International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

Vol. 36 No. 2 January 2023, pp. 700-712

Floristic Potential And Role In The Conservation Of Biodiversity Of Classified Plant Formations In The Northwest Of Côte d'Ivoire (West Africa)

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Abstract – Abstract – In the north of Côte d'Ivoire, classified forests play an important role in the conservation of biodiversity. The objective of this study is to better understand the floristic resources and biodiversity conservation value of the Palé and Pouniakélé classified forests, with a view to their effective and sustainable management. Surface survey and roving inventory methods were used to collect data in both biotopes. A total of 430 species (Palé forest: 281 species; Pouniakélé forest: 316 species) were inventoried in 280 genera, classified into 80 families. The floristic compositions show a predominance of phanerophytes, species of transition from Sudan to Zambezia. The majority of species have small fleshy diaspores which are spread by animals. The flora of these classified forests is also characterized by the presence of 69 species with special status, including one endangered species (*Pterocarpus erinaceus*). The specific quotients, globally low, testify to the richness of the forests in species. The forests are moderately diverse with Shannon diversity indices ranging from 2.34 ± 0.1 bits (Palé) to 2.37 ± 0.13 bits (Pouniakélé). The average Piélou equitability index is 0.70 ± 0.1 and reflects a moderately equitable distribution of individuals of each species in the two forests. Therefore, actions to protect these forests must be undertaken to conserve their biodiversity.

Keywords – Floristic composition, conservation value, special status species, classified forests, Côte d'Ivoire.

I. INTRODUCTION

Biodiversity conservation is one of the major challenges of the 21st century in the face of the recognised symptoms of the ecological crisis. The Convention on Biological Diversity, which emerged from the 1992 Rio Earth Summit and was ratified by almost all the world's states, is a reminder of this [1]. To protect this biodiversity, some of the natural forests have been removed from human control and set up as protected areas (national parks, natural reserves, classified forests). Unfortunately, man has not yet found a balance between his exploitation system and the environment, to the extent that he remains the main agent of the regressive evolution of ecosystems [2]. In the African continent, deforestation is very pronounced in West Africa, where nearly 30 million hectares have disappeared in the space of 30 years [3], [4].

In Côte d'Ivoire, human activities are modifying the vegetation structure [5] so that the country is experiencing a degradation of more than 83% of its forest areas [6]. The destruction of these natural ecosystems is accompanied by a loss of

biological diversity [7]. Faced with this situation, national parks, biological reserves and classified forests serve as refuges for both plant and animal biodiversity. It is therefore important to make an inventory of the flora and vegetation of these areas in order to take appropriate and sustainable protection measures. However, while certain areas such as those in the southern forest and the west of the country, particularly the Taï National Park, have long attracted the attention of researchers [8], the plant formations of the savannah north remain particularly poorly known and little explored [9], [10], [11]. Locally, the classified forests of the Bagoué region (North-West) have never been the subject of a study or floristic survey. In addition, agricultural infiltration and the fraudulent exploitation of certain wood species should be noted this was due to the weakening of the Ivorian state's authority in this area as a result of the military-political crisis.

This study aims to contribute significantly to a better knowledge of the flora of classified forests in the northwest of Côte d'Ivoire and their value for biodiversity conservation in the context of climate change. Specifically, the aim is (i) to determine the floristic richness and composition of these classified forests; (ii) to assess the resulting biodiversity conservation value. This study is based on the hypothesis that classified forests constitute important refuges for many species with special status.

II. Study Material And Method

2.1. Description of the study area

The Palé and Pouniakélé classified forests are geographically adjacent and are located in the northwest of Côte d'Ivoire (Figure 1). Located in the centre of the Bagoué region, the Palé forest, named after the Palé River which rises there, covers an area of 25,040 hectares and extends between 9° and 11° North latitude and 6° and 7° West longitude. This forested island belongs to the subsudanese sector included in the Congolese to Sudano-Zambezian domain according to the subdivisions of [12]. The classified forest of Pouniakélé, named after the village located on its southern periphery, is located in the northern part of the Bagoué region and covers an area of 9,233 hectares. This forest extends between 6° 45' and 4° 35' West longitude and belongs to the Sudanese sector included in the Sudano-Zambézienne domain. The climate is described as Sudanese or dry tropical savannah with a monomodal rainfall regime (April-October) with an isohyet of 1300 mm of rainfall per year [13]. The average annual temperature is 26.7°C. Both forests are influenced by the Bagoué River watershed. The vegetation of the area is essentially made up of gallery forests, open forests and savannahs (trees, shrubs and grass), according to [14].

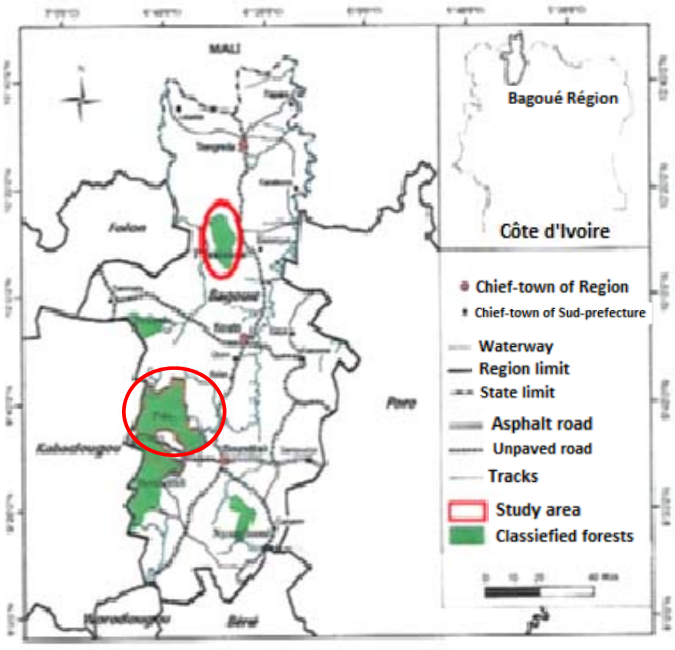

Figure 1: Geographical location of the study area

2.2. Materials

The study material consists of biological and technical material. The biological material contains the plant species of the two classified forests. The technical material usually used by the botanist (GPS, 50 m decameter tape, data collection sheets, pruning shears, newsprint, etc.).

2.3. Method of data collection

The sampling plan was designed to place surface surveys in all vegetation types encountered on the sites, namely gallery forests, open forests, trees and shrub savannas. Floristic data were collected through the surface and itinerant surveys in the different biotopes of the classified forests in order to assess qualitative and quantitative diversity. The surface method consisted of delimiting 10 plots of a fixed area of 1 ha (100 m x 100 m) in each of the forests. Each plot was subdivided into 100 plots of 100 m² (10 m x 10 m) and 10 plots were randomly selected for floristic data collection. In each plot, vascular plant species were counted, regardless of their abundance or size. The positioning of the inventory plots was based on points chosen randomly on the map of the classified forest and distributed homogeneously over the surface of the forest. Species not yet identified and outside the plots were taken into account by the itinerant method, which consists of surveying species by walking along the site along tracks and watercourses. Samples of species not identified in the field were collected and compared with those in the Herbarium of the Centre National de Floristique (CNF) of the Félix Houphouët-Boigny University, for identification. An ethnobotanical survey carried out among local populations, coupled with bibliographic research, enabled the identification of useful species of the flora of classified forests.

2.4. Method of data analysis

2.4.1. Qualitative diversity of the flora

Floristic richness and composition: The number of species, genera and families of all plant species encountered during the surveys in the study site were determined. The nomenclature adopted for the identification of these inventoried species is that of [15]. Subsequently, the morphological, biological and chorological types were identified according to the work of [16], [17], [18]. The terminology used is that of [19] adapted by [20].

Modes of dissemination of species diaspores: In order to assess the mode of regeneration and conservation of the forest vegetation, we classified the species according to the modes of dissemination of the diaspores (seeds, fruits or any other part of the plant used for the dissemination of the species). This classification follows that of [21], which distinguishes anemochory, zoochory, hydrochory and barochory (autochory).

Species with special ecological status: These are species endemic to Upper Guinea (UG), to West Africa (GCW) and Côte d'Ivoire (GCi), red-listed species [22] and species that have become rare and threatened with extinction according to [23]. In addition, commercially valuable species can be exploited in accordance with forestry legislation in Côte d'Ivoire. There are currently 84 such species in Côte d'Ivoire [24] and they are divided into 3 categories: P1 (commonly traded species), P2 (sporadically traded species) and P3 (species to be promoted).

2.4.2. Quantitative diversity of the flora

The quantitative diversity of species was assessed through several ecological parameters such as the species quotient, the frequency of occurrence and the Shannon and Piélou diversity indices.

- **Specific quotient** that allows comparison of two similar plant groups or areas [25]. It is expressed by the following formula:

$$SQ = \frac{S}{Ge} \qquad (1)$$

S is the number of species identified in a vegetation unit and Ge is the number of genera. When this quotient is 1 or very close to it, it indicates stable and therefore old vegetation [26].

- **Frequency of occurrence (F)** of species which represents the ratio expressed as a percentage of the number of surveys where the presence of this species is noted to the total number of surveys carried out [27]. It is defined by the following formula:

$$F = \frac{P_a}{P} \times 100 \qquad (2)$$

Where Pa is the total number of records containing the species under consideration and P is the total number of records.

In terms of constancy, [27] distinguishes three groups of species:

- frequent or constant species (common species) which are found in at least 50% of the records
- the infrequent or incidental species, which are present in 25 to 49% of the surveys
- rare species or accidental species with a frequency of occurrence of less than 25%.

- **Shannon's diversity index (H') and Piélou's equitability index (E)**, in order to assess the heterogeneity of spaces. These two indices were calculated from the following mathematical formulae (3) and (4):

$$H = -\sum(\frac{ni}{N} \times ln\frac{ni}{N}) \qquad (3)$$

H' is the Shannon index, ni is the number of individuals of a species i and N is the total number of individuals of all species.

E is the equitability index; H is the Shannon diversity index and S is the total number of species.

$$E = \frac{H}{lnS} \qquad (4)$$

2.5. Method of statistical analysis

The collected data were entered into Microsoft Office Excel 2016 spreadsheet software in order to perform descriptive statistics (sum, mean, percentage and list cross-tabulations) and illustrative graphs. For the calculation of diversity indices, MVSP 3.1 software was used.

III. Results

3.1. Floristic richness and composition

Analysis of the lists of species recorded during the itinerant inventory and surface surveys in the two classified forests revealed 430 species of vascular plants distributed among 280 genera, classified in 80 families (Table 1). These species belong to two major phyla, namely the Spermaphytes and the Pteridophytes. The most represented families (at least 10 species) of the flora (Figure 2) are the Fabaceae (69 species), the Poaceae (44 species), the Rubiaceae (26 species), the Euphorbiaceae (21 species), the Cyperaceae (21 species), the Asteraceae (18 species), the Anacardiaceae (10 species), the Combretaceae (10 species) and the Verbenaceae (10 species).

In the Palé classified forest, 281 species distributed among 210 genera in 71 families were inventoried, while in the Pouniakélé classified forest, the inventory yielded 316 species, distributed among 211 genera in 62 families (Table 1). The most representative families in the Palé forest are Fabaceae (59 species), Poaceae (17 species), Rubiaceae (14 species), Malvaceae (12 species), and Phyllanthaceae (11 species). In the Pouniakélé forest, these are Fabaceae (38 species), Poaceae (37 species), Rubiaceae (21 species), Asteraceae (17 species), Cyperaceae (16 species), and Malvaceae (15 species). Analysis of the floristic richness of the Angiosperms shows the preponderance of Dicotyledons in the two plant formations, with 223 species (79.36%) in the Palé forest and 230 species (72.78%) in the Pouniakélé forest. Pteridophytes are poorly represented, with two species in the Palé forest and one species in the Pouniakélé forest (Table 1).

Table 1: Distribution of species inventoried according to major taxonomic levels in the Palé and Pouniakélé classified forests

Taxonomic levels	Classified forest of Palé		Classified forest of Pouniakélé		Global Flora
	Number	%	Number	%	
Species	281	65,35	316	73,49	430
Genera	210	75	211	75,36	280
Famillies	71	88,75	62	77,5	80
Dicotyledones	223	79,36	230	72,78	309
Monocotyledones	58	20,64	86	27,22	119
Pteridophytes	2	0,71	1	50	2

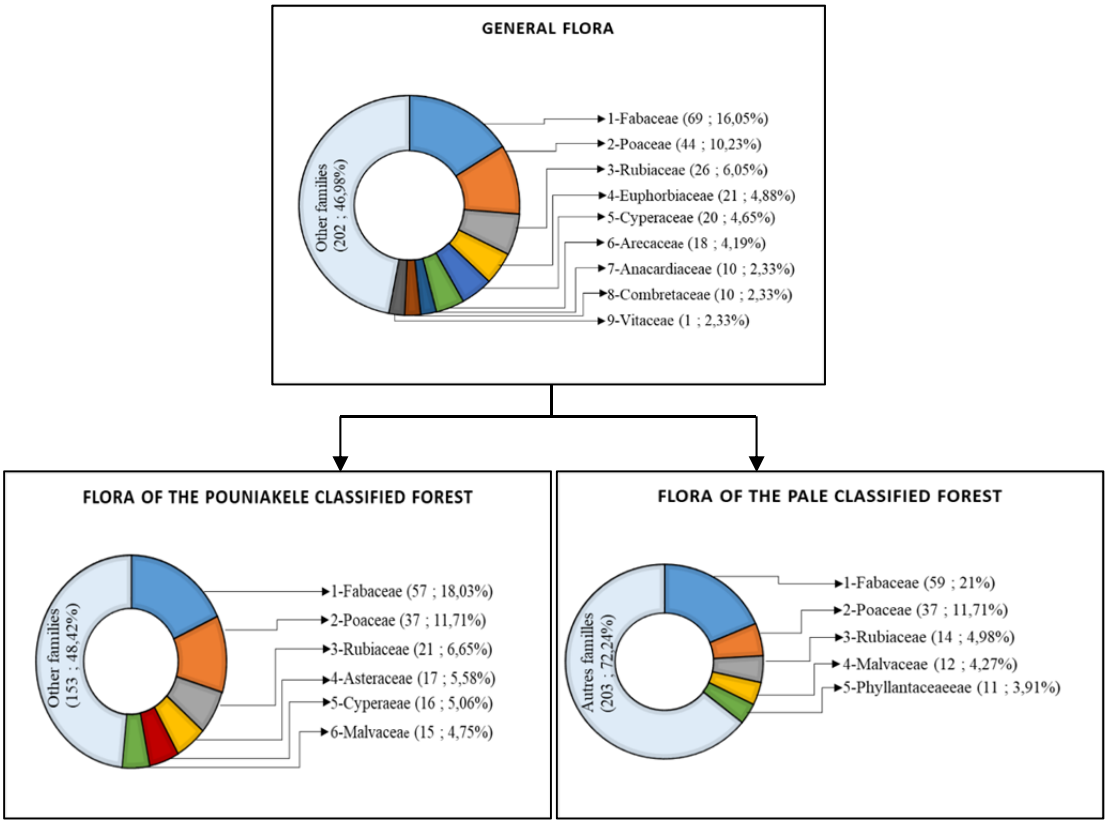

Figure 2: Spectrum of dominant families of the flora of the Palé and Pouniakélé classified forests

The flora of the Palé classified forest consists of 56.94% woody species and 42.70% herbaceous species. According to Fig. 3, the woody species are divided into 79 trees (28.11%), 46 lianas (16.37%) and 35 shrubs (12.45%). The large trees are *Aubrevillea platycarpa*, *Bombax brevicuspe*, *Adansonia digitata* and *Ceiba pentandra*. In the Pouniakélé forest, woody species are dominant at 51.27% against 48.42% for herbaceous species. The woody species consist of 88 trees (27.85%), 30 shrubs (9.49%) and 44 lianas (13.92%). The large trees in this forest are *Parinari excelsa*, *Pouteria altissima* and *Ceiba pentandra*.

The analysis of biological types (Figure 3) shows a predominance of phanerophytes, with 197 species (70.10%) in the Palé forest and 204 species (64.56%) in the Pouniakélé forest. Microphanerophytes are the most numerous (96 species in the Palé forest and 97 species in the Pouniakélé forest). In the Palé forest, phanerophytes are followed by hemicryptophytes (28 species, i.e. 9.96%), therophytes (23 species, i.e. 8.18%) and geophytes (21 species, i.e. 7.47%). On the other hand, in the Pouniakélé forest, therophytes (46 species, i.e. 14.56%) follow phanerophytes and are followed by hemicryptophytes with 29 species (i.e. 9.18%) and geophytes with 27 species (i.e. 8.54%)

Concerning the phytogeographical distribution, in the Palé classified forest, the chorological status could be attributed to 273 species out of 281 species inventoried. In the Pouniakélé classified forest, the chorological affinity of 308 species was determined out of 316 species surveyed. In the Palé forest, endemic species dominate the widely distributed species (Figure 4). The first group dominates at 56.94% (160 species) and the second group at 40.21% (113 species). For the Pouniakélé forest, the values are 155 species (49.05%) in the first group and 153 species (48.42%) in the second group. From the point of view of African endemism, the two forests are predominantly Sudano-Zambezian (SZ), with proportions of 22.79% for the Palé Forest and 20.92% for the Pouniakélé Forest. As regards the broad distribution group, the pantropical and Afrotropical elements are the most prevalent chorological types in the two classified forests.

In the Palé forest, the proportions are 9.23% and 10.70%, respectively for pantropical and Afrotropical species. In the Pouniakélé forest, the proportions are 17.59% and 11.40%.

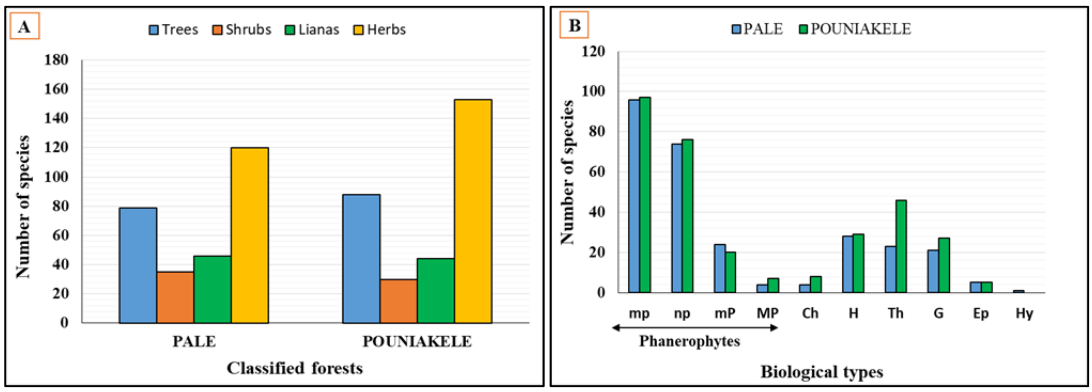

Figure 3: Spectrum of morphological (A) and biological (B) types of the flora of the Palé and Pouniakélé classified forests

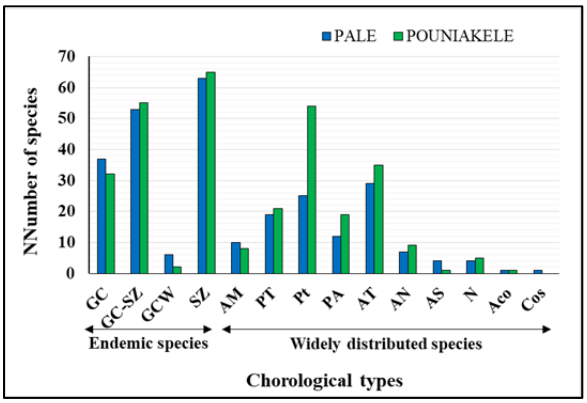

Figure 4: Spectrum of chorological types of the flora of the Palé and Pouniakélé classified forests

3.2. Adaptation to the spread of species diaspores

In the Palé and Pouniakélé classified forests, the majority of species have partially or totally fleshy fruits, which are sarcochores (Figure 5), with proportions of 37.01% (104 species) and 31.65% (100 species) respectively (100 species). Next come ballochores and sclerochores, whose proportions are 28.47% (80 species) and 16.01% (45 species) in the Palé forest, and 24.38% (77 species) and 21.52% (68 species) in the Pouniakélé forest. The modes of dispersal of diaspores are on the whole favoured by animals (zoochory: 41.64% in the Palé forest and 36.08% in the Pouniakélé forest). The autochthonous mode (Ballochores and Barochores) is more marked in the Palé forest (31.67%) than in the Pouniakélé forest (28.16%). On the other hand, the anemochore mode is remarkable in the Pouniakélé forest (35.76%), compared to 26.69% in the Palé forest.

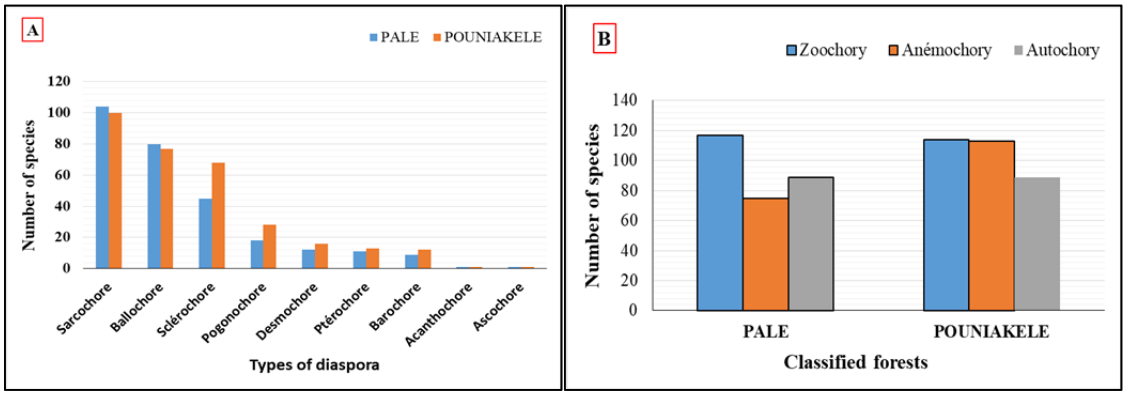

Figure 5: Morphology (A) and dissemination (B) spectra of diaspores of species from the Palé and Pouniakélé classified forests

3.3. Biodiversity conservation value of classified forests

3.3.1. Species with special ecological status

A total of 69 species were identified as having a special status in the two classified plant formations (Table 2). In the Pouniakélé classified forest, 59 of these species were identified against 47 species in the Palé classified forest. Regarding the level of endemism, four (4) species are endemic to the West African forest block (GCW) and one species is endemic to the forests of Upper Guinea (HG). Of these, 57 rare or endangered species were recorded according to the IUCN Red List, the majority of which are species of Least Concern (LC). Four species are classified as vulnerable on this list and one endangered species (*Pterocarpus erinaceus*) has also been identified.

3.3.2. Commercially valuable woody species

The floristic inventory from the two forests identified seven species of high commercial value used as raw material in the wood industry, i.e. 1.63% of the total number. Of these forest species (Table 2), four are the main species (P1), which are commonly traded, and three are species to be promoted (P3).

Table 2: List of special status species found in the Palé and Pouniakélé classified forests

N°	Collected species	IUCN	Endémism	Aké-Assi	Commercial species	Classified Forests
1	*Acroceras zizanioides*	LC				Po
2	*Afzelia africana*	VU			P1	Po-Pa
3	*Alchornea cordifolia*	LC				Pa
4	*Allophylus africanus*	LC				Po-Pa
5	*Anogeissus leiocarpus*	LC				Po-Pa
6	*Antidesma venosum*	LC				Po-Pa
7	*Aubrevillea platycarpa*			AA		Po-Pa
8	*Berlinia grandiflora*	LC				Po-Pa
9	*Bombax brevicuspe*				P1	Po-Pa
10	*Cassia sieberiana*	LC				Po-Pa
11	*Ceiba pentandra*	LC			P1	Po
12	*Cissus doeringii*	LC				Po
13	*Combretum adenogonium*	LC				Po-Pa
14	*Combretum molle*	LC				
15	*Combretum nigricans*	LC				Po-Pa
16	*Commelina erecta* subsp. erecta	LC				Po
17	*Crossopteryx febrifuga*	LC				Po
18	*Cussonia arborea*	LC				Po
19	*Daniellia oliveri*	LC				Po-Pa
20	*Detarium microcarpum*	LC		AA		Po-Pa
21	*Detarium senegalense*	VU			P3	Po-Pa
22	*Diospyros mespiliformis*		GCW			Po-Pa
23	*Echinochloa pyramidalis*	LC				Po
24	*Ensete livingstonianum*			AA		Pa
25	*Entada africana*	LC				Pa
26	*Ficus ottoniifolia*		GCW			Pa
27	*Fimbristylis dichotoma* var. dichotoma	LC				Po
28	*Fimbristylis ferruginea*	LC				Po
29	*Fimbristylis littoralis*	LC				Po
30	*Flacourtia indica*	LC				Po-Pa

31	*Flueggea virosa*	LC				Po-Pa
32	*Gardenia ternifolia*	LC				Po-Pa
33	*Gloriosa superba*	LC				Po
34	*Gmelina arborea*	LC				Pa
35	*Holarrhena floribunda*	LC				Po
36	*Holoptelea grandis*				P3	Po
37	*Hymenocardia acida*	LC				Po-Pa
38	*Indigofera conjugata*	LC				Po
39	*Isoberlinia doka*	LC				Po-Pa
40	*Keetia venosa*	LC				Po
41	*Khaya senegalensis*	VU				Po-Pa
42	*Lannea acida*	LC				Po
43	*Lannea barteri*	LC				Po-Pa
44	*Lannea nigritana*			AA		Po
45	*Lannea velutina*	LC				Po
46	*Margaritaria discoidea*	LC				Po-Pa
47	*Ochna schweinfurtiana*	LC				Po
48	*Panicum repens*	LC				Po-Pa
49	*Parinari excelsa*				P3	Po
50	*Parkia biglobosa*	LC				Po-Pa
51	*Paspalum scobiculatum* var. scrobiculatum	LC				Po-Pa
52	*Pericopsis laxiflora*	LC				Po-Pa
53	*Pouteria altissima*	LR/cd			P1	Po
54	*Pseudarthria hookeri*	LC				Po-Pa
55	*Psorospermum febrifugum*	LC				Pa
56	*Pterocarpus erinaceus*	EN				Po-Pa
57	*Raphia sudanica*	DD				Po-Pa
58	*Scadoxus multiflorus*		GCW			Pa
59	*Sherbournia calycina*		GCW			Pa
60	*Strychnos innocua*	LC				Po-Pa
61	*Syzygium guineense* var. macrocarpum			AA		Pa
62	*Tacca leontopetaloides*	LC				Po-Pa
63	*Terminalia laxiflora*	LC				Po-Pa
64	*Terminalia macroptera*	LC				Po-Pa
65	*Tricalysia faranahensis*		HG			Po-Pa
66	*Trichilia emetica*	LC				Po-Pa
67	*Vitellaria paradoxa*	VU				Po-Pa
68	*Vitex madiensis*	LC				Po-Pa
69	*Ximenia americana*	LC				Po-Pa
	Total	**57**	**5**	**5**	**7**	

HG : endemic species of Upper Guinea; GWC : West African endemic species; VU : species recognised as vulnerable ; EN : endangered species; LR : species at minor risk; LC : species of minor concern; AA : rare and threatened plants in Côte d'Ivoire according to Aké-Assi (1998); P1 : main species commonly marketed; P3 : species to be promoted; Pa : Palé classified forest; Po : Pouniakélé classified forest.

3.3.3. Species of ethnobotanical value

The survey conducted among the populations, coupled with bibliographic research, made it possible to identify 168 species (39.07%) with ethnobotanical values. In the Palé classified forest, 118 species (41.99%) provide utilitarian products, while in the Pouniakélé classified forest, the number of species is estimated at 137, or 43.35% (Table 3). These species are used for medicine (130 species, or 77.38%), food (39 species, or 22.62%), fodder (39 species, or 23.21%), handicrafts (39 species, or 23.21%) and other uses (33 species, or 19.64%).

Table 3: Domain specificity of ethnobotanical taxa in classified forests

	Types of biotopes		
	Palé classified forest	**Pouniakélé classified forest**	**General flora**
Total number of species	118	137	168
Rate (p.c.)	41,99	43,35	39,07
Pharmacopoeia	91	100	130
Rate (p.c.)	21,16	23,26	30,23
Feeding	32	25	39
Rate (p.c.)	7,44	5,81	9,07
Handicrafts	29	30	39
Rate (p.c.)	6,74	6,98	9,07
Other fields	28	22	33
Rate (p.c.)	6,51	5,12	7,67

3.4. Frequency of occurrence of species

Overall, most species are accidental in both classified forests (Figure 6). The proportions are 89.93% for the Pouniakélé classified forest against 83.10% for the Palé classified forest. Next come the accessory species, which are more abundant in the Palé classified forest (13.24%) than in the Pouniakélé classified forest (8.05%). Common or constant species have fairly low frequencies with rates of 3.65% and 2.01% respectively for the Palé and Pouniakélé.

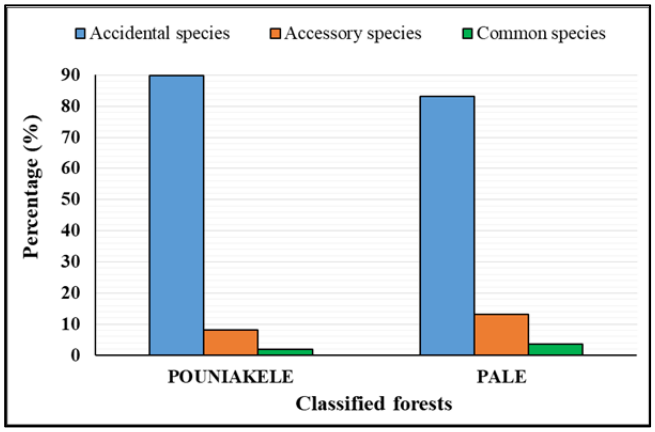

Figure 6: Frequency of occurrence of species in the Palé and Pouniakélé classified forests

3.5. Qualitative diversity of plant formations

The mean values of the specific quotient calculated are 1.13 ± 0.04 for the Palé forest and 1.15 ± 0.06 for the Pouniakélé forest (Table 4). For the Shannon index, the mean values are 2.34 ± 0.1 bits for the Palé forest and 2.37 ± 0.13 bits for the Pouniakélé forest. As for the equitability index, the average values are 0.70 ± 0.11 for the two plant formations.

Table 4: Average values of the diversity indices of the flora of the Palé and Pouniakélé classified forests

Diversity indices	Classified forest of Palé	classified forest of Pouniakélé
Specific quotient	1,13 ± 0,04	1,15 ± 0,06
Shannon Diversity Index	2,34 ± 0,1	2,37 ± 0,13
Piélou equitability index	0,70 ± 0,11	0,70 ± 0,11

IV. DISCUSSION

On the whole, the floristic procession of 430 species is quite rich and represents 11.16% of the total Ivorian flora as recorded by [16], [17]. There are 281 species in the Palé classified forest and 316 species in the Pouniakélé classified forest. Our results make it possible to establish a first draft of a floristic catalogue, valid not only for these two forests but also for the entire Sudanian zone of northwestern Côte d'Ivoire. The most represented botanical families common to both forests are Fabaceae, Poaceae and Rubiaceae, as is the case for many semi-deciduous and open Sudanian forests of Côte d'Ivoire and West Africa [8], [28], [11]. This collection of families highlights the importance of the savannah flora in these two classified forests.

The dominance of phanerophytes, with a representation of microphanerophytes, confirms the most widespread physiognomic type of vegetation in the Sudanian zone in northern Côte d'Ivoire and the forest or woodland character of the two classified forests [28]. The representativeness of hemicryptophytes in the Palé forest could be explained by the relatively high organic matter content of the soil and humidity in this forest [29]. On the other hand, the representativeness of therophytes in the Pouniakélé forest could be due to grazing, which enriches the soil in nitrates and allows the development of ruderal plants, especially annuals [30] and also to the openness of the vegetation in this forest [31]. These results are similar to those obtained by [11], in the classified forest of Badénou in Côte d'Ivoire.

The high proportion of species with an African regional distribution compared to species with a wide distribution reflects a low degree of alteration of the local flora ([32]. Also, the preponderance of Sudano-Zambezian species in the two plant formations reflects the fidelity of the species to their region of confinement (Sudanese domain) and allows us to judge the specificity of the local flora [33]. The non-negligible presence of species with a wide pantropical distribution and those from tropical Africa would be due to the fact that most of these species have a very wide geographical distribution due to a very wide ecological amplitude [34] cited by [35].

In all classified forests, there is a majority of fleshy diaspores (sarcochores). This type of diaspore, coupled with acanthochores and desmochores, makes zoochory the main mode of species dissemination in both forests. This spread is thought to involve birds and some frugivorous mammals, including antelopes, monkeys, rats and squirrels [8]. The importance of anemochory observed in the Pouniakélé forest is due to the abundance of Poaceae, characteristic of Sudanian savannahs, and also to the numerous anemochorous lianas pioneering secondary formations [36].

The flora of the plant formations in the Bagoué region, as inventoried, includes 69 species with special status and seven woody species with commercial value. This shows that these forests constitute refugees for these species threatened by human activities and the need for their protection. In addition, classified forests also constitute a source and reservoir of useful plants for local populations, given the number of species of the ethnobotanical value recorded. This makes the conservation of these forests above the 8th parallel particularly important. Unfortunately, these classified forests are still subject to enormous anthropic pressures, notably agricultural fields and fraudulent timber exploitation. Similar results were obtained by [37] in the Foumbou classified forest in northern Côte d'Ivoire.

The distribution of species according to the frequency in the two forests highlighted two essential facts: the conservation role and the refuge role of the ecosystems. The classified forests, therefore, play a conservation role for common species and a refuge role for rare or accidental species. The preponderance of accidental species suggests that they are species that are difficult to observe because of their restricted distribution and/or their low abundance or because they are confined to particular and fairly small habitats. These species would have very limited ecological plasticity, or they would be new species in the process of establishing themselves following disturbances of various origins [38]. Indeed, disturbances affecting savannahs lead to the reduction of certain species, but also to the opening up of the environment to many other species belonging to different floristic communities [39], [40].

The specific quotients obtained in the two forests are low (Palé forest: 1.13; Pouniakélé forest: 1.15). These low values of the specific quotient show that the two plant formations studied are indeed rich in species and at the same time very diversified from a generic point of view and testify to the maturity of the flora of the two forests. These are old and stable flora [41]. Regarding the α-diversity, the Shannon index values are less strong overall (< 4 bits) and the equitability is close to 1. This could be explained by the fact that some of the species recorded have high overlaps and other species have the same importance [42]. These results corroborate those of [43] who, in their studies, found that greater diversity did not directly imply greater equality of individual contributions and vice versa.

V. CONCLUSION

In the Bagoué region (north-west of Côte d'Ivoire), the Palé and Pouniakélé classified forests remain exceptional ecosystems with exceptional biodiversity. The inventory identified 430 species, divided into 281 species in the Palé Forest and 316 species in the Pouniakélé Forest. The most numerous families are the Fabaceae, Poaceae and Rubiaceae. The analysis of the biological spectra does not provide anything really original and confirms the dominance of phanerophytes in the Ivorian plant formations. The floras of the two forests, which are remarkable for the preponderance of Sudano-Zambezian species, reflect the local floristic history, including plant endemism, despite agricultural infiltration and illegal logging. The spectra of the modes of dissemination of diaspores confirm the classic observation for tropical forests, the dominance of zoochory, which makes it possible to specify the specific role of animals in the dissemination and indirectly in the regeneration of these forests. The richness of the flora of these protected areas is also characterised by the presence of 69 species of special status, which gives a particular interest in the conservation of these classified forests located above the 8th parallel. This study constitutes the first exploratory botanical sketch. Further studies on the plant groups present and the ecological compensation of these forests constitute research perspectives.

ACKNOWLEDGEMENTS

Our thanks go to the Director General of the Forestry Development Society (SODEFOR) in Côte d'Ivoire who authorised access to the classified forests of Palé and Pouniakélé and to the agents of the Cantonment of Water and Forests in the Department of Kouto who participated in this research.

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