | Mus | Lepto | Ballo | 20 | 4 | 1 | 2 | | | | | | | | | | | 27 |
| *Antiaris toxicaria* Lesch. | *Moraceae* | Mcph | At | Bm | Gilb | Méso | Ballo | 2 | 3 | 1 | 2 | | | | | | | | | | | 8 |
| *Carapa procera* DC. | *Meliaceae* | Msph | Aam | Bm/Sm | Gilb | Méso | Sarco | 6 | 11 | 9 | 2 | | | | | | | | | | | 28 |
| *Casearia barteri* Jacq. | *Samydaceae* | Mcph | At | Bm/Sm | Str | Méso | Sarco | 9 | 2 | | 2 | | | | | | | | | | | 13 |
| *Strombosiopsis tetrandra* Eng. | *Olacaceae* | Mcph | G | Bm/Sm | Str | Méso | Sarco | 31 | 5 | 2 | 2 | | | | | | | | | | | 40 |
| *Tetrapleura tetraptera* (Schum. & Thonn.) Taub. | *Leguminosae* | Mcph | G | Bm | Pip | Lepto | Baro | 23 | | 2 | 2 | | | | | | | | | | | 27 |
| *Myrianthus arboreus* P. Beauv. | *Cecropiaceae* | Mcph | G | Bm | Mus | Macro | Sarco | 35 | 9 | 7 | 2 | | | | | | | | | | | 53 |
| *Myrianthus liberucus* P. Beauv. | *Cecropiaceae* | Mcph | G | Sm | Gar | Macro | Sarco | 10 | 2 | 5 | 2 | | | | | | | | | | | 19 |
| *Alangium chinense* (Lour.) Harms | *Alangiaceae* | Msph | Pal | Mi | Pol | Macro | Baro | 21 | 1 | 5 | 1 | | | | | | | | | | | 28 |
| *Amphimas pterocarpoides* Harms. | *Leguminosae* | Msph | Cg | Bm | Gilb | Méso | Ptéro | 15 | 1 | 1 | 1 | | | | | | | | | | | 18 |
| *Beilschmiedia obscura* (stapf) Engl. & A. | *Lauraceae* | Chd | Cg | Bm | Gilb | Méso | Sarco | 14 | | 3 | 1 | | | | | | | | | | | 18 |
| *Brachystegia cynemetroides* Harms | *Leguminosae* | Msph | Cg | Bm | Pip | Méso | Ballo | 2 | 5 | 1 | 1 | | | | | | | | | | | 9 |
| *Cola acuminata* P. Beauv. | *Sterculiaceae* | Nnph | G | Bm | Pip | Méso | Sarco | | 2 | 1 | 1 | | | | | | | | | | | 4 |
| *Dacryodes igangaga* Aubr. & Pellegr. | *Burseraceae* | Msph | G | Bm | Str | Méso | Sarco | 1 | 3 | | 1 | | | | | | | | | | | 5 |
| *Distemonanthus benthamianus* Baill. | *Leguminosae* | Msph | Cg | Bm/Sm | Gilb | Méso | Sarco | | | | 1 | | | | | | | | | | | 1 |
| *Eriocoelum macrocarpum* Gilg. | *Sapindaceae* | Msph | Cg | Bm | Gilb | Méso | Ptéro | 20 | 19 | 3 | 1 | | | | | | | | | | | 43 |
| *Sorindeia grandifolia* Engl. | *Anacardiaceae* | Msph | At | Bm/Sm | Gar | Méso | Ballo | 2 | 3 | 1 | 1 | | | | | | | | | | | 7 |
| *Tessmania anomala* (Mich.) Harms | *Leguminosae* | Msph | Cg | Bm | Gilb | Lepto | Baro | | 1 | 1 | 1 | | | | | | | | | | | 3 |
| *Gossweilerodendron balsamiferum* (Verm.) Harms | *Leguminosae* | Mcph | Cg | Bm/Sm | Gilb | Méso | Sarco | 30 | | 1 | 1 | | | | | | | | | | | 32 |
| *Hannoa klaineana* Pierre & Engl. | *Simaroubaceae* | Msph | G | Bm | Pip | Méso | Sarco | | 4 | 5 | 1 | | | | | | | | | | | 10 |
| *Maesopsis eminii* Engl. | *Rhamnaceae* | Mcph | Am | Bm | Pip | Méso | Sarco | 5 | 5 | 2 | 1 | | | | | | | | | | | 13 |
| *Paraberlinia bifoliolata* Pellegr. | *Leguminosae* | Msph | G | Bm | Pip | Lepto | Ballo | 5 | | | 1 | | | | | | | | | | | 6 |
| *Petersianthus macrocarpus* (P. Beauv.) Liben | *Lecythidaceae* | Mgph | G | Bm/Sm | Pip | Lepto | Ptéro | 1 | 2 | 1 | 1 | | | | | | | | | | | 5 |
| *Rothmannia hispida* (K. Schum) Fagerlind | *Rubiaceae* | Msph | Cg | Bm | Gilb | Méso | Sarco | 16 | 4 | | 1 | | | | | | | | | | | 21 |
| *Aulacocalyx jasmiflora* Hook. f. | *Rubiaceae* | Mcph | Cg | Sm | Gar | Méso | Sarco | 64 | 64 | 14 | | | | | | | | | | | | 142 |
| *Landolphia congolensis* (Stapf) Pichon | *Apocynaceae* | Msph | G | Bm | Gilb | Méso | Sarco | | 6 | 7 | | | | | | | | | | | | 13 |

| Species | Famillies | TB | TP | Etage | UP | TF | TD | 1-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 | 100-110 | 110-120 | 120-130 | 130-140 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Coffea brevipes* Hiern | *Rubiaceae* | Mcph | G | Sm | Pip | Méso | Sarco | 37 | 7 | 6 | | | | | | | | | | | | 50 |
| *Garcinia smeathmannii* Oliv. | *Clusiaceae* | Msph | Cg | Sm | Gar | Méso | Ballo | 48 | 34 | 6 | | | | | | | | | | | | 88 |
| *Aulacocalyx caudata* Hook. f. | *Rubiaceae* | Mcph | Cg | Sm | Gar | Méso | Sarco | 41 | 12 | 4 | | | | | | | | | | | | 57 |
| *Dacryodes macrophylla* (Oliv.) Lam | *Burseraceae* | Msph | Cg | Bm | Gilb | Méso | Sarco | 28 | 16 | 4 | | | | | | | | | | | | 48 |
| *Dialum zenkeri* Harms | *Leguminosae* | Msph | Cg | Bm | Pip | Méso | Ptéro | 21 | 5 | 4 | | | | | | | | | | | | 30 |
| *Psydrax arnoldianum* (De Willd. & Th.Dur.) Hepper | *Rubiaceae* | Msph | G | Bm | Pip | Micro | Ptéro | 14 | 11 | 4 | | | | | | | | | | | | 29 |
| *Cleistopholis patens* (Benth.) Engl. & Diels | *Annonaceae* | Msph | G | Bm | Mitra | Méso | Sarco | 12 | 4 | 2 | | | | | | | | | | | | 18 |
| *Cola pachycarpa* K. Schum. | *Sterculiaceae* | Msph | Cg | Bm/Sm | Gilb | Méso | Baro | 3 | 5 | 2 | | | | | | | | | | | | 10 |
| *Dacryodes buettneri* (Engl.) Lam | *Burseraceae* | Msph | G | Bm | Gilb | Méso | Sarco | 14 | 3 | 2 | | | | | | | | | | | | 19 |
| *Discoglypremna caloneura* (Pax) Prain | *Euphorbiaceae* | Msph | G | Bm | Pip | Lepto | Baro | | | 2 | | | | | | | | | | | | 2 |
| *Entada gigas* (Linn.) Fawcett & Rendle | *Leguminosae* | Msph | G | Bm/Sm | Pip | Méso | Ptéro | 3 | 25 | 2 | | | | | | | | | | | | 30 |
| *Greenwayodendron suaveolens* (Engl. & Diels) Verd. | *Annonaceae* | Mcph | G | Bm | Oleo | Lepto | Sarco | 13 | 39 | 2 | | | | | | | | | | | | 54 |
| *Homalium* sp. | *Samydaceae* | Msph | Cg | Bm | Mus | Méso | Ptéro | 12 | 5 | 2 | | | | | | | | | | | | 19 |
| *Maesobotrya klaineana* Benth. | *Euphorbiaceae* | Msph | G-Sz | Bm/Sm | Mus | Méso | Sarco | 1 | | 2 | | | | | | | | | | | | 3 |
| *Massularia acuminata* (K. Schum.) Hoyle | *Rubiaceae* | Mcph | G-Sz | Mi | Fic | Méso | Sarco | 19 | 7 | 2 | | | | | | | | | | | | 28 |
| *Monodora myristica* (Geartn.) Dinal | *Annonaceae* | Mcph | G | Bm | Pip | Méso | Sarco | 48 | 6 | 2 | | | | | | | | | | | | 56 |
| *Monodora tenuifolia* Benth | *Annonaceae* | Msph | G | Bm/Sm | Mus | Macro | Sarco | 3 | 1 | 2 | | | | | | | | | | | | 6 |
| *Nesogordonia papaverifera* (A. Chev.) R. | *Sterculiaceae* | Msph | Cg | Bm | Gilb | Micro | Ballo | 2 | | 2 | | | | | | | | | | | | 4 |
| *Pseudospondias microcarpa* ( A. Rich. ) Engl. | *Anacardiaceae* | Mcph | pan | Bm/Sm | Mitra | Méso | Sarco | 1 | | 2 | | | | | | | | | | | | 3 |
| *Ptellopsis hylodendron* Mild. | *Combretaceae* | Msph | Cg | Bm | Pip | Micro | Ptéro | 2 | 3 | 2 | | | | | | | | | | | | 7 |
| *Rothmannia whitfieldii* (Lind. ) Dandy | *Rubiaceae* | Mgph | G | Sm | Gar | Méso | Sarco | | | 2 | | | | | | | | | | | | 2 |
| *Trichilia rubenscens* Oliv. | *Meliaceae* | Mcph | Cg | Bm/Sm | Str | Méso | Ballo | 8 | 1 | 2 | | | | | | | | | | | | 11 |
| *Vitex grandifolia* (C. H. Wright) Marq. ex chipp | *Verbenaceae* | Msph | Cg | Bm/Sm | Pip | Méso | Sarco | | | 2 | | | | | | | | | | | | 2 |
| *Aulacocalyx preussii* Hook. f. | *Rubiaceae* | Mcph | Cg | Sm | Gar | Méso | Sarco | 27 | 1 | 1 | | | | | | | | | | | | 29 |
| *Acacia pennata* (L.) Willd. | *Leguminosae* | Phgr | G | Bm/Sm | Oleo | Lepto | Ballo | 12 | 5 | 1 | | | | | | | | | | | | 18 |
| *Anthonotha fragrans* (Bak. f. ) Excell. Hill. | *Leguminosae* | Mcph | At | Bm | Gilb | Méso | Sarco | | 2 | 1 | | | | | | | | | | | | 3 |
| *Antidesma laciniatum* Müll. Arg. | *Euphorbiaceae* | Mcph | G | Mi | Str | Méso | Sarco | 7 | | 1 | | | | | | | | | | | | 8 |
| *Caloncoba glauca* (P. Beauv) Gilg. | *Flacourtiaceae* | Msph | Bg | Bm/Sm | Mus | Méso | Sarco | 2 | 2 | 1 | | | | | | | | | | | | 5 |
| *Cola lateritia* K. Schum. | *Sterculiaceae* | Msph | Cg | Bm/Sm | Gilb | Méso | Baro | 4 | 1 | 1 | | | | | | | | | | | | 6 |
| *Desplatsia dewevrei* De wild. & Th. Dur | *Tiliaceae* | Msph | G | Bm/Sm | Pip | Méso | Sarco | 15 | 6 | 1 | | | | | | | | | | | | 22 |
| *Desplatsia subericarpa* Bocq. | *Tiliaceae* | Msph | Cg | Bm | Gilb | Nano | Baro | 38 | 2 | 1 | | | | | | | | | | | | 41 |
| *Dialum bipendense* Harms | *Leguminosae* | Msph | Ca | Bm | Gilb | Méso | Baro | 10 | 4 | 1 | | | | | | | | | | | | 15 |
| *Elaeis guineensis* Jacq. | *Arecaceae* | Mcph | Aam | Bm | Pip | Méso | Baro | | | 1 | | | | | | | | | | | | 1 |
| *Entandrophragma utile* Dawe & Sprague | *Meliaceae* | Msph | G | Bm | Pip | Méso | Ballo | | 4 | 1 | | | | | | | | | | | | 5 |
| *Erythrococca africana* (Baill.) Prain | *Euphorbiaceae* | Msph | G-Sz | Bm | Pip | Lepto | Ballo | 12 | 3 | 1 | | | | | | | | | | | | 16 |
| *Erythrophleum ivorense* A. Chev. | *Leguminosae* | Msph | G-Sz | Bm | Pip | Lepto | Ballo | 14 | | 1 | | | | | | | | | | | | 15 |
| *Glyphaea brevis* (Sprague) Manachino | *Tiliaceae* | Mgph | Cg | Bm | Pip | Lepto | Ptéro | 17 | 9 | 1 | | | | | | | | | | | | 27 |
| *Khaya anthotheca* (welw.) C. DC. | *Meliaceae* | Mcph | At | Mi | Pip | Méso | Baro | 1 | 3 | 1 | | | | | | | | | | | | 5 |
| *Librevillea klainei* Pierre (ex Harms) Hoyle | *Leguminosae* | Msph | G | Bm | Gilb | Méso | Sarco | | 5 | 1 | | | | | | | | | | | | 6 |
| *Mammea africana* Sabine | *Clusiaceae* | Msph | G | Bm | Pip | Méso | Sarco | | 1 | 1 | | | | | | | | | | | | 2 |
| *Omphalocarpum procerum* P. Beauv. | *Sapotaceae* | Mcph | G | Bm | Mus | Macro | Sarco | 2 | 2 | 1 | | | | | | | | | | | | 5 |
| *Piptadeniastrum africanum* (Hook. F. ) Brenan | *Leguminosae* | Msph | G | Bm/Sm | Pip | Lepto | Ballo | | | 1 | | | | | | | | | | | | 1 |
| *Pterocarpus soyauxii* Taub. | *Leguminosae* | Msph | G | Bm/Sm | Ptery | Macro | Ptéro | 17 | 8 | 1 | | | | | | | | | | | | 26 |

| Species | Famillies | TB | TP | Etage | UP | TF | TD | 1-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 | 100-110 | 110-120 | 120-130 | 130-140 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Rauvolfia macrophylla* Stapf | *Apocynaceae* | Mcph | G | Bm/Sm | Mus | Méso | Sarco | 4 | 3 | 1 | | | | | | | | | | | | 8 |
| *Rothmannia lujae* (De Wild.) Keay | *Rubiaceae* | Mcph | G-Sz | Bm | Gilb | Méso | Sarco | 33 | 5 | 1 | | | | | | | | | | | | 39 |
| *Trichilia welwitschii* C.DC. | *Meliaceae* | Mcph | Cg | Bm/Sm | Gilb | Méso | Ballo | 1 | 9 | 1 | | | | | | | | | | | | 11 |
| *Xylopia staudtii* Engl. | *Annonaceae* | Msph | Cg | Bm | Gilb | Méso | Ballo | 6 | 3 | 1 | | | | | | | | | | | | 10 |
| *Treculia africana* Decne. | *Moraceae* | Msph | At | Bm | Mitra | Méso | Sarco | 5 | 18 | 1 | | | | | | | | | | | | 24 |
| *Annickia chlorantha* Oliv. | *Annonaceae* | Msph | Cg | Bm | Gilb | Méso | Sarco | 57 | 11 | | | | | | | | | | | | | 68 |
| *Diospyros simulans* F. White | *Ebenaceae* | Msph | G | Bm | Mus | Méso | Baro | 26 | 10 | | | | | | | | | | | | | 36 |
| *Oxyanthus speciosus* DC. | *Rubiaceae* | Msph | G | Bm | Gilb | Méso | Sarco | 1 | 10 | | | | | | | | | | | | | 11 |
| *Erysmadelphus exsul* Mildbr. | *Vochysiaceae* | Msph | Cg | Sm | Gar | Méso | Sarco | 25 | 8 | | | | | | | | | | | | | 33 |
| *Gilbertiodendron brachystegioides* Harms | *Leguminosae* | Msph | Cg | Bm | Gilb | Méso | Ballo | 31 | 7 | | | | | | | | | | | | | 38 |
| *Campylospermum elongatum* (Oliv.) Vahl Tiegh | *Ochnaceae* | Msph | Cg | Bm/Sm | Ptery | Méso | Sarco | 13 | 5 | | | | | | | | | | | | | 18 |
| *Combretum* sp. | *Combretaceae* | Msph | G | Bm | Pip | Méso | Sarco | 15 | 5 | | | | | | | | | | | | | 20 |
| *Celtis philippensis* Blanco | *Ulmaceae* | Msph | Bg | Bm | Pip | Méso | Sarco | | 4 | | | | | | | | | | | | | 4 |
| *Crudia gabonensis* Pierre ex De Willd. | *Leguminosae* | Nnph | G | Sm/Mi | Gar | Lepto | Sclér | 1 | 4 | | | | | | | | | | | | | 5 |
| *Garcinia mannii* Oliv. | *Clusiaceae* | Mcph | Cg | Sm/Mi | Gar | Méso | Sarco | 1 | 4 | | | | | | | | | | | | | 5 |
| *Gilbertiodendron preussii* Harms | *Leguminosae* | Msph | G | Bm | Gilb | Méso | Ballo | 23 | 4 | | | | | | | | | | | | | 27 |
| *Microdesmis puberula* Hook. | *Euphorbiaceae* | Mcph | At | Bm | Mus | Méso | Sarco | 19 | 4 | | | | | | | | | | | | | 23 |
| *Milletia sanagana* Harms | *Leguminosae* | Mcph | Cg | Bm/Sm | Pip | Méso | Sarco | | 4 | | | | | | | | | | | | | 4 |
| *Panda oleosa* Pierre | *Pandaceae* | Msph | G | Bm | Gilb | Méso | Ptéro | | 4 | | | | | | | | | | | | | 4 |
| *Beilschmiedia grandifolia* (Vahl.) Hutch. & Dalz. | *Lauraceae* | Mcph | Cg | Sm | Gar | Méso | Sarco | 28 | 3 | | | | | | | | | | | | | 31 |
| *Canarium schweinfurthii* Engl. | *Burseraceae* | Msph | G | Bm/Sm | Ptery | Méso | Sarco | 10 | 3 | | | | | | | | | | | | | 13 |
| *Cordia platythyrsa* Bak. | *Boraginaceae* | Msph | Cg | Bm | Gilb | Méso | Scléro | 43 | 3 | | | | | | | | | | | | | 46 |
| *Diospyros crassiflora* Hiern | *Ebenaceae* | Mcph | G-Sz | Bm/Sm | Gilb | Méso | Sarco | 10 | 3 | | | | | | | | | | | | | 13 |
| *Diospyros hoyleana* F. White | *Ebenaceae* | Mcph | G | Bm | Gilb | Méso | Sarco | 1 | 3 | | | | | | | | | | | | | 4 |
| *Gambeya africana* (G. Dan. ex Bak.) Pierre. | *Sapotaceae* | Mcph | G | Bm/Sm | Pip | Méso | Sarco | 4 | 3 | | | | | | | | | | | | | 7 |
| *Garcinia kola* Heckel | *Clusiaceae* | Mcph | G | Bm/Sm | Pip | Méso | Sarco | 1 | 3 | | | | | | | | | | | | | 4 |
| *Guarea cedrata* (A. Chev.) Pellegr. | *Meliaceae* | Msph | G | Bm/Sm | Gilb | Méso | Ballo | 8 | 3 | | | | | | | | | | | | | 11 |
| *Kigelia africana* (Lam.) Benth. | *Bignoniaceae* | Msph | G-Sz | Bm | Gilb | Méso | Sarco | | 3 | | | | | | | | | | | | | 3 |
| *Mallotus oppositifolius* ( Geisel.) Müll. Arg. | *Euphorbiaceae* | Msph | G-Sz | Bm | Gilb | Méso | Sarco | 6 | 3 | | | | | | | | | | | | | 9 |
| *Synsepalum dulcificum* Schum. &Thonn. | *Sapotaceae* | Msph | G | Bm | Ptery | Méso | Sarco | 20 | 3 | | | | | | | | | | | | | 23 |
| *Trichilia dregeana* Sond. | *Meliaceae* | Mcph | Cg | Sm | Gar | Méso | Ballo | 8 | 3 | | | | | | | | | | | | | 11 |
| *Uapaca esculenta* A. Chev. | *Euphorbiaceae* | Msph | G | Sm | Gar | Méso | Sarco | 2 | 3 | | | | | | | | | | | | | 5 |
| *Voacanga braeteata* Stapf | *Apocynaceae* | Mcph | At | Bm | Mus | Méso | Sarco | 14 | 3 | | | | | | | | | | | | | 17 |
| *Zanthoxylum tessmannii* (Engl.) R. Let. | *Rutaceae* | Msph | G | Bm/Sm | Ptery | Méso | Baro | 8 | 3 | | | | | | | | | | | | | 11 |
| *Antidesma venosum* Tul. | *Euphorbiaceae* | Mcph | G | Sm | Gar | Méso | Sarco | 2 | 2 | | | | | | | | | | | | | 4 |
| *Bertiera adamsii* (Hepper) N. Halle | *Rubiaceae* | Msph | G | Bm | Pip | Méso | Ballo | | 2 | | | | | | | | | | | | | 2 |
| *Caloncoba echinata* (Oliv.) Gilg. | *Flacourtiaceae* | Msph | Bg | Bm/Sm | Mitra | Méso | Sarco | 7 | 2 | | | | | | | | | | | | | 9 |
| *Caloncoba welwitschii* (Oliv.) Gilg. | *Flacourtiaceae* | Mcph | Bg | Bm | Str | Macro | Sarco | 23 | 2 | | | | | | | | | | | | | 25 |
| *Drypetes gossweilerii* S. Moore | *Euphorbiaceae* | Msph | Cg | Bm | Gilb | Méso | Sarco | | 2 | | | | | | | | | | | | | 2 |
| *Duboscia macrocarpa* Bocq. | *Tiliaceae* | Mcph | Pal | Bm/Sm | Mitra | Méga | Sarco | 12 | 2 | | | | | | | | | | | | | 14 |
| *Eribroma oblangum* (Mast.) Bodard | *Sterculiaceae* | Mcph | G | Bm | Gilb | Méso | Sarco | 2 | 2 | | | | | | | | | | | | | 4 |
| *Macaranga barteri* Müll. Arg. | *Euphorbiaceae* | Msph | Cg | Bm | Gilb | Méso | Sarco | 2 | 2 | | | | | | | | | | | | | 4 |
| *Macaranga monandra* Müll. Arg. | *Euphorbiaceae* | Msph | G | Bm | Gilb | Méso | Sarco | 2 | 2 | | | | | | | | | | | | | 4 |

| **Species** | **Famillies** | **TB** | **TP** | **Etage** | **UP** | **TF** | **TD** | **1-10** | **10-20** | **20-30** | **30-40** | **40-50** | **50-60** | **60-70** | **70-80** | **80-90** | **90-100** | **100-110** | **110-120** | **120-130** | **130-140** | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Maesobotrya dusenii* (Pax) Hutch. | *Euphorbiaceae* | Mcph | Cg | Bm | Gilb | Méso | Sarco | 2 | 2 | | | | | | | | | | | | | 4 |
| *Margaritaria discoidea* (Benth) K. Schum. | *Euphorbiaceae* | Mcph | G-Sz | Bm | Pip | Méso | Ptéro | 1 | 2 | | | | | | | | | | | | | 3 |
| *Pausinystalia macroceras* (K. Schum) Pierre | *Rubiaceae* | Nnph | Cg | Sm | Gar | Macro | Sarco | | 2 | | | | | | | | | | | | | 2 |
| *Penianthus longifolius* Miers | *Menispermaceae* | Msph | G | Sm | Gar | Macro | Sarco | 12 | 2 | | | | | | | | | | | | | 14 |
| *Plagiosiphon emarginatus* Hutch. & Dalz. | *Leguminosae* | Mcph | Cg | Bm/Sm | Gilb | Méso | Sarco | 1 | 2 | | | | | | | | | | | | | 3 |
| *Rauvolfia vomitoria* Afzel | *Apocynaceae* | Msph | G | Bm | Mus | Méso | Sarco | | 2 | | | | | | | | | | | | | 2 |
| *Spathodea campanulata* P. Beauv. | *Bignoniaceae* | Mcph | Cg | Bm/Sm | Str | Méso | Sarco | | 2 | | | | | | | | | | | | | 2 |
| *Xylopia aethiopica* (Dunal) A. Rich. | *Annonaceae* | Msph | G | Bm | Pip | Méso | Ballo | 9 | 2 | | | | | | | | | | | | | 11 |
| *Voacanga africana* Stapf | *Apocynaceae* | Mcph | Cg | Bm | Mus | Méso | Sarco | | 2 | | | | | | | | | | | | | 2 |
| *Antiaris welwitschii* Lesch. | *Moraceae* | Msph | G | Bm | Gilb | Méso | Sarco | 2 | 1 | | | | | | | | | | | | | 3 |
| *Antidesma* sp. | *Euphorbiaceae* | Mcph | At | Ind | Ind | Méso | Sarco | 17 | 1 | | | | | | | | | | | | | 18 |
| *Baphiopsis parviflora* Benth. & Bak. | *Leguminosae* | Mcph | G-Sz | Bm | Gilb | Méso | Baro | 5 | 1 | | | | | | | | | | | | | 6 |
| *Blighia welwitschii* (Hiern) Radlk. | *Sapindaceae* | Msph | G | Bm | Pip | Méso | Ballo | 3 | 1 | | | | | | | | | | | | | 4 |
| *Brachystegia laurentii* (De Wild.) Louis | *Leguminosae* | Mcph | At | Bm | Pip | Méso | Ballo | 14 | 1 | | | | | | | | | | | | | 15 |
| *Christiana africana* DC. | *Tiliaceae* | Mcph | Aam | Bm | Gilb | Méso | Ballo | 2 | 1 | | | | | | | | | | | | | 3 |
| *Gambea boukokoensis* Aubr. & Pellegr. | *Sapotaceae* | Msph | G | Bm | Gilb | Méso | Sarco | | 1 | | | | | | | | | | | | | 1 |
| *Hexalobus crispiflorus* A. Rich. | *Annonaceae* | Msph | G | Bm | Pip | Méso | Sarco | | 1 | | | | | | | | | | | | | 1 |
| *Hymenostegia afzelii* (Oliv.) Harms | *Leguminosae* | Mcph | Cg | Bm | Pip | Micro | Ballo | | 1 | | | | | | | | | | | | | 1 |
| *Lasiodiscus mannii* Hook. f. | *Rhamnaceae* | Mcph | At | Bm/Sm | Pip | Méso | Sarco | | 1 | | | | | | | | | | | | | 1 |
| *Maranthes glabra* (Oliv.) Prance | *Chrisobalanaceae* | Msph | At | Bm/Sm | Pip | Méso | Sarco | | 1 | | | | | | | | | | | | | 1 |
| *Milicia excelsa* (Welw.) C.C. Berg. | *Moraceae* | Mcph | Cg | Bm | Gilb | Méso | Ballo | 16 | 1 | | | | | | | | | | | | | 17 |
| *Sapium ellipticum* (Hochst.) Pax | *Sapindaceae* | Nnph | Cg | Bm/Sm | Str | Macro | Sarco | | 1 | | | | | | | | | | | | | 1 |
| *Schumanniophyton magnificum* Harms | *Rubiaceae* | Mcph | G | Bm | Gilb | Méso | Ballo | 10 | 1 | | | | | | | | | | | | | 11 |
| *Uvariastrum pynaertii* De Wild. | *Annonaceae* | Mcph | Cg | Bm | Gilb | Méso | Sarco | | 1 | | | | | | | | | | | | | 1 |
| *Cyathea camerooniana* Hook. f | *Cyatheaceae* | Nnph | G | Sm/Mi | Gar | Lepto | Scléro | 19 | | | | | | | | | | | | | | 19 |
| *Pterygota macrocarpa* K. Schum. | *Sterculiaceae* | Nnph | G | Bm/Sm | Str | Méso | Ballo | 18 | | | | | | | | | | | | | | 18 |
| *Rinorea oblongifolia* ( C.h. Wright) Marg. ex chipp | *Violaceae* | Nnph | G | Sm/Mi | Gilb | Méso | Sarco | 11 | | | | | | | | | | | | | | 11 |
| *Allophylus africanus* P. Beauv. | *Sapindaceae* | Msph | At | Sm | Oleo | Méso | Scléro | 10 | | | | | | | | | | | | | | 10 |
| *Cyathea manniana* Hook. f. | *Cyatheaceae* | Msph | G | Bm | Pip | Méso | Ballo | 8 | | | | | | | | | | | | | | 8 |
| *Newtonia griffoniana* (Baill.) Keay | *Leguminosae* | Msph | G | Bm | Gilb | Méso | Sarco | 5 | | | | | | | | | | | | | | 5 |
| *Cola rostrata* K. Schum. | *Sterculiaceae* | Msph | Aam | Sm | Gar | Méso | Sarco | 4 | | | | | | | | | | | | | | 4 |
| *Ficus mucuso* Ficalho | *Moraceae* | Msph | Cg | Bm | Pip | Méso | Sarco | 4 | | | | | | | | | | | | | | 4 |
| *Carpolobia lutea* G. Don. | *Polygalaceae* | Mcph | At | Bm/Sm | Gilb | Méso | Ballo | 3 | | | | | | | | | | | | | | 3 |
| *Markhamea lutea* (Benth.) K. Schum. | *Bignoniaceae* | Mcph | G-Sz | Bm/Sm | Str | Méso | Ptéro | 3 | | | | | | | | | | | | | | 3 |
| *Xylopia rubenscens* Oliv. | *Annonaceae* | Mcph | Cg | Sm | Gar | Méso | Ballo | 3 | | | | | | | | | | | | | | 3 |
| *Memecylon polyanthemos* Hook. f. | *Euphorbiaceae* | Mcph | G-Sz | Mi | Fic | Méso | Baro | 2 | | | | | | | | | | | | | | 2 |
| *Nauclea latifol*ia Sm. | *Rubiaceae* | Msph | G | Bm | Pip | Méso | Ptéro | 2 | | | | | | | | | | | | | | 2 |
| *Macaranga saccifera* Pax | *Euphorbiaceae* | Mcph | G | Bm | Gilb | Méso | Sarco | 1 | | | | | | | | | | | | | | 1 |
| *Tetracera alnifolia* Willd. | *Dilleniaceae* | Phgr | At | Bm | Mitra | Méso | Ptéro | 1 | | | | | | | | | | | | | | 1 |
| *Uapaca togoensis* Pax & Engl. | *Euphorbiaceae* | Msph | G | Sm | Ptery | Méso | Sarco | 1 | | | | | | | | | | | | | | 1 |
| Total | | | | | | | | 2568 | 1116 | 374 | 155 | 102 | 34 | 18 | 19 | 8 | 4 | 4 | 2 | 2 | 5 | 4411 |

**Appendix 2. Diversity, density, basal area and FIV of the plant families encountered in the 5.25-ha sampling in the Kala hill, presentde by decreasing FIV.**

| Families | Number of species | Numberof trees | Basal area | Relative diversity [x100 %] | Relative density [x100 %] | Relative dominance [x100 %] | FIV [x300 %] |
|---|---|---|---|---|---|---|---|
| *Alangiaceae* | 1 | 28 | 0.4006 | 0.4762 | 0.6483 | 0.3404 | 1.4649 |
| *Anacardiaceae* | 3 | 12 | 2.3483 | 1.4286 | 0.2778 | 1.9955 | 3.7019 |
| *Annonaceae* | 14 | 331 | 5.1895 | 6.6667 | 7.6638 | 4.4099 | 18.7403 |
| *Apocynaceae* | 7 | 326 | 9.2795 | 3.3333 | 7.5480 | 7.8853 | 18.7667 |
| *Araceae* | 1 | 14 | 0.0589 | 0.4762 | 0.3241 | 0.0501 | 0.8504 |
| *Bignoniaceae* | 3 | 15 | 0.3436 | 1.4286 | 0.3473 | 0.2920 | 2.0679 |
| *Bombacaceae* | 1 | 4 | 0.0236 | 0.4762 | 0.0926 | 0.0200 | 0.5888 |
| *Boraginaceae* | 1 | 20 | 0.1178 | 0.4762 | 0.4631 | 0.1001 | 1.0394 |
| *Burseraceae* | 5 | 45 | 1.2507 | 2.3810 | 1.0419 | 1.0628 | 4.4857 |
| *Cecropiaceae* | 3 | 72 | 4.2726 | 1.4286 | 1.6671 | 3.6307 | 6.7263 |
| *Celtidaceae* | 3 | 38 | 3.2319 | 1.4286 | 0.8798 | 2.7464 | 5.0548 |
| *Chrysobalanaceae* | 1 | 2 | 0.0668 | 0.4762 | 0.0463 | 0.0567 | 0.5792 |
| *Clusiaceae* | 6 | 233 | 17.4221 | 2.8571 | 5.3948 | 14.8046 | 23.0565 |
| *Combretaceae* | 3 | 114 | 4.5121 | 1.4286 | 2.6395 | 3.8342 | 7.9023 |
| *Cyatheaceae* | 2 | 24 | 0.1100 | 0.9524 | 0.5557 | 0.0934 | 1.6015 |
| *Delliniaceae* | 1 | 1 | 0.0020 | 0.4762 | 0.0232 | 0.0017 | 0.5010 |
| *Ebenaceae* | 4 | 63 | 0.8306 | 1.9048 | 1.4587 | 0.7058 | 4.0692 |
| *Euphorbiaceae* | 23 | 251 | 8.8809 | 10.9524 | 5.8115 | 7.5466 | 24.3106 |
| *Flacourtiaceae* | 7 | 63 | 1.0505 | 3.3333 | 1.4587 | 0.8926 | 5.6847 |
| *Irvingiaceae* | 2 | 51 | 0.5871 | 0.9524 | 1.1808 | 0.4989 | 2.6321 |
| *Lauraceae* | 2 | 32 | 0.1257 | 0.9524 | 0.7409 | 0.1068 | 1.8001 |
| *Lecythidaceae* | 1 | 14 | 0.0589 | 0.4762 | 0.3241 | 0.0501 | 0.8504 |
| *Leeaceae* | 1 | 1 | 0.0177 | 0.4762 | 0.0232 | 0.0150 | 0.5144 |
| *Leguminosae* | 34 | 602 | 11.2508 | 16.1905 | 13.9384 | 9.5605 | 39.6894 |
| *Melastomataceae* | 1 | 28 | 0.2592 | 0.4762 | 0.6483 | 0.2202 | 1.3447 |
| *Meliaceae* | 12 | 209 | 5.5783 | 5.7143 | 4.8391 | 4.7402 | 15.2936 |
| *Menispermaceae* | 1 | 2 | 0.0353 | 0.4762 | 0.0463 | 0.0300 | 0.5525 |
| *Moraceae* | 6 | 133 | 2.5231 | 2.8571 | 3.0794 | 2.1440 | 8.0806 |
| *Myristicaceae* | 5 | 126 | 1.6611 | 2.3810 | 2.9173 | 1.4116 | 6.7098 |
| *Ochnaceae* | 1 | 25 | 0.0805 | 0.4762 | 0.5788 | 0.0684 | 1.1234 |
| *Olacaceae* | 3 | 135 | 3.0140 | 1.4286 | 3.1257 | 2.5612 | 7.1154 |
| *Pandaceae* | 1 | 11 | 0.1787 | 0.4762 | 0.2547 | 0.1518 | 0.8827 |
| *Polygalaceae* | 1 | 28 | 0.8404 | 0.4762 | 0.6483 | 0.7141 | 1.8386 |
| *Rhamnaceae* | 1 | 13 | 0.4496 | 0.4762 | 0.3010 | 0.3821 | 1.1593 |
| *Rubiaceae* | 15 | 478 | 8.4312 | 7.1429 | 11.0674 | 7.1646 | 25.3748 |

| Families | Number of species | Numberof trees | Basal area | Relative diversity [x100 %] | Relative density [x100 %] | Relative dominance [x100 %] | FIV [x300 %] |
|---|---|---|---|---|---|---|---|
| *Rutaceae* | 2 | 25 | 0.2847 | 0.9524 | 0.5788 | 0.2419 | 1.7732 |
| *Samydaceae* | 1 | 3 | 0.0059 | 0.4762 | 0.0695 | 0.0050 | 0.5507 |
| *Sapindaceae* | 2 | 14 | 0.0589 | 0.9524 | 0.3241 | 0.0501 | 1.3266 |
| *Sapotaceae* | 6 | 57 | 3.8033 | 2.8571 | 1.3197 | 3.2319 | 7.4088 |
| *Simaroubaceae* | 1 | 89 | 1.0387 | 0.4762 | 2.0607 | 0.8826 | 3.4195 |
| *Sterculiaceae* | 13 | 311 | 7.9306 | 6.1905 | 7.2007 | 6.7391 | 20.1303 |
| *Tiliaceae* | 6 | 224 | 8.7022 | 2.8571 | 5.1864 | 7.3948 | 15.4383 |
| *Verbenaceae* | 1 | 2 | 0.0982 | 0.4762 | 0.0463 | 0.0834 | 0.6059 |
| *Violaceae* | 1 | 7 | 0.6578 | 0.4762 | 0.1621 | 0.5589 | 1.1972 |
| *Vochyliaceae* | 1 | 43 | 0.6185 | 0.4762 | 0.9956 | 0.5256 | 1.9974 |
| Total | 210 | 4319 | 117.6821 | 100 | 100 | 100 | 300 |

**Appendix 3. Occurency, density,basal area and IVI of the plant species encountered in the 1.5-ha sampling in the submountain Kala hill forest, presented by decreasing IVI**

| Species | Occurency | Number of trees | Basal area | Relative occurency [x100 %] | Relative density [x100 %] | relative dominance [x100 %] | IVI [x300 %] |
|---|---|---|---|---|---|---|---|
| *Acacia pennata* (L.) Willd. | 6 | 18 | 0.1610 | 0.8658 | 0.4168 | 0.1368 | 1.4194 |
| *Alangium chinense* (Lour.) Harms | 4 | 28 | 0.4006 | 0.5772 | 0.6483 | 0.3404 | 1.5659 |
| *Albizia adianthifolia* (Schum.) W. F. Wight | 3 | 11 | 0.3358 | 0.4329 | 0.2547 | 0.2853 | 0.9729 |
| *Albizia glaberrima* (schum. & thonn.) Benth. | 3 | 27 | 0.3515 | 0.4329 | 0.6251 | 0.2987 | 1.3567 |
| *Alchornea floribunda* Müll. Arg. | 5 | 21 | 0.4811 | 0.7215 | 0.4862 | 0.4088 | 1.6165 |
| *Allanblackia gabonensis* (Pellegr.) Bamps | 6 | 192 | 16.6033 | 0.8658 | 4.4455 | 14.1089 | 19.4201 |
| *Allophylus africanus* P. Beauv. | 2 | 10 | 0.0196 | 0.2886 | 0.2315 | 0.0167 | 0.5368 |
| *Alstonia boonei* De Willd. | 4 | 23 | 0.7991 | 0.5772 | 0.5325 | 0.6791 | 1.7888 |
| *Amphimas pterocarpoides* Harms. | 5 | 18 | 0.1924 | 0.7215 | 0.4168 | 0.1635 | 1.3018 |
| *Aningeria altissima* (A. chev.) Aubr. & Peller. | 5 | 20 | 3.3222 | 0.7215 | 0.4631 | 2.8231 | 4.0077 |
| *Annickia chlorantha* Oliv. | 5 | 68 | 0.3063 | 0.7215 | 1.5744 | 0.2603 | 2.5562 |
| *Anonidium mannii* (Oliv.) Engl. & Diels. | 2 | 79 | 3.0611 | 0.2886 | 1.8291 | 2.6012 | 4.7189 |
| *Anthonotha fragrans* (Bak. f. ) Excell. Hill. | 3 | 3 | 0.0844 | 0.4329 | 0.0695 | 0.0717 | 0.5741 |
| *Anthonotha macrophylla* P. Beauv. | 3 | 26 | 0.9935 | 0.4329 | 0.6020 | 0.8443 | 1.8792 |
| *Antiaris toxicaria* Lesch. | 1 | 8 | 0.2985 | 0.1443 | 0.1852 | 0.2536 | 0.5831 |
| *Antiaris welwitschii* Lesch. | 3 | 3 | 0.0216 | 0.4329 | 0.0695 | 0.0184 | 0.5207 |
| *Antidesma laciniatum* Müll. Arg. | 3 | 8 | 0.0628 | 0.4329 | 0.1852 | 0.0534 | 0.6715 |
| *Antidesma mambranaceum* Müll. Arg. | 2 | 7 | 0.2022 | 0.2886 | 0.1621 | 0.1719 | 0.6225 |
| *Antidesma* sp. | 2 | 18 | 0.0511 | 0.2886 | 0.4168 | 0.0434 | 0.7487 |
| *Antidesma venosum* Tul. | 4 | 4 | 0.0393 | 0.5772 | 0.0926 | 0.0334 | 0.7032 |

| Species | Occurency | Number of trees | Basal area | Relative occurency [x100 %] | Relative density [x100 %] | relative dominance [x100 %] | IVI [x300 %] |
|---|---|---|---|---|---|---|---|
| *Antrocaryon klaineanum* Pierre | 4 | 6 | 0.4673 | 0.5772 | 0.1389 | 0.3971 | 1.1132 |
| *Aulacocalyx caudata* Hook. f. | 6 | 57 | 0.4889 | 0.8658 | 1.3197 | 0.4155 | 2.6010 |
| *Aulacocalyx jasmiflora* Hook. f. | 3 | 142 | 1.9439 | 0.4329 | 3.2878 | 1.6518 | 5.3725 |
| *Aulacocalyx talbotii* (Wernham) Keay | 2 | 29 | 0.1198 | 0.2886 | 0.6715 | 0.1018 | 1.0618 |
| *Baphiopsis parviflora* Benth. & Bak. | 3 | 6 | 0.0275 | 0.4329 | 0.1389 | 0.0234 | 0.5952 |
| *Beilschmiedia grandifolia* (Vahl.) Hutch. & Dalz. | 3 | 31 | 0.1080 | 0.4329 | 0.7178 | 0.0918 | 1.2424 |
| *Beilschmiedia obscura* (stapf) Engl. & A. Chev. | 2 | 18 | 0.2710 | 0.2886 | 0.4168 | 0.2303 | 0.9356 |
| *Bertiera adamsii* (Hepper) N. Halle | 2 | 2 | 0.0353 | 0.2886 | 0.0463 | 0.0300 | 0.3649 |
| *Blighia welwitschii* (Hiern) Radlk. | 2 | 4 | 0.0236 | 0.2886 | 0.0926 | 0.0200 | 0.4012 |
| *Bombax buonopozense* P. Beauv. | 4 | 5 | 1.9105 | 0.5772 | 0.1158 | 1.6235 | 2.3164 |
| *Brachystegia cynemetroides* Harms | 2 | 9 | 0.2376 | 0.2886 | 0.2084 | 0.2019 | 0.6989 |
| *Brachystegia laurentii* (De Wild.) Louis | 4 | 15 | 0.0452 | 0.5772 | 0.3473 | 0.0384 | 0.9629 |
| *Caloncoba echinata* (Oliv.) Gilg. | 3 | 9 | 0.0491 | 0.4329 | 0.2084 | 0.0417 | 0.6830 |
| *Caloncoba glauca* (P. Beauv) Gilg. | 6 | 5 | 0.0884 | 0.8658 | 0.1158 | 0.0751 | 1.0567 |
| *Caloncoba welwitschii* (Oliv.) Gilg. | 2 | 25 | 0.0805 | 0.2886 | 0.5788 | 0.0684 | 0.9358 |
| *Campylospermum elongatum* (Oliv.) Vahl Tiegh | 3 | 18 | 0.1139 | 0.4329 | 0.4168 | 0.0968 | 0.9464 |
| *Canarium schweinfurthii* Engl. | 2 | 13 | 0.0726 | 0.2886 | 0.3010 | 0.0617 | 0.6513 |
| *Carapa grandiflora* (Pax) Hutch | 5 | 6 | 0.6715 | 0.7215 | 0.1389 | 0.5706 | 1.4311 |
| *Carapa procera* DC. | 3 | 28 | 0.8404 | 0.4329 | 0.6483 | 0.7141 | 1.7953 |
| *Carpolobia lutea* G. Don. | 5 | 3 | 0.0059 | 0.7215 | 0.0695 | 0.0050 | 0.7960 |
| *Casearia barteri* Jacq. | 2 | 13 | 0.2454 | 0.2886 | 0.3010 | 0.2086 | 0.7982 |
| *Celtis philippensis* Blanco | 5 | 4 | 0.0707 | 0.7215 | 0.0926 | 0.0601 | 0.8742 |
| *Celtis tessmannii* Rendle | 5 | 21 | 2.9158 | 0.7215 | 0.4862 | 2.4777 | 3.6855 |
| *Celtis zenkeri* Engl. | 2 | 45 | 3.5127 | 0.2886 | 1.0419 | 2.9850 | 4.3155 |
| *Christiana africana* DC. | 6 | 3 | 0.0216 | 0.8658 | 0.0695 | 0.0184 | 0.9536 |
| *Cleistopholis patens* (Benth.) Engl. & Diels | 2 | 18 | 0.1924 | 0.2886 | 0.4168 | 0.1635 | 0.8689 |
| *Coelocaryon preussii* Warb. | 5 | 121 | 3.5834 | 0.7215 | 2.8016 | 3.0450 | 6.5681 |
| *Coffea brevipes* Hiern | 1 | 50 | 0.4909 | 0.1443 | 1.1577 | 0.4171 | 1.7191 |
| *Cola acuminata* P. Beauv. | 6 | 4 | 0.1806 | 0.8658 | 0.0926 | 0.1535 | 1.1119 |
| *Cola attiensis* var. bordardii (Pellegr.) N. Halle | 3 | 94 | 3.4675 | 0.4329 | 2.1764 | 2.9466 | 5.5559 |
| *Cola ballayi* M. Cornu | 3 | 27 | 0.8541 | 0.4329 | 0.6251 | 0.7258 | 1.7838 |
| *Cola lateritia* K. Schum. | 4 | 6 | 0.0746 | 0.5772 | 0.1389 | 0.0634 | 0.7795 |
| *Cola pachycarpa* K. Schum. | 2 | 10 | 0.1924 | 0.2886 | 0.2315 | 0.1635 | 0.6836 |
| *Cola rostrata* K. Schum. | 4 | 4 | 0.0079 | 0.5772 | 0.0926 | 0.0067 | 0.6765 |
| *Cola verticillata* (Thonn.) stapf ex A. chev | 2 | 83 | 3.6501 | 0.2886 | 1.9217 | 3.1017 | 5.3121 |
| *Combretum* sp. | 5 | 20 | 0.1178 | 0.7215 | 0.4631 | 0.1001 | 1.2847 |
| *Cordia platythyrsa* Bak. | 3 | 46 | 0.1374 | 0.4329 | 1.0651 | 0.1168 | 1.6148 |

| Species | Occurency | Number of trees | Basal area | Relative occurency [x100 %] | Relative density [x100 %] | relative dominance [x100 %] | IVI [x300 %] |
|---|---|---|---|---|---|---|---|
| *Crudia gabonensis* Pierre ex De Willd. | 3 | 5 | 0.0726 | 0.4329 | 0.1158 | 0.0617 | 0.6104 |
| *Cyathea camerooniana* Hook. f | 2 | 19 | 0.0373 | 0.2886 | 0.4399 | 0.0317 | 0.7602 |
| *Cyathea manniana* Hook. f. | 1 | 8 | 0.0157 | 0.1443 | 0.1852 | 0.0133 | 0.3429 |
| *Cylicodiscus gabunense* Harms | 5 | 1 | 0.7088 | 0.7215 | 0.0232 | 0.6023 | 1.3470 |
| *Dacryodes buettneri* (Engl.) Lam | 1 | 19 | 0.1787 | 0.1443 | 0.4399 | 0.1518 | 0.7361 |
| *Dacryodes igangaga* Aubr. & Pellegr. | 5 | 5 | 0.1512 | 0.7215 | 0.1158 | 0.1285 | 0.9657 |
| *Dacryodes macrophylla* (Oliv.) Lam | 6 | 48 | 0.5341 | 0.8658 | 1.1114 | 0.4538 | 2.4310 |
| *Desbordesia glaucescens* (Engl.) Vans Tiegh | 4 | 41 | 3.7405 | 0.5772 | 0.9493 | 3.1785 | 4.7050 |
| *Desplatsia dewevrei* De wild. & Th. Dur | 4 | 22 | 0.1846 | 0.5772 | 0.5094 | 0.1568 | 1.2434 |
| *Desplatsia subericarpa* Bocq. | 5 | 41 | 0.1590 | 0.7215 | 0.9493 | 0.1351 | 1.8059 |
| *Dialum bipendense* Harms | 6 | 15 | 0.1394 | 0.8658 | 0.3473 | 0.1185 | 1.3316 |
| *Dialum zenkeri* Harms | 3 | 30 | 0.3259 | 0.4329 | 0.6946 | 0.2770 | 1.4045 |
| *Diospyros crassiflora* Hiern | 2 | 13 | 0.0726 | 0.2886 | 0.3010 | 0.0617 | 0.6513 |
| *Diospyros hoyleana* F. White | 2 | 4 | 0.0550 | 0.2886 | 0.0926 | 0.0467 | 0.4279 |
| *Diospyros longiflora* R. Let. | 6 | 16 | 0.3770 | 0.8658 | 0.3705 | 0.3204 | 1.5566 |
| *Diospyros simulans* F. White | 2 | 36 | 0.2278 | 0.2886 | 0.8335 | 0.1935 | 1.3157 |
| *Discoglypremna caloneura* (Pax) Prain | 1 | 2 | 0.0982 | 0.1443 | 0.0463 | 0.0834 | 0.2740 |
| *Distemonanthus benthamianus* Baill. | 2 | 1 | 0.0962 | 0.2886 | 0.0232 | 0.0818 | 0.3935 |
| *Drypetes gossweilerii* S. Moore | 5 | 2 | 0.0353 | 0.7215 | 0.0463 | 0.0300 | 0.7978 |
| *Drypetes klainei* Pierre ex Pax | 2 | 35 | 0.3358 | 0.2886 | 0.8104 | 0.2853 | 1.3843 |
| *Duboscia macrocarpa* Bocq. | 1 | 14 | 0.0589 | 0.1443 | 0.3241 | 0.0501 | 0.5185 |
| *Elaeis guineensis* Jacq. | 5 | 1 | 0.0491 | 0.7215 | 0.0232 | 0.0417 | 0.7864 |
| *Entada gigas* (Linn.) Fawcett & Rendle | 5 | 30 | 0.5459 | 0.7215 | 0.6946 | 0.4638 | 1.8800 |
| *Entandrophragma cylindricum* Sprague | 1 | 1 | 0.2376 | 0.1443 | 0.0232 | 0.2019 | 0.3693 |
| *Entandrophragma utile* Dawe & Sprague | 1 | 5 | 0.1198 | 0.1443 | 0.1158 | 0.1018 | 0.3618 |
| *Eribroma oblangum* (Mast.) Bodard | 2 | 4 | 0.0393 | 0.2886 | 0.0926 | 0.0334 | 0.4146 |
| *Eriocoelum macrocarpum* Gilg. | 5 | 43 | 0.6185 | 0.7215 | 0.9956 | 0.5256 | 2.2427 |
| *Erysmadelphus exsul* Mildbr. | 4 | 33 | 0.1905 | 0.5772 | 0.7641 | 0.1618 | 1.5031 |
| *Erythrina mildbraedii* Harms | 4 | 21 | 0.6067 | 0.5772 | 0.4862 | 0.5156 | 1.5790 |
| *Erythrococca africana* (Baill.) Prain | 3 | 16 | 0.1257 | 0.4329 | 0.3705 | 0.1068 | 0.9101 |
| *Erythrophleum ivorense* A. Chev. | 3 | 15 | 0.0766 | 0.4329 | 0.3473 | 0.0651 | 0.8453 |
| *Ficus exasperata* Vahl. | 6 | 22 | 0.6087 | 0.8658 | 0.5094 | 0.5172 | 1.8924 |
| *Ficus mucuso* Ficalho | 2 | 4 | 0.0079 | 0.2886 | 0.0926 | 0.0067 | 0.3879 |
| *Gambea boukokoensis* Aubr. & Pellegr. | 6 | 1 | 0.0177 | 0.8658 | 0.0232 | 0.0150 | 0.9040 |
| *Gambeya africana* (G. Dan. ex Bak.) Pierre. | 1 | 7 | 0.0609 | 0.1443 | 0.1621 | 0.0517 | 0.3581 |
| *Garcinia kola* Heckel | 3 | 4 | 0.0550 | 0.4329 | 0.0926 | 0.0467 | 0.5722 |
| *Garcinia mannii* Oliv. | 2 | 5 | 0.0726 | 0.2886 | 0.1158 | 0.0617 | 0.4661 |

| **Species** | **Occurency** | **Number of trees** | **Basal area** | **Relative occurency [x100 %]** | **Relative density [x100 %]** | **relative dominance [x100 %]** | **IVI [x300 %]** |
|---|---|---|---|---|---|---|---|
| *Garcinia smeathmannii* Oliv. | 6 | 88 | 0.9896 | 0.8658 | 2.0375 | 0.8409 | 3.7442 |
| *Gilbertiodendron brachystegioides* Harms | 4 | 38 | 0.1846 | 0.5772 | 0.8798 | 0.1568 | 1.6139 |
| *Gilbertiodendron preussii* Harms | 4 | 27 | 0.1158 | 0.5772 | 0.6251 | 0.0984 | 1.3008 |
| *Glyphaea brevis* (Sprague) Manachino | 6 | 27 | 0.2415 | 0.8658 | 0.6251 | 0.2052 | 1.6962 |
| *Gossweilerodendron balsamiferum* (Verm.) Harms | 5 | 32 | 0.2042 | 0.7215 | 0.7409 | 0.1735 | 1.6359 |
| *Greenwayodendron suaveolens* (Engl. & Diels) Verd. | 5 | 54 | 0.8129 | 0.7215 | 1.2503 | 0.6908 | 2.6626 |
| *Grewia coriacea* Mast. | 5 | 38 | 0.6401 | 0.7215 | 0.8798 | 0.5439 | 2.1453 |
| *Guarea cedrata* (A. Chev.) Pellegr. | 3 | 11 | 0.0687 | 0.4329 | 0.2547 | 0.0584 | 0.7460 |
| *Guarea thompsonii* Harms. | 6 | 89 | 1.0387 | 0.8658 | 2.0607 | 0.8826 | 3.8091 |
| *Hannoa kleineana* Pierre & Engl. | 4 | 10 | 0.4123 | 0.5772 | 0.2315 | 0.3504 | 1.1591 |
| *Hexalobus crispiflorus* A. Rich. | 1 | 1 | 0.0177 | 0.1443 | 0.0232 | 0.0150 | 0.1825 |
| *Homalium letestui* Pellgr. | 4 | 9 | 0.3475 | 0.5772 | 0.2084 | 0.2953 | 1.0809 |
| *Homalium* sp. | 4 | 19 | 0.2101 | 0.5772 | 0.4399 | 0.1785 | 1.1956 |
| *Hylodendron gabunense* Taub. | 4 | 12 | 0.6362 | 0.5772 | 0.2778 | 0.5406 | 1.3956 |
| *Hymenostegia afzelii* (Oliv.) Harms | 1 | 1 | 0.0177 | 0.1443 | 0.0232 | 0.0150 | 0.1825 |
| *Hypodaphnis zenkeri* ( Engl.) Stapf | 6 | 48 | 0.5027 | 0.8658 | 1.1114 | 0.4271 | 2.4043 |
| *Isolana hexaloba* Engl. | 5 | 10 | 1.0564 | 0.7215 | 0.2315 | 0.8977 | 1.8507 |
| *Khaya anthotheca* (welw.) C. DC. | 2 | 5 | 0.1041 | 0.2886 | 0.1158 | 0.0884 | 0.4928 |
| *Kigelia africana* (Lam.) Benth. | 3 | 3 | 0.0530 | 0.4329 | 0.0695 | 0.0450 | 0.5474 |
| *Klainedoxa gabonensis* Pierre ex Engl. | 6 | 19 | 0.7599 | 0.8658 | 0.4399 | 0.6457 | 1.9514 |
| *Landolphia congolensis* (Stapf) Pichon | 2 | 13 | 0.4496 | 0.2886 | 0.3010 | 0.3821 | 0.9717 |
| *Lasiodiscus mannii* Hook. f. | 1 | 1 | 0.0177 | 0.1443 | 0.0232 | 0.0150 | 0.1825 |
| *Leea guineensis* G. Don | 3 | 20 | 0.4791 | 0.4329 | 0.4631 | 0.4071 | 1.3031 |
| *Leplaea mayombensis* (Under.) Alst. | 4 | 43 | 1.7966 | 0.5772 | 0.9956 | 1.5267 | 3.0995 |
| *Librevillea klainei* Pierre (ex Harms) Hoyle | 1 | 6 | 0.1374 | 0.1443 | 0.1389 | 0.1168 | 0.4000 |
| *Macaranga barteri* Müll. Arg. | 2 | 4 | 0.0393 | 0.2886 | 0.0926 | 0.0334 | 0.4146 |
| *Macaranga monandra* Müll. Arg. | 2 | 4 | 0.0393 | 0.2886 | 0.0926 | 0.0334 | 0.4146 |
| *Macaranga saccifera* Pax | 1 | 1 | 0.0020 | 0.1443 | 0.0232 | 0.0017 | 0.1691 |
| *Maesobotrya dusenii* (Pax) Hutch. | 2 | 4 | 0.0393 | 0.2886 | 0.0926 | 0.0334 | 0.4146 |
| *Maesobotrya klaineana* Benth. | 3 | 3 | 0.1001 | 0.4329 | 0.0695 | 0.0851 | 0.5875 |
| *Maesopsis eminii* Engl. | 4 | 13 | 0.2926 | 0.5772 | 0.3010 | 0.2486 | 1.1268 |
| *Mallotus oppositifolius* ( Geisel.) Müll. Arg. | 2 | 9 | 0.0648 | 0.2886 | 0.2084 | 0.0551 | 0.5520 |
| *Mammea africana* Sabine | 1 | 2 | 0.0668 | 0.1443 | 0.0463 | 0.0567 | 0.2473 |
| *Maranthes glabra* (Oliv.) Prance | 5 | 1 | 0.0177 | 0.7215 | 0.0232 | 0.0150 | 0.7597 |
| *Margaritaria discoidea* (Benth) K. Schum. | 1 | 3 | 0.0373 | 0.1443 | 0.0695 | 0.0317 | 0.2455 |
| *Markhamea lutea* (Benth.) K. Schum. | 2 | 3 | 0.0059 | 0.2886 | 0.0695 | 0.0050 | 0.3631 |
| *Massularia acuminata* (K. Schum.) Hoyle | 5 | 28 | 0.2592 | 0.7215 | 0.6483 | 0.2202 | 1.5900 |

| Species | Occurency | Number of trees | Basal area | Relative occurency [x100 %] | Relative density [x100 %] | relative dominance [x100 %] | IVI [x300 %] |
|---|---|---|---|---|---|---|---|
| *Memecylon polyanthemos* Hook. f. | 2 | 2 | 0.0039 | 0.2886 | 0.0463 | 0.0033 | 0.3382 |
| *Microdesmis puberula* Hook. | 4 | 23 | 0.1080 | 0.5772 | 0.5325 | 0.0918 | 1.2015 |
| *Milicia excelsa* (Welw.) C.C. Berg. | 2 | 17 | 0.0491 | 0.2886 | 0.3936 | 0.0417 | 0.7239 |
| *Milletia sanagana* Harms | 2 | 4 | 0.0707 | 0.2886 | 0.0926 | 0.0601 | 0.4413 |
| *Monodora myristica* (Geartn.) Dinal | 5 | 56 | 0.2985 | 0.7215 | 1.2966 | 0.2536 | 2.2717 |
| *Monodoxa tenuifolia* Benth | 2 | 6 | 0.1217 | 0.2886 | 0.1389 | 0.1034 | 0.5310 |
| *Musanga cecropioides* R. Br. | 3 | 13 | 3.3870 | 0.4329 | 0.3010 | 2.8782 | 3.6121 |
| *Myrianthus arboreus* P. Beauv. | 5 | 53 | 0.7638 | 0.7215 | 1.2271 | 0.6490 | 2.5977 |
| *Myrianthus liberucus* P. Beauv. | 3 | 19 | 0.4928 | 0.4329 | 0.4399 | 0.4188 | 1.2916 |
| *Nauclea diderrichii* ( De Wild. & Th. Dur .) Merrill | 2 | 3 | 0.3986 | 0.2886 | 0.0695 | 0.3387 | 0.6968 |
| *Nauclea latifoli*a Sm. | 1 | 2 | 0.0039 | 0.1443 | 0.0463 | 0.0033 | 0.1939 |
| *Nesogordonia papaverifera* (A. Chev.) R. | 2 | 4 | 0.1021 | 0.2886 | 0.0926 | 0.0868 | 0.4680 |
| *Newtonia griffoniana* (Baill.) Keay | 1 | 5 | 0.0098 | 0.1443 | 0.1158 | 0.0083 | 0.2684 |
| *Omphalocarpum procerum* P. Beauv. | 5 | 5 | 0.0884 | 0.7215 | 0.1158 | 0.0751 | 0.9124 |
| *Oxyanthus speciosus* DC. | 3 | 11 | 0.1787 | 0.4329 | 0.2547 | 0.1518 | 0.8394 |
| *Panda oleosa* Pierre | 2 | 4 | 0.0707 | 0.2886 | 0.0926 | 0.0601 | 0.4413 |
| *Paraberlinia bifoliolata* Pellegr. | 2 | 6 | 0.1060 | 0.2886 | 0.1389 | 0.0901 | 0.5176 |
| *Parkia bicolor* A. Chev. | 5 | 6 | 0.4987 | 0.7215 | 0.1389 | 0.4238 | 1.2842 |
| *Pausinystalia macroceras* (K. Schum) Pierre | 2 | 2 | 0.0353 | 0.2886 | 0.0463 | 0.0300 | 0.3649 |
| *Penianthus longifolius* Miers | 3 | 14 | 0.0589 | 0.4329 | 0.3241 | 0.0501 | 0.8071 |
| *Petersianthus macrocarpus* (P. Beauv.) Liben | 2 | 5 | 0.1826 | 0.2886 | 0.1158 | 0.1552 | 0.5595 |
| *Piptadeniastrum africanum* (Hook. F. ) Brenan | 1 | 1 | 0.0491 | 0.1443 | 0.0232 | 0.0417 | 0.2092 |
| *Plagiosiphon emarginatus* Hutch. & Dalz. | 3 | 3 | 0.0373 | 0.4329 | 0.0695 | 0.0317 | 0.5341 |
| P*olyalthia suaveolens Engl.* & Diels | 2 | 2 | 0.3181 | 0.2886 | 0.0463 | 0.2703 | 0.6052 |
| *Pseudospondias microcarpa* ( A. Rich. ) Engl. | 3 | 3 | 0.1001 | 0.4329 | 0.0695 | 0.0851 | 0.5875 |
| *Psydrax arnoldianum* (De Willd. & Th.Dur.) Hepper | 5 | 29 | 0.4182 | 0.7215 | 0.6715 | 0.3554 | 1.7483 |
| *Pteliopsis hylodendron* Mild. | 2 | 7 | 0.1551 | 0.2886 | 0.1621 | 0.1318 | 0.5825 |
| *Pterocarpus mildbreadii* Engl. | 4 | 8 | 0.3613 | 0.5772 | 0.1852 | 0.3070 | 1.0694 |
| *Pterocarpus soyauxii* Taub. | 5 | 26 | 0.2238 | 0.7215 | 0.6020 | 0.1902 | 1.5137 |
| *Pterygota macrocarpa* K. Schum. | 2 | 18 | 0.0353 | 0.2886 | 0.4168 | 0.0300 | 0.7354 |
| *Pycnanthus angolensis* (Welw.) Warb. | 6 | 90 | 4.0252 | 0.8658 | 2.0838 | 3.4204 | 6.3700 |
| *Rauvolfia macrophylla* Stapf | 5 | 8 | 0.1100 | 0.7215 | 0.1852 | 0.0934 | 1.0002 |
| *Rauvolfia vomitoria* Afzel | 2 | 2 | 0.0353 | 0.2886 | 0.0463 | 0.0300 | 0.3649 |
| *Ricinodendron heudelotii* (Baill.) Pierre ex pax . | 3 | 7 | 0.6578 | 0.4329 | 0.1621 | 0.5589 | 1.1539 |
| *Rinorea oblongifolia* ( C.h. Wright) Marg. ex chipp | 3 | 11 | 0.0216 | 0.4329 | 0.2547 | 0.0184 | 0.7059 |
| *Rothmannia hispida* (K. Schum) Fagerlind | 4 | 21 | 0.1983 | 0.5772 | 0.4862 | 0.1685 | 1.2319 |
| *Rothmannia lujae* (De Wild.) Keay | 5 | 39 | 0.2022 | 0.7215 | 0.9030 | 0.1719 | 1.7963 |

| Species | Occurency | Number of trees | Basal area | Relative occurency [x100 %] | Relative density [x100 %] | relative dominance [x100 %] | IVI [x300 %] |
|---|---|---|---|---|---|---|---|
| *Rothmannia whitfieldii* (Lind. ) Dandy | 2 | 2 | 0.0982 | 0.2886 | 0.0463 | 0.0834 | 0.4183 |
| *Santiria trimera* (Oliv.) Aubr. | 6 | 70 | 5.6352 | 0.8658 | 1.6207 | 4.7886 | 7.2752 |
| *Sapium ellipticum* (Hochst.) Pax | 1 | 1 | 0.0177 | 0.1443 | 0.0232 | 0.0150 | 0.1825 |
| *Schumanniophyton magnificum* Harms | 2 | 11 | 0.0373 | 0.2886 | 0.2547 | 0.0317 | 0.5750 |
| *Scottellia coreacea* A. Chev. | 4 | 13 | 0.4653 | 0.5772 | 0.3010 | 0.3954 | 1.2736 |
| *Scottellia minfiensis* Gilg. | 2 | 4 | 1.5629 | 0.2886 | 0.0926 | 1.3281 | 1.7093 |
| *Sizygium rowlandii* Sprague | 3 | 65 | 1.3057 | 0.4329 | 1.5050 | 1.1096 | 3.0474 |
| *Sorindeia grandifolia* Engl. | 3 | 7 | 0.2022 | 0.4329 | 0.1621 | 0.1719 | 0.7668 |
| *Spathodea campanulata* P. Beauv. | 2 | 2 | 0.0353 | 0.2886 | 0.0463 | 0.0300 | 0.3649 |
| *Staudtia kamerunensis* Warb. | 5 | 43 | 1.0583 | 0.7215 | 0.9956 | 0.8993 | 2.6164 |
| *Sterculia rhimopetala* K. Schum. | 5 | 30 | 0.3259 | 0.7215 | 0.6946 | 0.2770 | 1.6931 |
| *Sterculia tragacantha* Lindl. | 4 | 23 | 0.7677 | 0.5772 | 0.5325 | 0.6524 | 1.7621 |
| *Strombosia grandifolia* Hook. f. ex Benth. | 5 | 72 | 1.8064 | 0.7215 | 1.6671 | 1.5350 | 3.9236 |
| *Strombosia pustulata* Oliv. | 5 | 25 | 0.4104 | 0.7215 | 0.5788 | 0.3487 | 1.6491 |
| *Strombosiopsis tetrandra* Eng. | 4 | 40 | 0.4398 | 0.5772 | 0.9261 | 0.3737 | 1.8771 |
| *Symphonia globulifera* L. f. | 3 | 16 | 0.5655 | 0.4329 | 0.3705 | 0.4805 | 1.2839 |
| *Synsepalum dulcificum* Schum. &Thonn. | 4 | 23 | 0.0923 | 0.5772 | 0.5325 | 0.0784 | 1.1882 |
| *Tabernaemontana crassa* Benth. | 6 | 167 | 3.4695 | 0.8658 | 3.8666 | 2.9482 | 7.6807 |
| *Terminalia superpa* Engl. & Diels | 1 | 2 | 0.4437 | 0.1443 | 0.0463 | 0.3771 | 0.5677 |
| *Tessmania anomala* (Mich.) Harms | 1 | 3 | 0.1630 | 0.1443 | 0.0695 | 0.1385 | 0.3522 |
| *Tetraberlinia bifoliolata* (harms) Hauman | 2 | 3 | 0.1944 | 0.2886 | 0.0695 | 0.1652 | 0.5232 |
| *Tetracera alnifolia* Willd. | 1 | 1 | 0.0020 | 0.1443 | 0.0232 | 0.0017 | 0.1691 |
| *Tetrapleura tetraptera* (Schum. & Thonn.) Taub. | 4 | 27 | 0.3358 | 0.5772 | 0.6251 | 0.2853 | 1.4877 |
| *Treculia africana* Decne. | 3 | 24 | 0.3770 | 0.4329 | 0.5557 | 0.3204 | 1.3089 |
| *Trichilia dregeana* Sond. | 3 | 11 | 0.0687 | 0.4329 | 0.2547 | 0.0584 | 0.7460 |
| *Trichilia rubenscens* Oliv. | 5 | 11 | 0.1316 | 0.7215 | 0.2547 | 0.1118 | 1.0880 |
| *Trichilia welwitschii* C.DC. | 4 | 11 | 0.2101 | 0.5772 | 0.2547 | 0.1785 | 1.0104 |
| *Trilepisium madagascariensis* DC. | 4 | 46 | 1.3312 | 0.5772 | 1.0651 | 1.1312 | 2.7735 |
| *Triplochiton scleroxylon* K. Schum. | 2 | 10 | 0.9307 | 0.2886 | 0.2315 | 0.7909 | 1.3110 |
| *Turraeanthus africanus* (Welw. ex DC.) | 6 | 47 | 1.3960 | 0.8658 | 1.0882 | 1.1863 | 3.1403 |
| *Uapaca esculenta* A. Chev. | 3 | 5 | 0.0569 | 0.4329 | 0.1158 | 0.0484 | 0.5971 |
| *Uapaca guineensis* Müell. Arg. | 5 | 17 | 0.6774 | 0.7215 | 0.3936 | 0.5756 | 1.6907 |
| *Uapaca togoensis* Pax & Engl. | 1 | 1 | 0.0020 | 0.1443 | 0.0232 | 0.0017 | 0.1691 |
| *Uvariastrum pynaertii* De Wild. | 1 | 1 | 0.0177 | 0.1443 | 0.0232 | 0.0150 | 0.1825 |
| *Vitex grandifolia* (C. H. Wright) Marq. ex chipp | 2 | 2 | 0.0982 | 0.2886 | 0.0463 | 0.0834 | 0.4183 |
| *Voacanga africana* Stapf | 2 | 2 | 0.0353 | 0.2886 | 0.0463 | 0.0300 | 0.3649 |
| *Voacanga braeteata* Stapf | 3 | 17 | 0.0805 | 0.4329 | 0.3936 | 0.0684 | 0.8949 |

| **Species** | **Occurency** | **Number of trees** | **Basal area** | **Relative occurency [x100 %]** | **Relative density [x100 %]** | **relative dominance [x100 %]** | **IVI [x300 %]** |
|---|---|---|---|---|---|---|---|
| *Xylopia aethiopica* (Dunal) A. Rich. | 4 | 11 | 0.0530 | 0.5772 | 0.2547 | 0.0450 | 0.8769 |
| *Xylopia rubenscens* Oliv. | 1 | 3 | 0.0059 | 0.1443 | 0.0695 | 0.0050 | 0.2188 |
| *Xylopia staudtii* Engl. | 5 | 10 | 0.1139 | 0.7215 | 0.2315 | 0.0968 | 1.0498 |
| *Zanthoxylum gillettii* De Willd. | 3 | 14 | 0.2160 | 0.4329 | 0.3241 | 0.1835 | 0.9406 |
| *Zanthoxylum tessmannii* (Engl.) R. Let. | 5 | 11 | 0.0687 | 0.7215 | 0.2547 | 0.0584 | 1.0346 |
| Total | 693 | 4319 | 117.6821 | 100 | 100 | 100 | 300 |

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