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# FLORISTIC DIVERSITY AND STRUCTURE OF WOODY STANDS IN THE DRY SAVANNAHS OF NORTH CAMEROON

T. B. Prudence[1, 2*], B. Christophe[3], B. N. Africa[1], F. Moksia[1], D. Azaria[12] and Tchobsala[1]

[1]University of Maroua, Faculty of Science, Department of Biological Sciences, PO Box: 814, Maroua, Cameroon
[2]Institute of Agricultural Research for Development (IRAD, CRA-Maroua), BP: 33 Maroua, Cameroon.
[1]University of Ngaoundere, Faculty of Science, Department of Biological Sciences, PO Box: 454, Ngaoundere, Cameroon
[*] Corresponding author's E-mail: bakaryprudence007@gmail.com

## ABSTRACT

The dry savannahs of North Cameroon are known for their specific richness and socioeconomic importance in the lives of local populations. The aim of this study is to characterise the floristic diversity and vegetation structure of woody stands in the dry savannahs of northern Cameroon. A methodological approach based on quadrats was used for the floristic surveys in the study site. A total of 8 villages were selected and the inventory was carried out in two plant formations per village. Thirty-two (32) quadrats (100 m x 100 m) in total were installed at random with an equidistance of 500 m, and all woody plants with a circumference at breast height > 15 cm were inventoried. The crown diameter and height were also measured. The results show a taxonomic composition of 102 species belonging to 60 genera and 29 families. The Combretaceae and Mimosaceae families highlight the shrubby to arborescent nature of the stands in the study area. The biological characteristics revealed a predominance of microphanerophytes and mesophanerophytes. The flora is characterised by the predominance of Sudano-Zambézian species. The specific diversity of the dry savannahs of northern Cameroon shows that the Shannon index varies from 2.24 bits in the tree savannahs to 3.33 bits in the shrub savannahs. Pielou equitability follows the same trend, ranging from 0.35 in the treed savannah to 0.71 in the shrub savannah. Evaluation of the horizontal and vertical structure shows a predominance of woody stands, with a very high proportion of species of low height and circumference. These results reveal the state of degradation and disturbance of the dry savannah vegetation in North Cameroon. The study of the floristic and structural diversity of the woody stand of the dry savannahs of northern Cameroon thus constitutes a data reference base for the sustainable management of plant formations in this zone.

**Key words:** Floristic diversity, plant structure, woody stand, dry savannahs, North Cameroon.



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## INTRODUCTION

Ecosystems in sub-Saharan Africa are very important for human populations because of their contribution to meeting needs for food, health, energy, income and other aspects of human wellbeing (Diallo *et al*., 2008; Oumorou *et al*., 2010). Savannahs are essential ecosystems for local populations in sub-Saharan Africa who depend on agriculture and livestock for their livelihoods (Yoka *et al.,* 2013; Bakoulou *et al*., 2020). They provide non-timber forest products for multiple purposes (Ouédraogo *et al*., 2014; Zizka *et al*., 2015). Cameroon has a great diversity of natural habitats due to the variability of its physical and climatic characteristics (Mai Nipa *et al*., 2024). In its northern part, it is characterised by sparse but diverse vegetation cover, as in all the Sahelian and Sudano-Sahelian zones of Africa (Pourtier, 2003). In these savannah ecosystems, people can find fruit and food supplements, medicines, a source of energy, and materials that are essential for making everyday objects and substantially increasing the incomes of disadvantaged households (Mapongmetsem *et al*., 2012; Froumsia *et al*., 2019). Today, sub-Saharan African ecosystems in general, and savannah ecosystems in particular, are being degraded by unprecedented population growth, leading to increased expansion of agricultural land (Nacoulma *et al*., 2011). Degradation leads to a reduction in carbon sequestration capacity (Toru and Kibret, 2019) and the fragmentation of forest and savannah ecosystems (Gnoumou *et al*., 2011). Savannah ecosystems are undergoing severe changes in vegetation composition and species cover, resulting from the impact of land use pressure under changing climatic conditions (Zerbo *et al*., 2016). Strong demographic growth has led to ever-increasing pressure on the phytodiversity of savannah ecosystems in recent years

(Todou *et al*., 2017; Todou *et al*., 2022). This climatic deterioration, combined with other anthropogenic factors such as increased livestock pressure, the extension of agricultural land and the shortening of fallow periods, has resulted in dramatic changes in ecosystems (Zerbo *et al*., 2016). In the Sudano-Sahelian zone of Cameroon, the human activities that lead to ecosystem degradation are the extraction of fuelwood, building materials, gathering products and medicines, grazing and bush fires (Froumsia *et al.,* 2019). However, the exploitation of woody species for fuelwood production is the most significant threat to resources (Froumsia *et al.,* 2019). The protection of savannah ecosystems is therefore essential for the sustainable management of biodiversity, in order to ensure the availability of natural resources that contribute to subsistence needs and generate cash income for rural populations (Nacoulma *et al*., 2011). In the Sudano-Sahelian zone of Cameroon, despite the intervention of the State and non-governmental organisations in biodiversity conservation, this pressure on plant diversity is increasing as urban centres grow and needs become more pressing (Bakoulou *et al*., 2020). To solve the problem of managing savannah ecosystems, it is therefore essential to have reliable and relevant environmental data to monitor long-term changes in natural environments. However, the lack of scientific data is a factor that limits the implementation of development and sustainable management practices; hence the main objective of this work is to contribute to the conservation of woody stands in the Sudano-Sahelian sector of Cameroon for sustainable management. The aim is to analyse the taxonomic composition, plant structure and ecological parameters of woody stands in the dry savannahs of northern Cameroon.

## MATERIALS AND METHODS

The study was conducted in the Sudano-Sahelian agro-ecological zone of Cameroon represented by the North and Far North regions. The floristic surveys were carried out in the divisions of Benoue, Mayo-louti, Mayo-kani and Mayo-danay. A total of eight villages, including Gounougou, Bakona, Louguere, Singaidi, Moumour, Gaban, Domo and Yirdeng, were selected following a preliminary study of the sites based on the presence of tree and shrub savannah plant formations, and the accessibility and anthropization of these plant formations. These villages belong to the dry savannah zone of northern Cameroon (Letouzey. 1985). The climate of the study zone is Sudano-Sahelian type, characterized by two seasons: a long drying season wich lasts approximately to eight months, from October to May and a short raining season covering June to September. Rainfall varies between 600 mm and 900 mm per year. The average temperature is 27°C, with a maximum of 38°C from March to April and a minimum of 18°C from December to January (Suchel, 1987). According to recent studies (Bakoulou *et al*., 2020), Cameroon's natural Sudano-Sahelian savannahs are populated by trees, shrubs and grasses. The most common families are Mimosaceae (mainly the genus *Acacia*), Ceasalpinaceae (mainly the genus *Piliostigma*) and Combretaceae (mainly the genera *Combretum, Terminalia* and *Anogeissus*), as well as the genus *Ziziphus*. The most common ethnic groups are the Peul, Moufou, Toupouri, Moundang, Giziga, Guidar and Massa. These peoples live from agriculture, livestock farming, fishing and trade.

**Data collection:** Investigations were conducted in two distinct savannah such as wooddy savannah and shrubby savannah. The quadrat method was used for the floristic surveys of the study area. Thirty-six (32) quadrats (100 m x 100 m) in total were installed at random with an equidistance of 500 m. In each quadrat, the scientific name of the species encountered and the dendrometric data were recorded. The circumference was measured at chest height (1.30 m) above the ground using a sewing tape or a decameter. It is then converted into diameter at breast height (DBH) using the relationship: DBH = C/3.14 With C the circumference of the tree measured at 1.30m and 20cm. Only trees with a circumference at breast height ≥ 15 cm were considered. In the case of forked trees, those whose fork is above 1.30 m from the ground are considered to be a single individual. However, when the tree is forked before 1.30 m from the ground, the circumference was also measured 20 cm above the ground using a tape measure. The height of each individual was measured using a 6 m graduated pole or estimated for trees over 6 m tall. In the case of multi-stemmed trees, the height of the tallest stem was estimated. Individuals with a total height of less than 1.5 m were not taken into account (D'Eon *et al*., 1994). During this exercise, trees and shrubs were identified using the appropriate literature and identification keys (Arbonnier, 2000).

**Data processing and analysis**: The data collected in the field between June and October 2021 was statistically processed. The Cronsquit classification system was used to group families. The diameters were grouped into classes with a range of 10 centimetres. This grouping was used to analyse the horizontal structure of the stand.

Shannon-Weaver's diversity index (1949) expresses the relative importance of land occupation by species in a given environment. The index is minimum when all the individuals belong to the same species. On the other hand, it is maximum when the individuals represent different distinct species. It is expressed in bits per individual (N'da *et al*., 2008). It is given by the following relationship: $H' = -\Sigma (ni/N) \, Log2 \, (ni/N)$, where ni = number of species i, N = number of all species.

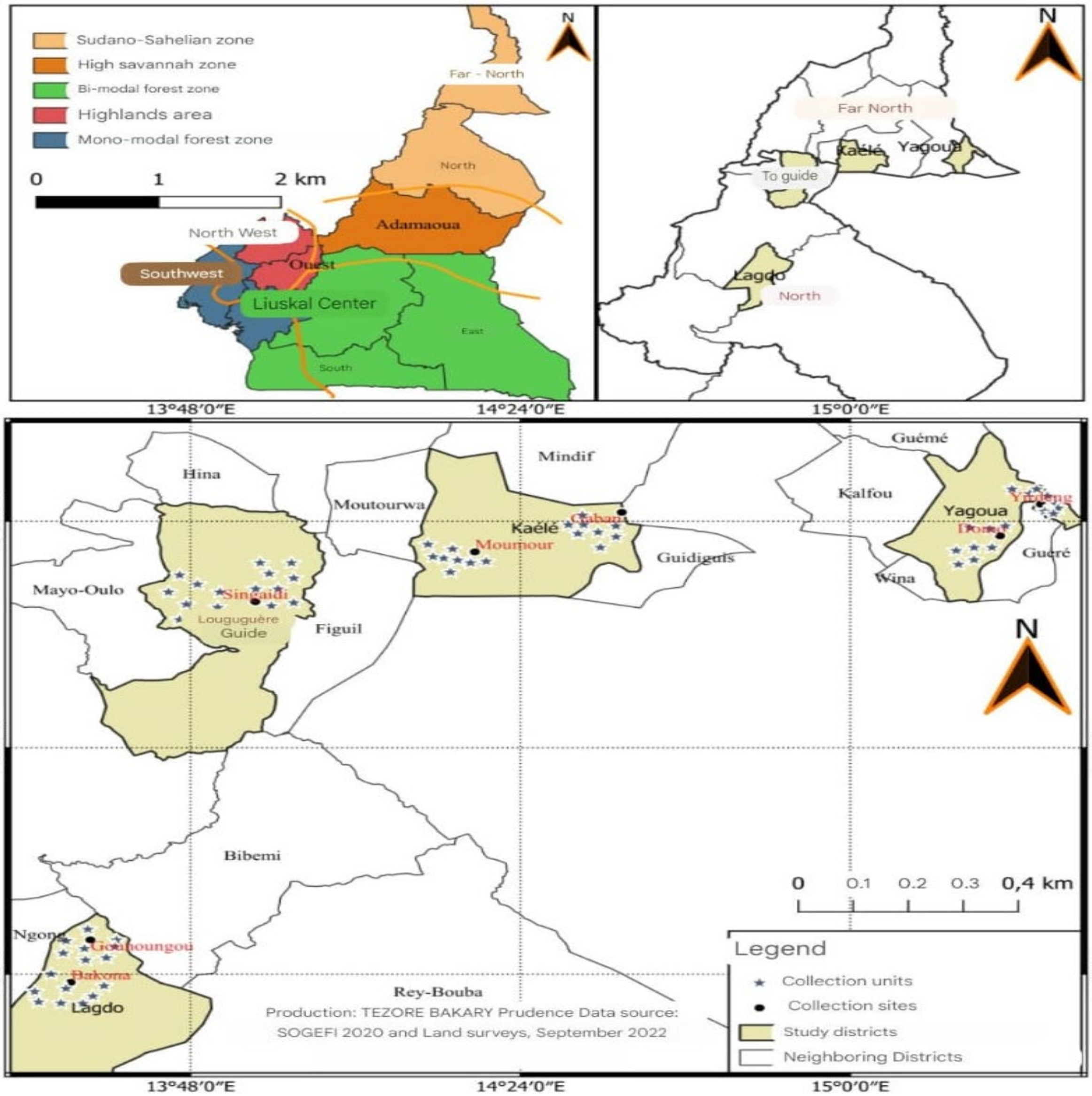


**Figure 1: Location of the study area**

The regularity index or Piélou Equitability (Devineau *et al.,* 1984) is the ratio between the observed diversity and the maximum possible diversity in the number of species (N). It tends towards 0 when there is dominance and towards 1 when a maximum number of species participate in the cover (N'da *et al.,* 2008). Its value is obtained using the following formula:

**E** = H'/Log2N

The Importance Value Index (IVI) was determined by summing relative density, relative frequency and relative dominance (Curtis, 1959). It was used to characterise plant communities and identify dominant species.

IVI= relative density + relative frequency + relative dominance

Density (N) is the number of individuals per unit area. It is expressed as the number of individuals/ha. It is obtained by dividing the total number of individuals in the sample (n) by the surface area sampled (S).

$$N = \frac{n}{S}$$

where n=total number of individuals counted at each site; S=total sampled area of the site in ha.

Relative density $= \frac{ni}{N} * 100$ where $n_i$ = number of individuals of one species and N = total number of individuals of all species).

Relative frequency = (frequency of a species / sum of all frequencies) x 100.

Relative dominance = (basal area of one species / total basal area of all species) x 100.

Relative diversity = (number of species in a family / total species counted) x 100.

The basal area (St) or basal cover is the sum of the basal areas of all individuals whose basal circumference (C) is greater than or equal to 0.3 m. This basal area can be estimated by assuming that the sections of the individuals are circular. It is expressed per unit area ($m^2 . ha^{-1}$) and is calculated as described by Ndiaye *et al.*, 2014): $St = \sum \frac{C^2}{4\pi}$ where St = basal area expressed in $m^2.ha^{-1}$ ; C = circumference at 0.3 m from the ground of the individuals measured.

The family importance value index (FIV) represented the sum of the relative density, relative frequency and relative dominance of a family (Mori *et al.,* 1983). It was used to identify the dominant families in an area.

IVF= relative family density + relative diversity + relative dominance

The biological types were determined with reference to the work of Raunkiaer (1934), which was taken up and adapted to tropical regions (Guinko, 1984; Saadou, 1990). The woody stratum is essentially composed of Phanerophytes, which have been subdivided into Nanophanerophytes, shrubs 0.5 to 2 m high; Microphanerophytes, shrubs 2 to 8 m high; Mesophanerophytes, medium-sized trees 8 to 30 m high.

The phytogeographical elements of Lebrun (1947) and White (1986) were used to determine the phytogeographical distribution of the vegetation in the dry savannahs. These are the following chorological types:

- Cosmopolites (Cos): species distributed throughout the world;
- Pantropical (Pan): species known from tropical Africa, America and Asia;
- Palaeotropics (Pal): species found in tropical Africa and Asia, Madagascar and Australia, Afromalgache;
- Multi-regional African (PRA): species whose range covers several African floristic regions or two floristic regions that are not in contact. Linking species: these are species with a spread-out distribution area, tolerating more or less specific ecological conditions. A distinction is made here between :
- Afrotropical species (At) ;
- Sudano-Zambézian species (Sz).

Once the data had been collected from the various plant formations identified, they were entered and processed using Excel spreadsheet software version Excel 2016, and diversity indices and dendrometric parameters such as density, basal area, diameter at breast height (DBH) and height were evaluated. Analysis of variance (ANOVA) was performed to compare plant formations with each other at the 5% threshold using XLSTAT 2007 software.

# RESULTS

**Taxonomic composition and diversity of the woody stand:** The floristic inventory of the woody vegetation of the dry savannahs enabled us to count a total of 3,269 individuals with a circumference at breast height ≥ 15 cm belonging to 102 species divided into 61 genera and 29 families (according to the Cronsquit classification) (Table 1). The shrub savannah had the highest number of species recorded, 92, in contrast to the tree savannah, which had 69 species (Table 1).

**Table 1: Taxonomic composition of woody species in savannahs.**

| | Shrubby savannah | Wooded savannah |
|---|---|---|
| Individuals | 1737 | 1532 |
| Species | 91 | 69 |
| Genres | 57 | 39 |
| Families | 28 | 22 |

**Diversity indices:** Table 2 shows the diversity indices for the different savannas. The table shows that diversity indices vary between savannahs. The value of the Shannon diversity index is higher in the shrub savannah (3.65 bits) than in the tree savannah where the value is 3.61 bits. The Pielou equilibrium follows the same trend as the Shannon diversity index for the savannahs, with values of 0.86 and 0.79 respectively. Maximum diversity also follows the same logic.

**Table 2. Diversity indices for savannahs.**

| | Wooded savannah | Shrubby savannah |
|---|---|---|
| Shannon index (H') | 3.61 | 3.65 |
| Pielou index (E) | 0.79 | 0.86 |
| Maximum diversity (H'max) | 6.1 | 6.51 |

**Density and land area:** Table 3 shows the density (ind./ha) according to the savannahs in the study area. It should be noted that density varies from one savannah to another. Thus 1737 individuals of all species were counted in the tree savannah, i.e. a density of 48.25 ind./ha, whereas 1532 individuals were counted in the shrub savannah, i.e. a density of 42.57 ind./ha. The basal area was higher in the wooded savannah (2.32 m²/ha) than in the shrub savannah (0.6 m²/ha).

From a specific point of view, density varies according to species. In the wooded savannah, the highest densities were observed among the following species: *Balanites aegyptiaca* (L.) Del. (3.97 ind./ha)*, Combretum glutinosum* Perr. ex DC. (4.64 ind./ha)*, Anogeissus leiocarpus* (DC.) G. & Perr**.** (5.94 ind./ha)*, Guiera* *senegalensis* J.F. Gmel. (2.36 ind./ha) and *Combretum molle* R. Br. Ex G.Don (2.00 ind./ha). The other species only represent a low density per ha (table). On the other hand, in the shrub savannah, the highest densities were observed among the species *Balanites aegyptiaca* (L.) Del (3.83 ind./ha), *Piliostigma reticulatum* (DC.) Hochst. (2.72 ind./ha) *Ziziphus mauritiana* Lam. (2.42 ind./ha), *Combretum glutinosum* Perr. ex DC. (2.22 ind./ha), *Azadirachta indica* A. Juss. (1.69 ind./ha), *Feretia apodanthera* Del. (1.67 ind./ha).

The species with the highest basal area values are *Prosopis africana* (Guill. & Perr.) Taub. (0.32 m²/ha), *Anogeissus leiocarpus* (DC.) G. & Perr. (0.3 m²/ha), *Sterculia setigera* Del. (0.17 m²/ha), *Combretum glutinosum* Perr. ex DC. (0.14 m²/ha) and *Sclerocarya birrea* (A. Rich.) Hochst. (0.12 m²/ha) in the wooded savannah (Table 3). In the shrub savannah, the species with the highest basal area values were *Balanates aegyptiaca* (L.) Del. (0.08 m²/ha) and *Azadirachta indica* A. Juss. (0.04 m²/ha) (Table 3).

**Table 3. Species densities and land areas in savannahs.**

| Species | Wooded savannah | | Shrubby savannah | |
|---|---|---|---|---|
| | Da (ind./ha) | St (m²/ha) | Da (ind./ha) | St (m²/ha) |
| *Acacia albida* (Del.) A. Chev. | 0.06 | / | / | / |
| *Acacia ataxacantha* DC. | 0.42 | / | 0.64 | / |
| *Acacia erythrocalyx* Brenan. | 0.03 | / | / | / |
| *Acacia gerradii* Benth. | 0.03 | / | 0.19 | / |
| *Acacia hockii* De Wild. | 0.03 | / | 1.50 | 0.02 |
| *Acacia kirkii* Oliv. | 0.03 | / | 0.08 | 0.00 |
| *Acacia nilotica* (L.) Wild. Ex Delile | 0.33 | 0.01 | 1.42 | 0.03 |
| *Acacia polyacantha* Wild. | 0.42 | 0.03 | 0.47 | 0.01 |
| *Acacia senegal* (L.) Willd. | 0.36 | 0.01 | 0.08 | / |
| *Acacia seyal* Del. | 1.94 | 0.08 | 0.69 | 0.02 |
| *Acacia sieberiana* DC. | 1.11 | 0.12 | 0.11 | 0.00 |
| *Acacia* sp. | 0.03 | / | 0.50 | 0.01 |
| *Acacia tortilis* (Forssk.) Hayne | 0.06 | / | 1.03 | 0.01 |
| *Afzelia africana* Pers. | / | / | 0.06 | / |
| *Albizia chevalieri* Harms | 0.53 | 0.02 | 0.06 | / |
| *Amblygonocarpus andongensis* (Oliv.) Excell & Torre | 0.19 | 0.00 | / | / |
| *Annona senegalensis* Pers. | 0.53 | 0.00 | 1.39 | 0.01 |
| *Anogeissus leiocarpus* (DC.) G. et Perr. | 5.94 | 0.30 | / | / |
| *Azadirachta indica* A. Juss. | 0.75 | 0.04 | 1.69 | 0.04 |
| *Balanites aegyptiaca* (L.) Del. | 3.97 | 0.15 | 3.83 | 0.08 |
| *Bauhinia rufescens* Lam. | 0.03 | / | / | / |
| *Bombax costatum* Pell. Et Vuill. | 0.08 | 0.01 | / | / |
| *Borassus aethiopium* Mart. | 0.06 | / | / | / |
| *Boswelia dalzieli* Hutch. | 0.33 | 0.04 | / | / |
| *Bridelia scleroneura* Mùll. Arg. | | / | 0.06 | / |
| *Burkea africana* Hook. | 0.03 | / | 0.11 | / |
| *Cadaba farinosa* Forssk. | | / | 0.06 | / |
| *Capparis sepiaria* L. | 0.03 | / | / | / |
| *Cassia sieberiana* DC. | 0.11 | / | 0.06 | / |
| *Combretum aculeatum* Vent. | 0.06 | / | 0.92 | / |
| *Combretum collinum* Fresen. | 1.19 | 0.01 | 1.36 | 0.01 |
| *Combretum collinum* Fresen. | 1.19 | 0.01 | 1.36 | 0.01 |
| *Combretum fragrans* F. Hoffm. | 1.83 | 0.07 | 1.83 | 0.03 |
| *Combretum glutinosum* Perr. Ex DC. | 4.64 | 0.14 | 2.22 | 0.02 |
| *Combretum micranthum* G. Don. | 1.03 | 0.01 | 0.25 | / |
| *Combretum molle* R. Br. Ex G.Don | 2.00 | 0.05 | 0.44 | 0.01 |
| *Commiphora africana* (A. Rich.) Engl. | 0.11 | / | 1.69 | 0.03 |
| *Commiphora kerstingii* Engl. | 0.03 | / | | |

| | | | | |
|---|---|---|---|---|
| *Commiphora pedonculata* (Kotschy & Peyr) Engl. | 0.58 | 0.02 | | |
| *Crateva adansonii* DC. | 0.03 | / | | |
| *Crossopteryx febrifuga* (Afz. Ex G.Don) Benth. | 0.03 | / | | |
| *Dalbergia melanoxylon* Guill. et Perr. | 0.06 | / | 1.06 | 0.02 |
| *Detarium microcarpum* Guill. & Perr | 0.67 | 0.01 | | |
| *Dichrostachys cinerea* (Forsk.) Chiov. | 0.86 | 0.01 | 0.97 | 0.01 |
| *Diospyros mespiliformis* Hochst. | 0.19 | 0.02 | 0.36 | 0.03 |
| *Entada africana* Guill. & Perr | 0.64 | 0.02 | 0.50 | 0.01 |
| *Eucalyptus camaldulensis* Dehnh. | 0.08 | 0.00 | | |
| *Feretia apodanthera* Del | 0.50 | 0.00 | 1.67 | 0.01 |
| *Ficus ingens* Miq. | 0.08 | 0.02 | / | / |
| *Ficus platyphylla* Del. | 0.22 | 0.08 | / | / |
| *Ficus sp* | 0.03 | 0.01 | / | / |
| *Ficus sycomorus* L. | 0.08 | 0.03 | / | / |
| *Ficus thonengii* Blume | 0.06 | 0.04 | / | / |
| *Gardenia aqualla* Stapf & Hutch. | 0.39 | 0.00 | 0.08 | / |
| *Gardenia ternifolia* Schumach. & Thonn. | 0.53 | 0.00 | 0.03 | / |
| *Grewia bicolor* Juss. | | | 0.14 | / |
| *Grewia flavescens* Juss. | 0.19 | 0.00 | 0.17 | / |
| *Guiera senegalensis* J.F. Gmel. | 2.36 | 0.01 | 0.47 | / |
| *Hexalobus monopetalus* (A. Rich.) Engl. & Diels | 0.97 | 0.02 | 1.39 | 0.03 |
| *Hymenocardia acida* Tul. | 0.11 | 0.00 | | |
| *Hyphaena thebaica* (L.) Mart. | 0.39 | 0.01 | | |
| *Jatropha curcas* L. | 0.11 | 0.00 | | |
| *Khaya senegalensis* (Desv.) A. Juss. | 0.19 | 0.04 | 0.17 | 0.01 |
| *Lannea acida* A. Rich. | 0.25 | 0.01 | 0.25 | 0.01 |
| *Lannea fruticosa* Engl. | 0.25 | 0.01 | 1.03 | 0.02 |
| *Lannea humilis* (Oliv.) Engl. | | | 0.19 | 0.01 |
| *Lannea schemperi* Engl. | 0.06 | 0.00 | 0.56 | 0.01 |
| *Lannea sp* | 0.03 | 0.00 | 0.39 | 0.01 |
| *Lannea velutina* A. Rich. | 0.86 | 0.04 | | |
| *Lonchocarpus laxiflorus* Guill. & Perr. | 0.08 | 0.00 | | |
| *Maerua angolensis* DC. | 0.11 | 0.01 | 0.22 | 0.00 |
| *Maytenus senegalensis* (Lam.) Exell. | 0.08 | 0.00 | | |
| *Mitragina inermis* (Willd.) O. Ktze. | 0.17 | 0.02 | | |
| *Phylanthus muellenianus* (Kuntze) Exell. | | | 0.06 | 0.00 |
| *Piliostigma reticulatum* (DC) Hochst. | 0.19 | 0.00 | 2.72 | 0.02 |
| *Piliostigma thonningii* (Sch.) Miln.Red. | 0.47 | 0.01 | 0.42 | 0.00 |
| *Prosopis africana* (Guill. & Perr.) Taub. | 2.17 | 0.32 | | |
| *Prosopis juliflora* (Sw.) DC. | 0.06 | 0.00 | | |
| *Pterocarpus erinaceus* Poir. | 0.06 | 0.00 | | |
| *Pterocarpus lucens* Lepr. | 0.11 | 0.00 | 0.08 | 0.00 |
| *Sclerocarya birrea* (A. Rich.) Hochst. | 0.86 | 0.12 | 0.39 | 0.02 |
| *Securidaca longepedunculata* Fresen. | 0.08 | 0.00 | 0.08 | 0.00 |
| *Senna siamea* Lam. | | | 0.06 | 0.00 |
| *Senna singueana* (Delile) Lock | 0.31 | 0.01 | 0.36 | 0.00 |
| *Senna spectabilis* (DC.) Irwin & Barneby | | | 0.19 | 0.00 |
| *Steganotaenia araliacea* Hochst. | | | 0.17 | 0.00 |
| *Stercula setigera* Del. | 0.72 | 0.17 | | |
| *Stereospermum kunthianum* Cham. | 0.06 | 0.00 | 0.17 | 0.00 |
| *Strychnos spinosa* Lam. | 0.14 | 0.00 | 0.03 | 0.00 |
| *Swartzia madagascariensis* Desv. | 0.06 | 0.00 | | |
| *Tamarindus indica* L. | 0.31 | 0.02 | 0.08 | 0.00 |

| | | | | |
|---|---|---|---|---|
| *Terminalia avicennioides* Guill. & perr. | 0.22 | 0.01 | | |
| *Terminalia brownii* Fresen. | | | 0.17 | 0.00 |
| *Terminalia glaucescens* Planch. ex Benth. | 0.06 | 0.00 | 0.53 | 0.01 |
| *Terminalia laxiflora* Engl. & Diels. | | | 0.11 | 0.00 |
| *Terminalia macrocarpa* Declin. | 0.03 | 0.00 | 0.08 | 0.00 |
| *Terminalia macroptera* Guill. & Perr | 0.47 | 0.11 | 0.61 | 0.01 |
| *Vitellaria paradoxa* C.F. Gaertn. | 0.56 | 0.02 | 0.11 | 0.00 |
| *Vitex doniana* Sweet. | 0.03 | 0.00 | 0.14 | 0.01 |
| *Ximenia americana* L. | 0.22 | 0.00 | 0.81 | 0.00 |
| *Ziziphus mauritiana* Lam | 1.00 | 0.01 | 2.42 | 0.02 |
| *Ziziphus mucronata* Willd. | 0.50 | 0.00 | 0.31 | 0.00 |
| *Ziziphus spina-christi* (L.) Willd. | | | 0.08 | 0.00 |
| **Total** | **48.25** | **2.32** | **42.57** | **0.6** |

**Plant structures:** Figure 2 shows the distribution of individuals by height class and savannah. In the tree savannah, 590 individuals are between 1.50 and 5 m tall, compared with 839 individuals in the shrub savannah.

In both savannahs, species 1.30>H≤5 m are dominant, while those 5>H≤10 m are more common in the shrub savannah. Individuals exceeding 10 m are rare in the shrub savannah. Statistical analysis shows a significant variation in height classes between savannas (0.002<0.01). In general, tree heights show an inverted "J" structure, reflecting the dominance of shrubs in the study area.

Figure 3 shows the distribution of individuals by diameter class and savannah. This diametric structure shows that the diameter of individuals varies significantly between savannas and between diameter classes (0.0001<0.001). The two savannahs are distinguished by the dominance of plants with a DBH between 10>DHP≤20 cm. For this class, the variation is significant between sites (0.02<0.05). Shrub savannas are more represented in terms of number of individuals in the first two classes. Overall, this structure shows an inverted "J" shape, reflecting the dominance of shrubs in the study area.

**Ecological importance of species:** Table 4 shows the ecological importance values of the species according to the savannahs. The ecological importance index of species varies according to the savannahs in the study area. Species such as *Anogeisus leiocarpus* (DC.) G. & Perr**.** (31.23), *Combretum glutinosum* Perr. ex DC. (21.06), *Balanites aegyptiaca* (L.) Del. (20.65), *Prosopis Africana* (Guill. & Perr.) Taub. (20.02), *Acacia seyal* Del. (12.49) are the most represented species in terms of Importance Value Index (IVI) values in the wooded savannah. In the shrub savannah, the species with the highest Importance Value Index (IVI) values are: *Balanites aegyptiaca* (L.) Del. (27.75), *Piliostigma reticulatum* (DC.) Hochst. (15.35), *Combretum fragrans* F. Hoffm. (14.79), *Combretum glutinosum* Perr. ex DC. (14.57) *Ziziphus mauritiana* Lam. (14.26).

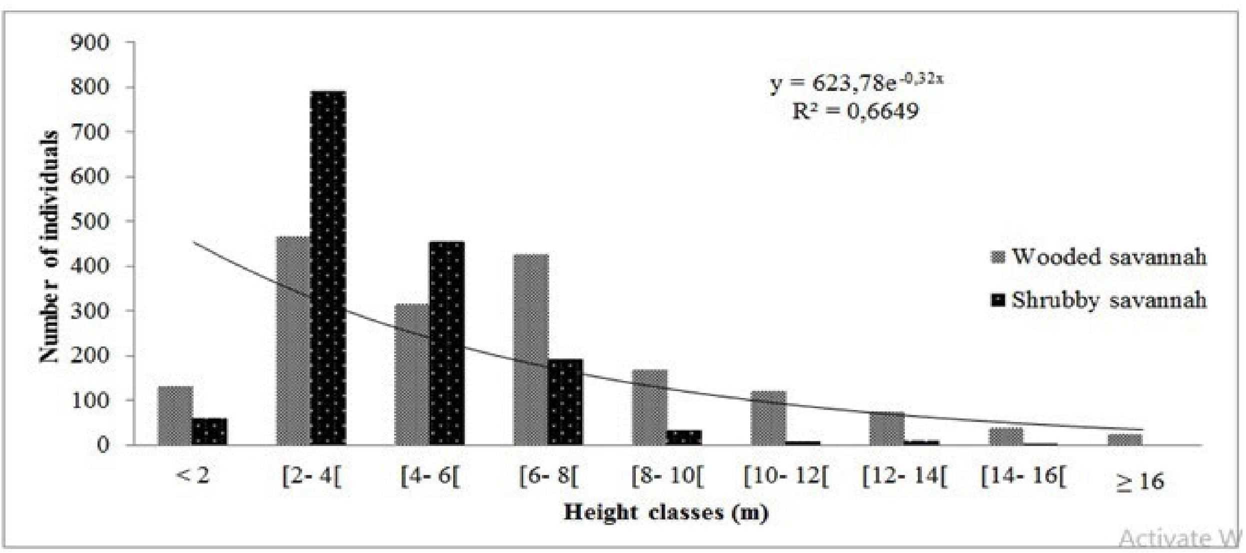


**Figure 2. Distribution of individuals by height class**

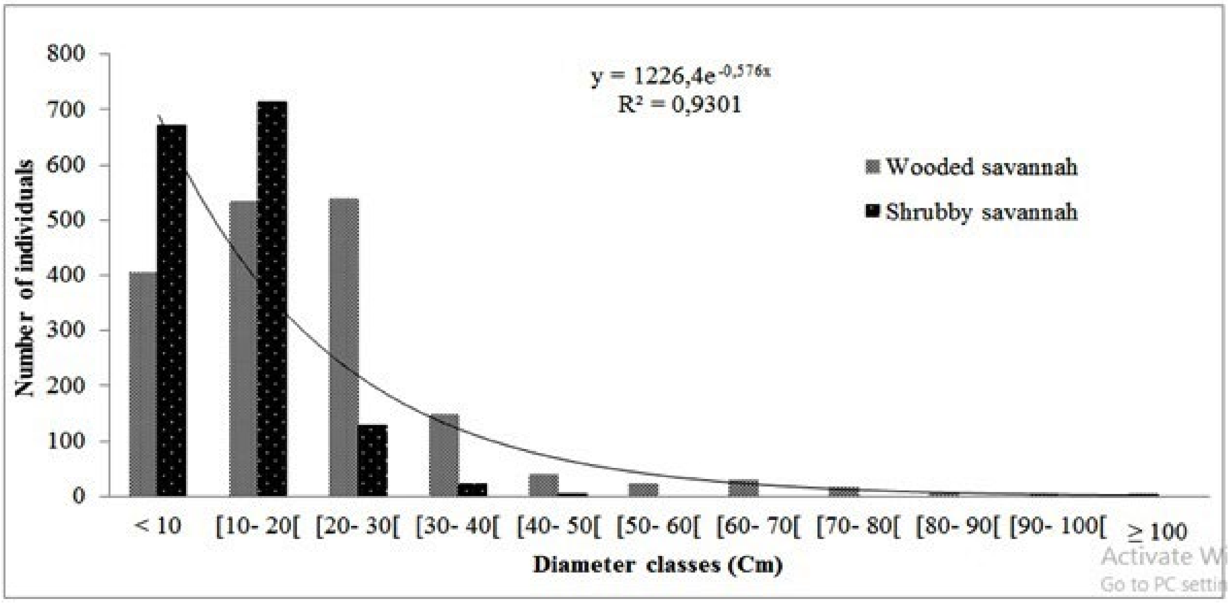


**Figure 3: Diameter classes according to savannah**

**Table 4: Index of species ecological importance values for savannahs**

| Species | Wooded savannah | | | | Shrubby savannah | | | |
|---|---|---|---|---|---|---|---|---|
| | DeR | DoR | FR | IVI | DeR | DoR | FR | IVI |
| *Acacia albida* (Del.) A. Chev. | 0.12 | 0.11 | 0.36 | 0.58 | | | | |
| *Acacia ataxacantha* DC. | 0.86 | 0.07 | 0.90 | 1.83 | 1.50 | 0.68 | 2.01 | 4.20 |
| *Acacia erythrocalyx* Brenan. | 0.06 | 0.02 | 0.18 | 0.26 | | | | |
| *Acacia gerradii* Benth. | 0.06 | 0.00 | 0.18 | 0.24 | 0.46 | 0.23 | 0.50 | 1.19 |
| *Acacia hockii* De Wild. | 0.06 | 0.04 | 0.18 | 0.28 | 3.52 | 2.87 | 3.19 | 9.58 |
| *Acacia kirkii* Oliv. | 0.06 | 0.03 | 0.18 | 0.27 | 0.20 | 0.08 | 0.17 | 0.45 |
| *Acacia nilotica* (L.) Wild. Ex Delile | 0.69 | 0.47 | 1.26 | 2.43 | 3.33 | 4.94 | 4.03 | 12.30 |
| *Acacia polyacantha* Wild. | 0.86 | 1.13 | 1.08 | 3.07 | 1.11 | 1.73 | 1.01 | 3.85 |
| *Acacia senegal* (L.) Willd. | 0.75 | 0.62 | 0.90 | 2.27 | 0.20 | 0.11 | 0.34 | 0.64 |
| *Acacia seyal* Del. | 4.03 | 3.42 | 5.05 | 12.49 | 1.63 | 2.83 | 0.84 | 5.30 |
| *Acacia sieberiana* DC. | 2.30 | 5.22 | 2.16 | 9.68 | 0.26 | 0.37 | 0.17 | 0.79 |
| *Acacia* sp. | 0.06 | 0.00 | 0.18 | 0.24 | 1.17 | 1.29 | 0.84 | 3.30 |
| *Acacia tortilis* (Forssk.) Hayne | 0.12 | 0.02 | 0.18 | 0.31 | 2.42 | 1.59 | 3.52 | 7.53 |
| *Afzelia africana* Pers. | | | | | 0.13 | 0.70 | 0.17 | 1.00 |
| *Albizia chevalieri* Harms | 1.09 | 0.76 | 1.08 | 2.93 | 0.13 | 0.06 | 0.17 | 0.36 |
| *Amblygonocarpus andongensis* Excell & Torre | 0.40 | 0.16 | 0.72 | 1.29 | | | | |
| *Annona senegalensis* Pers. | 1.09 | 0.14 | 1.80 | 3.04 | 3.26 | 1.06 | 4.70 | 9.02 |
| *Anogeissus leiocarpus* (DC.) G. et Perr. | 12.32 | 12.42 | 6.49 | 31.23 | | | | |
| *Azadirachta indica* A. Juss. | 1.55 | 1.89 | 2.34 | 5.78 | 3.98 | 6.97 | 2.85 | 13.81 |
| *Balanites aegyptiaca* (L.) Del. | 8.23 | 6.47 | 5.95 | 20.65 | 9.01 | 13.20 | 5.54 | 27.75 |
| *Bauhinia rufescens* Lam. | 0.06 | 0.01 | 0.18 | 0.25 | | | | |
| *Bombax costatum* Pell. Et Vuill. | 0.17 | 0.47 | 0.18 | 0.83 | | | | |
| *Borassus aethiopium* Mart. | 0.12 | 0.09 | 0.18 | 0.39 | | | | |
| *Boswelia dalzieli* Hutch. | 0.69 | 1.60 | 0.90 | 3.19 | | | | |
| *Bridelia scleroneura* Mùll. Arg. | | | | | 0.13 | 0.06 | 0.17 | 0.36 |
| *Burkea africana* Hook. | 0.06 | 0.02 | 0.18 | 0.25 | 0.26 | 0.30 | 0.34 | 0.90 |
| *Cadaba farinosa* Forssk. | | | | | 0.13 | 0.02 | 0.34 | 0.48 |
| *Capparis sepiaria* L. | 0.06 | 0.02 | 0.18 | 0.26 | | | | |
| *Cassia sieberiana* DC. | 0.23 | 0.02 | 0.18 | 0.43 | 0.13 | 0.08 | 0.17 | 0.38 |
| *Combretum aculeatum* Vent. | 0.12 | 0.03 | 0.18 | 0.33 | 2.15 | 0.75 | 2.01 | 4.92 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Combretum collinum* Fresen. | 2.48 | 0.29 | 2.16 | 4.92 | 3.20 | 1.87 | 5.03 | 10.10 |
| *Combretum fragrans* F. Hoffm. | 3.80 | 2.96 | 4.32 | 11.09 | 4.31 | 4.78 | 5.70 | 14.79 |
| *Combretum glutinosum* Perr. Ex DC. | 9.61 | 5.86 | 5.59 | 21.06 | 5.22 | 3.30 | 6.04 | 14.57 |
| *Combretum micranthum* G. Don. | 2.13 | 0.36 | 1.62 | 4.11 | 0.59 | 0.22 | 0.84 | 1.65 |
| *Combretum molle* R. Br. Ex G.Don | 4.15 | 2.16 | 3.96 | 10.26 | 1.04 | 0.98 | 0.84 | 2.86 |
| *Commiphora africana* (A. Rich.) Engl. | 0.23 | 0.11 | 0.36 | 0.70 | 3.98 | 4.10 | 2.01 | 10.10 |
| *Commiphora kerstingii* Engl. | 0.06 | 0.03 | 0.18 | 0.26 | | | | |
| *Commiphora pedonculata* Engl. | 1.21 | 0.72 | 1.44 | 3.37 | | | | |
| *Crateva adansonii* DC. | 0.06 | 0.00 | 0.18 | 0.24 | | | | |
| *Crossopteryx febrifuga* Benth. | 0.06 | 0.01 | 0.18 | 0.24 | | | | |
| *Dalbergia melanoxylon* Guill. et Perr. | 0.12 | 0.01 | 0.18 | 0.31 | 2.48 | 2.65 | 1.51 | 6.64 |
| *Detarium microcarpum* Guill. & Perr | 1.38 | 0.41 | 1.08 | 2.88 | | | | |
| *Dichrostachys cinerea* (Forsk.) Chiov. | 1.78 | 0.31 | 1.44 | 3.53 | 2.28 | 1.22 | 1.85 | 5.35 |
| *Diospyros mespiliformis* Hochst. | 0.40 | 0.72 | 0.54 | 1.66 | 0.85 | 4.29 | 0.67 | 5.81 |
| *Entada africana* Guill. & Perr | 1.32 | 0.96 | 1.26 | 3.55 | 1.17 | 1.88 | 1.17 | 4.23 |
| *Eucalyptus camaldulensis* Dehnh. | 0.17 | 0.07 | 0.18 | 0.43 | | | | |
| *Feretia apodanthera* Del | 1.04 | 0.08 | 0.90 | 2.01 | 3.92 | 0.94 | 4.70 | 9.55 |
| *Ficus ingens* Miq. | 0.17 | 0.76 | 0.18 | 1.12 | | | | |
| *Ficus platyphylla* Del. | 0.46 | 3.18 | 0.72 | 4.37 | | | | |
| *Ficus* sp. | 0.06 | 0.58 | 0.18 | 0.82 | | | | |
| *Ficus sycomorus* L. | 0.17 | 1.22 | 0.36 | 1.75 | | | | |
| *Ficus thonengii* Blume | 0.12 | 1.71 | 0.18 | 2.01 | | | | |
| *Gardenia aqualla* Stapf & Hutch. | 0.81 | 0.16 | 1.44 | 2.41 | 0.20 | 0.08 | 0.34 | 0.62 |
| *Gardenia ternifolia* Schumach. & Thonn. | 1.09 | 0.19 | 0.90 | 2.18 | 0.07 | 0.03 | 0.17 | 0.26 |
| *Grewia bicolor* Juss. | | | | | 0.33 | 0.23 | 0.67 | 1.23 |
| *Grewia flavescens* Juss. | 0.40 | 0.12 | 0.54 | 1.07 | 0.39 | 0.17 | 0.50 | 1.06 |
| *Guiera senegalensis* J.F. Gmel. | 4.89 | 0.34 | 4.86 | 10.10 | 1.11 | 0.19 | 1.01 | 2.31 |
| *Hexalobus monopetalus* Engl. & Diels | 2.01 | 0.71 | 2.34 | 5.07 | 3.26 | 4.58 | 2.85 | 10.69 |
| *Hymenocardia acida* Tul. | 0.23 | 0.01 | 0.18 | 0.42 | | | | |
| *Hyphaena thebaica* (L.) Mart. | 0.81 | 0.58 | 1.26 | 2.65 | | | | |
| *Jatropha curcas* L. | 0.23 | 0.04 | 0.18 | 0.45 | | | | |
| *Khaya senegalensis* (Desv.) A. Juss. | 0.40 | 1.84 | 0.54 | 2.79 | 0.39 | 1.29 | 0.67 | 2.35 |
| *Lannea acida* A. Rich. | 0.52 | 0.33 | 0.54 | 1.39 | 0.59 | 1.14 | 0.50 | 2.24 |
| *Lannea fruticosa* Engl. | 0.52 | 0.40 | 0.54 | 1.46 | 2.42 | 2.43 | 1.34 | 6.19 |
| *Lannea humilis* (Oliv.) Engl. | | | | | 0.46 | 1.14 | 0.50 | 2.10 |
| *Lannea schemperi* Engl. | 0.12 | 0.03 | 0.18 | 0.33 | 1.31 | 1.66 | 1.01 | 3.98 |
| *Lannea* sp. | 0.06 | 0.02 | 0.18 | 0.25 | 0.91 | 0.89 | 0.67 | 2.48 |
| *Lannea velutina* A. Rich. | 1.78 | 1.64 | 1.08 | 4.50 | | | | |
| *Lonchocarpus laxiflorus* Guill. & Perr. | 0.17 | 0.14 | 0.18 | 0.49 | | | | |
| *Maerua angolensis* DC. | 0.23 | 0.24 | 0.36 | 0.83 | 0.52 | 0.32 | 0.34 | 1.18 |
| *Maytenus senegalensis* (Lam.) Exell. | 0.23 | 0.03 | 0.44 | 0.80 | | | | |
| *Mitragina inermis* (Willd.) O. Ktze. | 0.35 | 0.97 | 0.54 | 1.85 | | | | |
| *Phylanthus muellenianus* (Kuntze) Exell. | | | | | 0.13 | 0.04 | 0.17 | 0.34 |
| *Piliostigma reticulatum* (DC) Hochst. | 0.40 | 0.15 | 1.08 | 1.63 | 6.40 | 2.92 | 6.04 | 15.35 |
| *Piliostigma thonningii* (Sch.) Miln.Red. | 0.98 | 0.33 | 0.90 | 2,21 | 0.98 | 0.41 | 1.01 | 2.40 |
| *Prosopis africana* (Guill. & Perr.) Taub. | 4.49 | 13.37 | 2.16 | 20.03 | | | | |
| *Prosopis juliflora* (Sw.) DC. | 0.12 | 0.15 | 0.18 | 0.45 | | | | |
| *Pterocarpus erinaceus* Poir. | 0.12 | 0.02 | 0.36 | 0.49 | | | | |
| *Pterocarpus lucens* Lepr. | 0.23 | 0.14 | 0.18 | 0.55 | 0.20 | 0.52 | 0.34 | 1.05 |
| *Sclerocarya birrea* (A. Rich.) Hochst. | 1.78 | 5.10 | 2.88 | 9.77 | 0.91 | 3.05 | 1.34 | 5.31 |
| *Securidaca longepedunculata* Fresen. | 0.17 | 0.02 | 0.36 | 0.55 | 0.20 | 0.15 | 0.17 | 0.52 |
| *Senna siamea* Lam. | | | | | 0.13 | 0.12 | 0.17 | 0.42 |
| *Senna singueana* (Delile) Lock | 0.63 | 0.29 | 0.90 | 1.82 | 0.85 | 0.66 | 0.84 | 2.35 |
| *Senna spectabilis* (DC.) Irwin & Barneby | | | | | 0.46 | 0,.46 | 0.84 | 1.75 |
| *Steganotaenia araliacea* Hochst. | | | | | 0.39 | 0.29 | 0.67 | 1.35 |
| *Stercula setigera* Del. | 1.50 | 7.29 | 1.26 | 10.04 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Stereospermum kunthianum* Cham. | 0.12 | 0.05 | 0.18 | 0.34 | 0,39 | 0,31 | 1,01 | 1,71 |
| *Strychnos spinosa* Lam. | 0.29 | 0.11 | 0.54 | 0.94 | 0.07 | 0.08 | 0.17 | 0.31 |
| *Swartzia madagascariensis* Desv. | 0.12 | 0.02 | 0.18 | 0.31 | | | | |
| *Tamarindus indica* L. | 0.63 | 0.74 | 1.08 | 2.46 | 0.20 | 0.40 | 0.34 | 0.93 |
| *Terminalia avicennioides* Guill. & perr. | 0.46 | 0.23 | 0.54 | 1.23 | | | | |
| *Terminalia brownii* Fresen. | | | | | 0.39 | 0.67 | 0.67 | 1.73 |
| *Terminalia glaucescens* Planch. ex Benth. | 0.12 | 0.08 | 0.18 | 0.38 | 1.24 | 1.35 | 1.01 | 3.60 |
| *Terminalia laxiflora* Engl. & Diels. | | | | | 0.26 | 0.41 | 0.17 | 0.84 |
| *Terminalia macrocarpa* Declin. | 0.06 | 0.02 | 0.18 | 0.25 | 0.20 | 0.17 | 0.17 | 0.54 |
| *Terminalia macroptera* Guill. & Perr | 0.98 | 4.56 | 1.80 | 7.34 | 1.44 | 1.62 | 1.51 | 4.57 |
| *Vitellaria paradoxa* C.F. Gaertn. | 1.15 | 0.90 | 2.34 | 4.40 | 0.26 | 0.74 | 0.17 | 1.17 |
| *Vitex doniana* Sweet. | 0.06 | 0.07 | 0.18 | 0.30 | 0.33 | 1.19 | 0.50 | 2.02 |
| *Ximenia americana* L. | 0.46 | 0.06 | 0.54 | 1.06 | 1.89 | 0.78 | 2.01 | 4.69 |
| *Ziziphus mauritiana* Lam | 2.07 | 0.62 | 3.96 | 6.65 | 5.68 | 2.88 | 5.70 | 14.26 |
| *Ziziphus mucronata* Willd. | 1.04 | 0.16 | 1.08 | 2.27 | 0.72 | 0.29 | 0.84 | 1.85 |
| *Ziziphus spina-christi* (L.) Willd. | | | | | 0.20 | 0.15 | 0.17 | 0.51 |
| Totaux | 100 | 100 | 100 | 300 | 100 | 100 | 100 | 300 |

**Families of ecological importance:** Figure 4 shows the following families of importance in the savannas. This table shows that the index of families of ecological importance varies between 1.25 (Verbenaceae) and 83.64 (Combretaceae) in the tree savannah. In the shrub savannah, the family index varies between 1.59 (Loganiaceae) and 61.85 (Mimosaceae). For all the savannas in the study area, Combretaceae, Mimosaceae and Anacardiaceae are the most dominant families.

In the shrub savannah, the Combretaceae, Mimosoaceae and Anacardiaceae families are the most dominant. Ten families of great ecological importance (IVF>10%) were counted: Combretaceae (63.62%), Mimosoaceae (46.54%), Sterculiaceae (39.35%) and Anacardiaceae (22.58%) (Figure 5).

**Characterisation of biological types and phytogeographical distributions of woody species in relation to savannas Biological types:** Figure 6 shows the biological spectrum of species by savannah. It can be seen from this figure that the biological spectrum of species inventoried is most represented by microphanerophytes (86.81% of species), whereas mesophanerophytes and nanophanerophytes are poorly represented, representing only 5.87% and 7.31% respectively in the tree savannah. In the shrub savannah, microphanerophytes are also dominant with a percentage of 95.69%, while nanophanerophytes are poorly represented with a percentage of 4.30%.

**Distribution of phytogeographical types:** Figure 7 shows the distribution of phytogeographical types of species across the savannas. This figure shows that, in the tree savannah, Afro-tropical species (45.65%) and multi-regional species (27.17%) are the most dominant, followed by link species and species with a wide geographical distribution, which are few in number. In the shrubby savannah, Afro-tropical, multiregional and pantropical species are still the most represented, with values of 39.13%, 31.88% and 28.98% respectively. Montane African species are the least represented, with a percentage of 0.1% in the shrub savannah and 0.2% in the tree savannah.

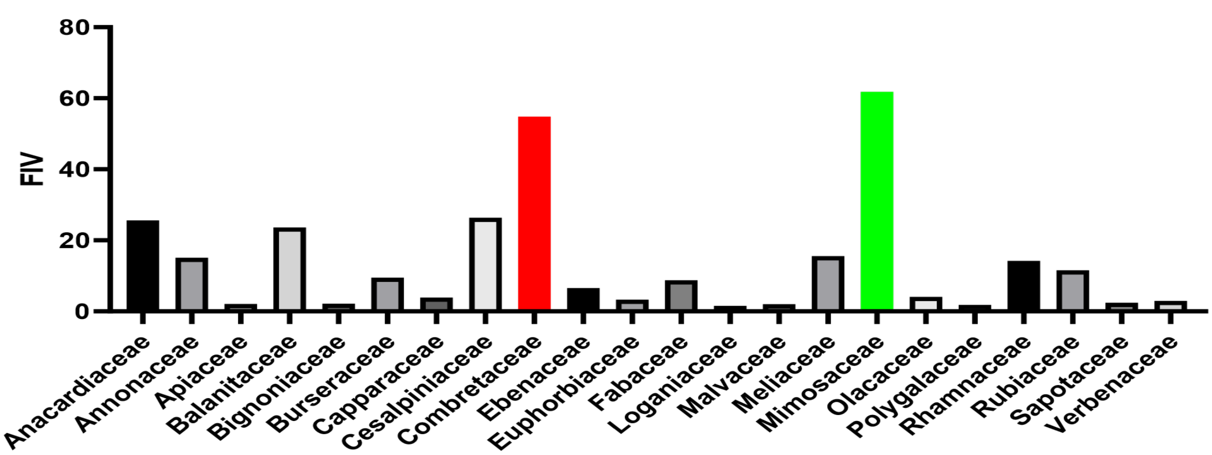


**Figure 4. Families of ecological importance in the shrub savannah**

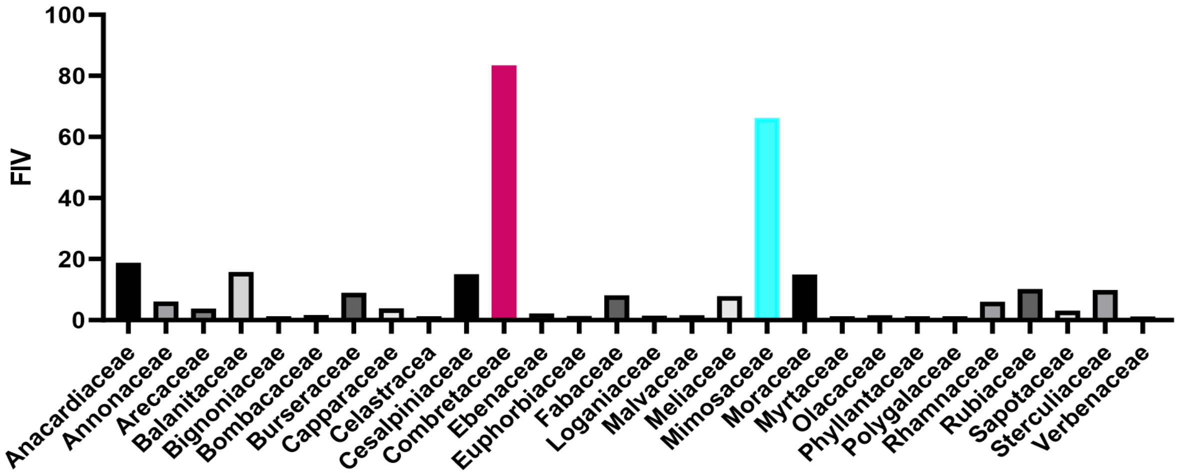


**Figure 5. Families of ecological importance in wooded savannahs**

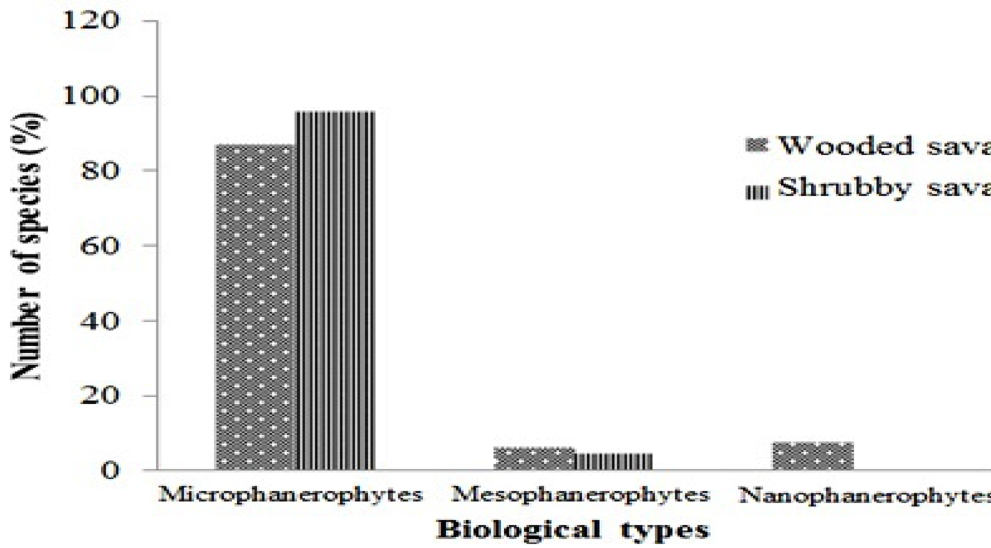


**Figure 6. Biological spectrum of species**

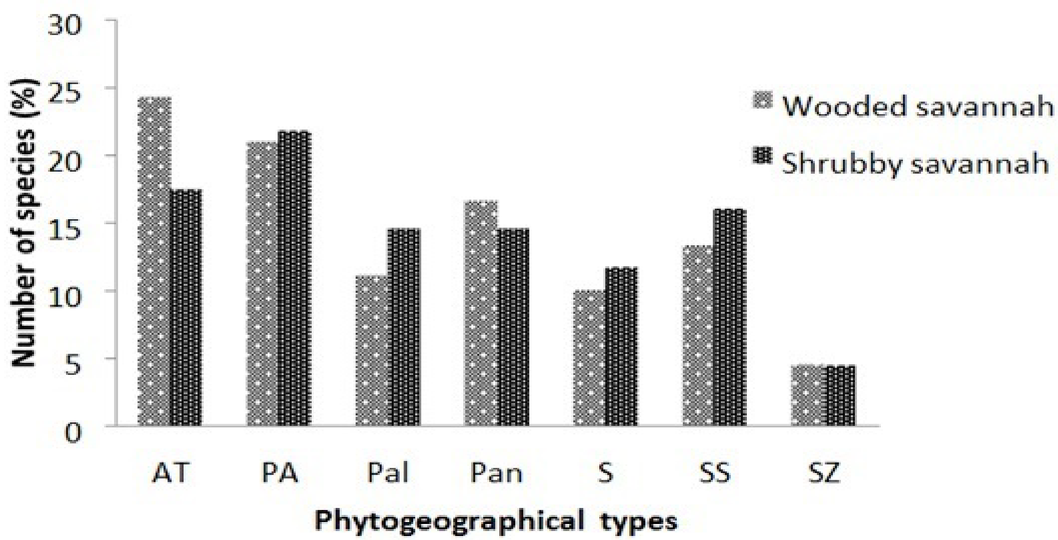


**Figure 7. Spectrum of phytogeographical types of species according to savannas**

**Pan: Pantropical; Pal: Palaeotropical;** AT: Afro-Tropical; PA: Pluri-regional; SZ: Sudanese-Zambezi; S: Sudanian

**Dissemination of diaspores;** Figure 8 shows the modes of dissemination of diaspores in the dry savannahs. This figure shows that anemochory is the most represented mode in terms of number of species, with 47.83% in the shrub savannah and 43.95% in the tree savannah. It is followed by zoochory with 42.03% of the number of species in the shrub savannah and 41.76% in the tree savannah. The anemochorous plants include: *Anogeissus leiocarpus* (DC.) G. et Perr. and *Combretum collinum* Fresen., *Guiera senegalensis* J.F. Gmel. Hydrochory is the mode of diaspore dispersal least represented in savannas. It includes species such as *Ficus* sp, *Eucalyptus camaldulensis* Dehn. and *Andira inermis* DC. Zoochorous species found in these savannas include *Balanites aegyptiaca* (L.) Del., *Azadirachta indica* A. Juss., *Ziziphus mauritiana* Lam. and *Annona senegalensis* Pers.

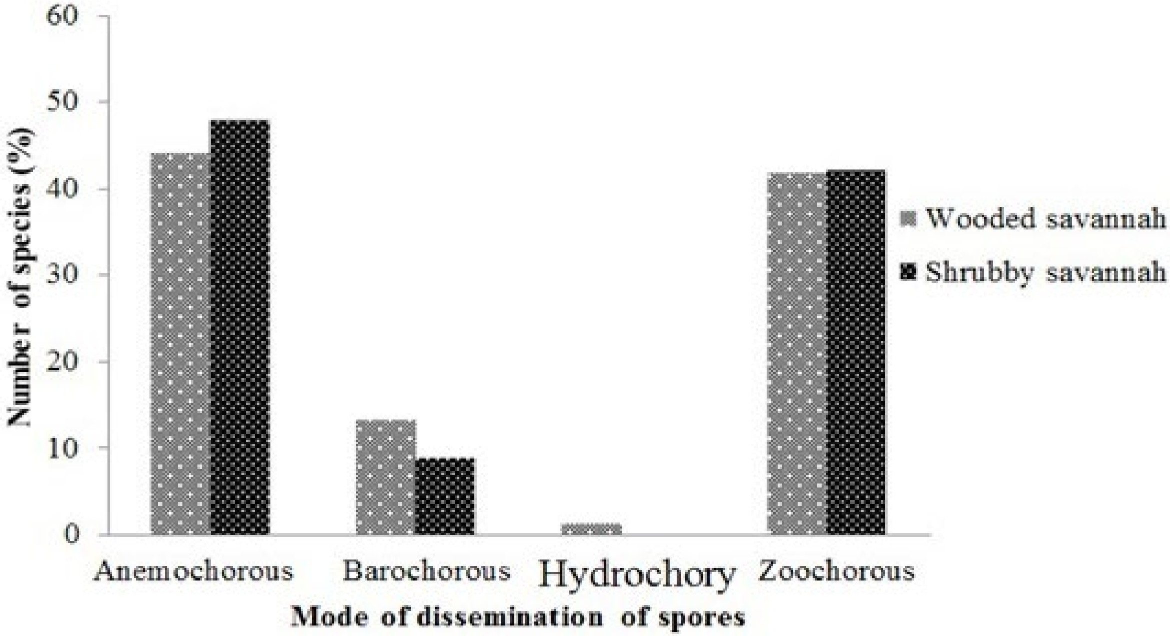


**Figure 8. Spread of species across savannahs**

## DICUSSION

**Taxonomic composition and diversity of the woody stand:** The present study on the woody stands of the dry savannahs of Cameroon reveals that 102 species distributed in 60 genera and 29 families were recorded. These results are higher than those obtained by Froumsia *et al.* (2019), who found 99 species in 62 genera and 32 families in the Sudano-Sahelian zone of Cameroon, and Todou *et al.* (2016), who found 75 species in 54 genera and 28 families in the Moutourwa forest massifs, and Mai Nipa *et al*. (2024), who obtained 63 species in 49 genera and 25 families in the protected plant formations of the Sudano-Sahelian zone of Cameroon. This difference may be due to the fact that our work was carried out in several localities and beyond one region, which could influence the structure of the ecosystem, unlike other work that was limited to one locality or one region of the dry savannahs of Cameroon.

The values of the Shannon diversity indices varied respectively from 3.61 to 3.65 bits for the tree savannah and the shrub savannah. These average values for these indices reflect moderate specific diversity and the fact that these stands are more or less stable. The Pielou index values are above 0.5 for both types of savannah. This means that in both savannas, species share individuals in ecological niches relatively equally.

**Dendrometric characterisation:** Tree density varies from site to site. The high densities reflect the fact that human activities are still less accentuated in these sites. On the other hand, in the sites with the lowest density values, the human activities are more intense through the production of firewood, charcoal and the flush felling of woody species when land is cleared for agricultural plots.

Basal area varies from site to site. The high basal area values observed can be explained by the fact that species with very large diameters are dense at these sites, whereas basal area is a function of diameter. These results are in agreement with those of Bakoulou *et al* (2020) who showed that as the density of species with large diameters or large circumferences increases, the basal area also increases. On the other hand, the low basal area values are thought to be due to anthropogenic activities linked to various uses of ligneous plants.

The woody stand structures of the dry savannahs established according to diameter and height classes show a predominance of the first three classes and present an "inverted J" shape, reflecting a decrease in the number of individuals when moving from the small diameter classes to the larger diameter classes. The majority of individuals measured and considered to be young are in fact stunted adults. This stunted state is the result of the combined effects of stresses and disturbances caused by human activities and climatic hazards (Souare *et al.,* 2020; Bakoulou *et al.,* 2020; Mai Nipa *et al*., 2024).

The ecological importance of the species differs according to the formations and areas studied. The high values for the ecological importance of species such as *Balanites aegyptiaca, Combretum glutinosum* and *Anogeissus leiocarpus* could be explained partly by the fact that these species are better adapted to the climatic conditions of this dry savannah zone, but also by their frequency due to their importance to the local population, who protect these species.

The best represented families in terms of importance value index are Combretaceae and Mimosaceae. These results are comparable to those found by several authors who have worked on woody vegetation in the Sudano-Sahelian zone (Jiagho *et al.,* 2016; Froumsia *et al.,* 2019; Souare *et al.,* 2020; Bakoulou *et al.,* 2020). This confirms that the Fabaceae and Combretaceae are characteristic of the Sudano-Sahelian zone of Cameroon. These families are common in most wooded savannah mosaics in Africa and more typical of the Sudano-Sahelian zone (Letouzey, 1985). Savadogo *et al* (2016) also showed that, in the Sahelian zone of Burkina-Faso, the Combretaceae family was the most represented. According to these authors, Combretaceae are strongly represented in tropical countries, particularly in the African savannah and more typically in the Sudano-Sahelian zone.

**Biological and Phytogeographical type:** The geographical position of the Sudano-Sahelian agroecological zone may explain the dominance of microphanerophytes. This zone is characterised by the massive presence of shrubs. In the same vein, Baiyabe *et al* (2018) and Sandjong *et al* (2018) have shown through their results that shrubs are more dominant in reforested sites and in the Mozogo-Gokoro National Park in the Far North of Cameroon. These results are in agreement with those of Melom *et al.* (2015) who obtained a dominance of Microphanerophytes (53.06% and 74.21%) followed by Nanophanerophytes (30.61% and 8.09%), MsPh (15.31% and 17.69%) and a very low representation of Megaphanerophytes respectively in the raw spectrum and the weighted spectrum of the Massenya plant formations in Chad. In contrast, Yangakola *et al* (2004) showed that the Ngotto forests in the Central African Republic are dominated by Megaphanerophytes (82%). This contradiction may be justified by the difference in the study environments, with forests consisting mainly of tall plants, unlike savannahs.

The dominance of Afro-tropical and multi-regional African species in the two savannahs can be explained by the fact that the flora of the area still retains its phytogeographical specificity despite anthropisation. This study area is favourable to the development of woody species characteristic of dry tropical zones. These results are similar to those of Tchobsala *et al* (2016), who obtained a dominance of African multi-regional species (67.07%) on the Ngaoundere cliff.

**Conclusion:** This study has provided a better understanding of the floristic composition and structural characteristics of dry savannah vegetation groups in North Cameroon. The dry savannas are made up of 102 species in 60 genera and 29 families. The dominant biological types are phanerophytes with a predominance of microphanerophytes, while the most represented phytogeographical types are Afrotropical and multi-regional species. Zoochory and anemochory are the dominant modes of dissemination. The diversity and equitability indices reveal low diversity within the savannas. The structure of the stands shows a predominance of low height and diameter classes in dry savannahs as a whole, reflecting the dominance of the shrubby character of the woody strata of dry savannahs. This study could be used as a reference data base for the sustainable management of savannah ecosystems through plant formation restoration projects.

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