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Floristic Inventory of the Ngoltongo Botanical Garden at Sindia, Mbour Department, Senegal

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: The intertropical plant world has undergone and continues to undergo major destruction and/or transformation, both in terms of 'ecosystems' and their components. The demographic explosion on a global scale has accentuated these new spatial modifications, by encouraging the emergence of threats: fires, slash-and-burn agriculture, savannah fires; animal introductions, plant species introductions, anthropic actions, etc. Ex situ conservation is sometimes the only chance of survival for threatened species.
Aim: The aim of the work carried out was to make a floristic inventory of the Ngoltongo botanical garden in Sindia,
Results: The inventory of the ngoltongo botanical garden shows a relatively diverse flora with 220 species in 161 genera and 58 families. In order of importance, the Fabacaeae, Arecaeae, Apocynaceae, Euphorbiaceae and Poaceae are the best represented. The other families, which are

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less well represented (0.41% each), nevertheless contribute to the diversity of the flora, particularly the monospecific families (Asparagaceae, Cyperaceae, Musaceae, etc.).
We have noted that some families are relatively abundant in terms of the number of species: in the Dicotyledonous class, these are the Fabacaeae Apocynaceae, Euphorbiaceae, Malvaceae and Rutaceae groups, with a total of 71 species. In the class of Monocotyledons, the Arecaeae are in the lead with 18 species, followed by the Poaceae with 9 species. In addition, certain genera are relatively well represented, including Asparagaceae (8 species), *Euphorbia* (7 species), and Ficus (5 species).
Conclusion: The Ngoltongo Botanical Garden appears to be a site of high biodiversity due to the diversity of species planted in a relatively large area. If it is to succeed in its conservation, education and scientific research missions, it is therefore important to consider : its protection against bush fires and the anthropics actions, labelling the feet of all plants and the construction of a seed bank to enable exchanges with other botanical gardens.

Keywords: Botanical garden; floristic inventory; ngoltongo; sindia.

1. INTRODUCTION

Biodiversity is the totality of genes, species and ecosystem in a region. It is essential for human survival and economic well being and for the ecosystem function and stability (Singh, 2002). The total number of species available on the earth is not determined yet however, it is estimated that the total number of animal and plant species could be between 13 and 14 millions (Heywood, 1995). Conservation biologists warn that 25 percent of all species could become extinct during the next twenty to thirty years (Khera et al., 2001). Indeed, the intertropical plant world has undergone and continues to undergo major destruction and/or transformation, both in terms of 'ecosystems' and their components. The demographic explosion on a global scale has accentuated these new spatial modifications, by encouraging the emergence of threats: fires, slash-and-burn agriculture, savannah fires; animal introductions, plant species introductions, anthropic actions (Balaji Naik et al., 2020). However, long-term changes in patterns and processes in forest systems may lead to losses in their biological diversity and may render them more susceptible to invasion (Hobbs & Huenneke, 1992). Humans have extensively altered the global environment, changing global biogeochemical cycles, transforming land, and enhancing the mobility of biota. Even in national parks and wilderness areas left untouched or actively managed, populations of plant species can be threatened, particularly by the spread of invasive alien species, pests and diseases and climate change. Ex situ conservation is sometimes the only chance of survival for endangered species. In this context, botanic gardens have a major role to play in conserving and managing a wide variety of plants, not only ex situ, but also in situ in larger natural areas. A botanical garden is an area set aside and maintained by an organization for growing and studyingvarious groups of plants for aesthetic, conservation, economic, educational, recreational and scientificpurposes (Drouin, 2000).

Various programs namely, UNEP (United Nations Environmental Programme), IUBS (International Union of Biological Sciences, UNESCO (United Nations Educational Scientific and Cultural Organization), CITES (Convention on International Trade in Endangered Species) Global Biodiversity Strategy were set off for understanding and evaluating biodiversity. Global conservation of biodiversity will require efforts at multiple levels to be successful (Miller et al., 1999). More than 160 countries have ratified the Convention on Biological Diversity (CBD), and are expected to initiate inventory of various components of biodiversity and institute measures for in situ conservation and monitoring (Rawat, 2009). Floristic inventory is a necessary prerequisite for much fundamental research in tropical community ecology, such as modeling patterns of species diversity or understanding species distributions (Phillips et al., 2003). Many floristic diversity studies have been conducted in different parts of world. Majority of studies focus on inventory (Balaji Naik et al., 2020; Padalia et al., 2004; Appolinario et al., 2005; Ndiaye, 2012; Lazli et al., 2019; Samb et al., 2020).

In Senegal, more precisely in Sindia, in order to protect biodiversity, the ngoltongo botanical garden was created by Haddad C over an area of 50 ha, 25 ha of which is planted.

However, the insufficiency or even absence of scientific data on the flora of this garden is a major constraint that limits the implementation of

development and management plans that are essential for the rational use of the NGOLTONGO's resources.
The general aim of this study is to contribute to a better understanding of the natural plant resources of the NGOLTONGO botanical garden through a floristic inventory.

2. MATERIALS AND METHODOLOGY

2.1 Study Area

The Ngoltongo botanical garden covers 25 ha, is located in the rural community (CR) of Sindia, in the department of Mbour in the Thies region (Fig. 1). It is bordered to the north by the rural community of Diass, to the south by the rural community of Malicounda, to the east by the district of Notto (CR Tassette), Sesséne (Sandiara) and Fissel (Ndiaganiao) and to the west by the Atlantic Ocean. The Sindia CR covered an area of 158 km^2. Today it has 19 official villages with a population of 28,728 (Local Development Plan, 2009-2010). Sindia CR has two types of soil: tropical ferruginous soils (dior, deck, deck dior soils) and hydromorphic soils. Sindia CR has two types of soil: tropical ferruginous soils (dior, deck, deck dior soils) and hydromorphic soils. The garden is located on a laterite plateau on the slope leading down to the marble-rich soil.The current state of the soils is deteriorated by the destruction of plant cover, deforestation and over-exploitation. There is also a demographic push into the cultivated areas, which in turn advance into the wooded and grazing areas. Commercial activity is mainly in the hands of women, especially in the small-scale trade of fruit, vegetable. Fig. 1 shows the localisation of study area.

2.2 Methods

This study was carried out in the Ngoltongo Botanical Garden from November 2022 to May 2023. We proceeded to sample the vegetation by making transects in which we delimited stations within which we carried out floristic surveys. Given the large size of the study region, we opted to choose the most accessible areas, with different plant formations and landscapes. A total of 220 samples were collected. As the common species were recognised in the field, those that we were unable to identify were carefully sampled, others photographed where possible and taken back to the laboratory for identification. This task was facilitated by the uses of Berhaut flora (1967 ; 1971-1991), HUTCHINSON J. & DAZEIL J.M Flora of west tropical Africa (1954, 1963, 1968), Senegal new flora and neighbouring regions and guides to medicinal plants (The wild fruits of Senegal by Charles HADDAD, 2000). The nomenclatures used are those of LEBRUN & STORK 1991,1992, 1995,1997, and the classification systems used are those of APG III of 2009 and APG IV of 2016 and IPNI of 2024 (On line).

Fig. 1. The localisation of study area [On line https://www.villa-saly-senegal.com/visites/geolocalisation]

3. RESULTS AND DISCUSSION

3.1 Floristic Inventory

The aim of botanical inventories is to describe the floristic composition of each plant formation in order to locate plant formations with a high diversity of species (primary forest) or containing rare species and to draw up an environmental protection plan.

In the Sahelian zone (Ferlo) of the JBN, we collected 220 species in 161 genera and 58 families.

The systematic spectrum of the different taxa sampled in the study region shows the predominance of Fabaceae (34 species, i.e. 58.62%), Arecaceae (18 species, i.e 31.03%) , Apocynaceae, Euphorbiaceae, Poaceae (9 species, i.e 15.52%), Asteraceae, Asparagaceae (8 species, i.e 13.79%), Malvaceae, Combretaceae, Capparaceae (7 species i.e 12,06%) and ,Moraceae (6 species, i.e 10.34%) (Table 1).The other families are represented with a number of species ranging from 1 to 5 (Fig. 2). The total number of species in the garden is 220 species, with 167 genera and 58 families. Analysis of this flora also shows that the Fabaceae family is the most represented in the environment. In anther study of the spontaneous flora of O.V. Fomin Botanical Garden of Taras Shevchenko National University, Kyiv, Shynder et al., 2022 (Shynder et al., 2022) have determined that poaceae largely dominate the garden. This strong presence of Fabaceae could be explained by their ability to fix atmospheric nitrogen and their high seed production, which can remain viable for a very long time in the soil.

In the same region, Ndiaye (2012) recorded more than 324 species in 243 genera and 81 families, and noted a simple regression, probably due to human activities and land predation (Ndiaye, 2012). However, our results are superior to those of the flora of the Michel Adanson botanical conservatory in Mbour, which comprises 184 species in 146 genera and 54 families.

In the garden, certain species are poorly represented or even very seldom; this is the case of the commelinaceae, cyperaceae and musaceae (Fig. 2). Great care must therefore be taken with these monospecific families, because if the corresponding species disappears, the family disappears from the flora. This distribution of families is greater than that of the JEPU flora (Diatta, 2010), where legumes dominate with 14.87%, followed by Euphorbiaceae (8.43%) in 8 genera.

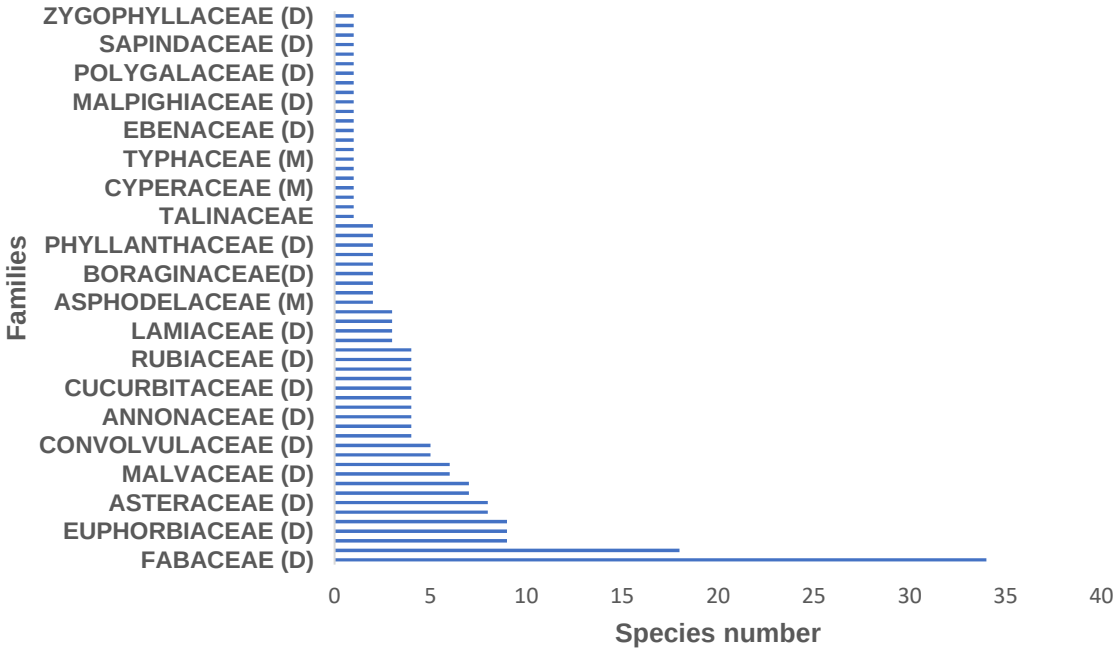

Fig. 2. Systematic spectrum of the various taxa sampled

Table 1. The list of species inventoried in the JBN.

Nº	Species Name	Family	Class	Biological Type
1.	*Abrus precatorius subsp. Africanus Verdc.*	FABACEAE	D	liana
2.	*Abutilon theophrasti* Medik	MALVACEAE	D	Herb
3.	*Abutilon pannosum (Forst) Schl.*	MALVACEAE	D	under shrub
4.	*Acacia holosericea var. typica*	FABACEAE	D	Tree
5.	*Acanthospermum hispidum DC.*	ASTERACEAE	D	Herb
6.	*Phoenix sylvestris (L.) Roxb.*	ARECACEAE	D	Herb
7.	*Adansonia digitata L.*	MALVACEAE	D	Tree
8.	*Adenium obesum subsp. socotranum (Vierh.) Lavranos*	APOCYNACEAE	D	under shrub
9.	*Agave americana subsp. americana*	ASPARAGACEAE	M	Herb
10.	*Agave cordillerensis Lodé & Pino*	ASPARAGACEAE	M	Herb
11.	*Agave polianthes Thiede et Eggli*	ASPARAGACEAE	M	Herb
12.	*Agave segurae D.Guillot & P.Van der Meer*	ASPARAGACEAE	M	Herb
13.	*Albizia chevalieri (Kosterm.) Y.H.Huang*	FABACEAE	D	Tree
14.	*Albizia julibrissin var. julibrissin*	FABACEAE	D	Tree
15.	*Albizia lebbeck var. rostrata Haines*	FABACEAE	D	Tree
16.	*Samanea saman (Jacq.) Merr.*	FABACEAE	D	Tree
17.	*Aloe vera (L.) Burm.f.*	ASPHODELACEAE	M	Herb
18.	*Aloe sp.*	ASPHODELACEAE	M	Herb
19.	*Alternanthera pungens Kunth*	AMARANTHACEAE	D	Herb
20.	*Amaranthus spinosus L.*	AMARANTHACEAE	D	Herb
21.	*Amaranthus viridis L.*	AMARANTHACEAE	D	Herb
22.	*Ampelocissus multistriata (Baker) Planch.*	VITACEAE	D	Herb
23.	*Annona muricata L.*	ANNONACEAE	D	Tree
24.	*Annona senegalensis Pers.*	ANNONACEAE	D	Tree
25.	*Annona squamosa L.*	ANNONACEAE	D	shrub
26.	*Archontophoenix alexandrae (F.Muell.) H.Wendl et Drude*	ARECACEAE	M	Tree
27.	*Sideroxylon spinosum L.*	SAPOTACEAE	D	Tree
28.	*Cleome viscosa L.*	CLEOMACEAE	D	Herb
29.	*Aster alpinus L.*	ASTERACEAE	D	Herb
30.	*Avicennia marina (Forssk.) Vierh.*	ACANTHACEAE	D	Tree
31.	*Azadirachta indica A.Juss.*	MELIACEAE	D	Tree
32.	*Balanites aegyptiaca (L.) Delile*	ZYGOPHYLLACEAE	D	Tree

Nº	Species Name	Family	Class	Biological Type
33.	*Bauhinia rufescens Lam.*	FABACEAE	D	Tree
34.	*Bixa orellana L.*	BIXACEAE	D	shrub
35.	*Boerhavia diffusa L.*	NYCTAGINACEAE	D	Herb
36.	*Boerhavia repens L.*	NYCTAGINACEAE	D	Herb
37.	*Boscia integrifolia J.St.-Hil.*	CAPPARACEAE	D	shrub
38.	*Boscia salicifolia Oliv*	CAPPARACEAE	D	shrub
39.	*Boscia senegalensis (Pers.) Lam.ex Poir.*	CAPPARACEAE	D	shrub
40.	*Boswellia neglecta S.Moore*	BURSERACEAE	D	shrub
41.	*Bougainvillea glabra Chois.*	NYCTAGINACEAE	D	shrub
42.	*Bougainvillea spectabilis Willd.*	NYCTAGINACEAE	D	shrub
43.	*Cadaba farinosa Forsk.*	CAPPARACEAE	D	shrub
44.	*Guilandina bonduc L.*	FABACEAE	D	Liana
45.	*Tara spinosa (Molina) Britton et Rose*	FABACEAE	D	Tree
46.	*Calotropis procera (Aiton) W.T.Aiton*	APOCYNACEAE	D	shrub
47.	*Calystegia sepium (L.) R. Br.*	CONVOLVULACEAE	D	Herb
48.	*Capparis tomentosa Lam.*	CAPPARACEAE	D	Liana
49.	*Cardiospermum halicacabum L.*	SAPINDACEAE	D	Herb
50.	*Carpenteira acuminata (Becc.)*	ARECACEAE	M	Tree
51.	*Cascabela thevetia (L.) Lippold*	APOCYNACEAE	D	shrub
52.	*Cassia sieberiana DC.*	FABACEAE	D	Tree
53.	*Celtis toka (Forssk.) Hepper & J.R.I.Wood*	CANNABACEAE	D	Tree
54.	*Cereus repandus (L.)Mill*	CACTACEAE	D	Under shrub
55.	*Chrozophora senegalensis (Lam) A.Juss. ex Spreng*	EUPHORBIACEAE	D	Herb
56.	*Citrus aurantiifolia (Christm.) Swingle*	RUTACEAE	D	Tree
57.	*Citrus latifolia (Tanaka ex Yu.Tanaka) Tanaka*	RUTACEAE	D	Tree
58.	*Citrus reticulata Blanco*	RUTACEAE	D	Tree
59.	*Citrus volkmeriana V.Ten et Pasq*	RUTACEAE	D	Tree
60.	*Clotalaria incana L.*	FABACEAE	D	Herb
61.	*Combretum aculeatum Vent.*	COMBRETACEAE	D	shrub
62.	*Combretum glutinosum Perr.ex DC.*	COMBRETACEAE	D	Tree
63.	*Combretum micrantum G. Don.*	COMBRETACEAE	D	Shrub
64.	*Combretum paniculatum Vent.*	COMBRETACEAE	D	Shrub
65.	*Commelina benghalensis L.*	COMMELINACEAE	M	Herb
66.	*Commiphora africana 0(A.Rich.) Engl.*	BURSERACEAE	D	Tree

Nº	Species Name	Family	Class	Biological Type
67.	*Commiphora mildbraedii Eng.*	BURSERACEAE	D	Tree
68.	*Commiphora multijuga (Hiern) K.Schum*	BURSERACEAE	D	Tree
69.	*Conocarpus erectus L.*	COMBRETACEAE	D	Shrub
70.	*Copernicia gigas (Ekman et Burret)*	ARECACEAE	M	Tree
71.	*Corchorus olitorius L.*	MALVACEAE	D	Herb
72.	*Corchorus tridens L.*	MALVACEAE	D	Herb
73.	*Cordia senegalensis Juss.*	BORAGINACEAE	D	Tree
74.	*Cordia sinensis Lam.*	BORAGINACEAE	D	Shrub
75.	*Cordyline fruticosa (L.) A.Chev.*	ASPARAGACEAE	M	Shrub
76.	*Crataeva religiosa G.Forst.*	CAPPARACEAE	D	Tree
77.	*Cucumis melo var. agretis Naudin*	CUCURBITACEAE	D	Herb
78.	*Cymbopogan caesius Chiov.*	POACEAE	M	Herb
79.	*Cyperus rotundus L.*	CYPERACEAE	M	Herb
80.	*Dalbergia melanoxylon Guill.et Pett.*	FABACEAE	D	Tree
81.	*Datura stramonium L.*	SOLANACEAE	D	Herb
82.	*Dichrostachys cinerea (L.) Wight & Arn*	FABACEAE	D	Shrub
83.	*Dictyosperma album (Bory) Scheff.*	ARECACEAE	M	Tree
84.	*Digitaria sanguinalis (L.) Scop*	POACEAE	M	Herb
85.	*Diospyros mespiliformis Hochst.ex A. Rich.*	EBENACEAE	D	Tree
86.	*Chrysalidocarpus decaryi (Jum.) Eiserhardt & W.J.Baker*	ARECACEAE	M	Tree
87.	*Chrysalidocarpus madagascariensis (D.T.Fish) Becc.*	ARECACEAE	M	Tree
88.	*Pontederia crassipes Mart.*	PONTEDERIACEAE	M	Herb
89.	*Eleusine indica Gaertn.*	POACEAE	M	Herb
90.	*Emilia sonchifolia (L.) DC*	ASTERACEAE	D	Herb
91.	*Eragrostis pilosa (L.) P.Beauv.*	POACEAE	M	Herb
92.	*Eragrostis tenella (Linn.) Roem.et Schult.*	POACEAE	M	Herb
93.	*Eriochloa vilosa (Thunb.) Kunth*	POACEAE	M	Herb
94.	*Erythrina peruviana Krukoff.*	FABACEAE	D	Shrub
95.	*Erythrophleum fordii Oliv.*	FABACEAE	D	Tree
96.	*Eucalyptus camaldulensis Dehnh*	MYRTACEAE	D	Tree
97.	*Euonymus japonicus Thunb.*	CELASTRACEAE	D	Shrub
98.	*Euphorbia hypericifolia L.*	EUPHORBIACEAE	D	Herb
99.	*Euphorbia heterophylla L.*	EUPHORBIACEAE	D	Herb
100.	*Euphorbia hirta L.*	EUPHORBIACEAE	D	Herb

Nº	Species Name	Family	Class	Biological Type
101.	*Euphorbia lactea Haw.*	EUPHORBIACEAE	D	Shrub
102.	*Euphorbia milii Des Moul.*	EUPHORBIACEAE	D	Shrub
103.	*Euphorbia milii var. splendeur (Bojer ex Hook.) Ursch & Leandri*	EUPHORBIACEAE	D	Shrub
104.	*Euphorbia sudanica A.Chev.*	EUPHORBIACEAE	D	Shrub
105.	*Evolvolus alsinoides (L.) L.*	CONVOLVULACEAE	D	Herb
106.	*Faidherbia albida Del. A. Chev.*	FABACEAE	D	Tree
107.	*Feretia apodanthera Del.*	RUBIACEAE	D	Shrub
108.	*Ficus benjamina L.*	MORACEAE	D	Tree
109.	*Ficus thonningii Blume*	MORACEAE	D	Tree
110.	*Ficus lutea Vahl*	MORACEAE	D	Tree
111.	*Ficus platyfylla Del.*	MORACEAE	D	Tree
112.	*Ficus racemosa L.*	MORACEAE	D	Tree
113.	*Flueggea virosa (Roxb. & Willd.) Baill.*	PHYLLANTHACEAE	D	Shrub
114.	*Grewia bicolor Juss.*	MALVACEAE	D	Shrub
115.	*Guiera senegalensis j.f.gmel.*	COMBRETACEAE	D	Shrub
116.	*Hibiscus cannabinus L.*	MALVACEAE	D	Herb
117.	*Loeseneriella africana (Willd.) R.Wilczek*	CELASTRACEAE	D	Liana
118.	*Selenicereus undatus (Haw.) D.R.Hunt*	CACTACEAE	D	Tree
119.	*Hyophorbe lagenicaulis (L.H.Bailey) H.E.Moore.*	ARECACEAE	M	Shrub
120.	*Hyparrhenia hirta (L.) Stapf*	POACEAE	M	Herb
121.	*Hyphaene thebaica (L.) Mart.*	ARECACEAE	M	Tree
122.	*Mesosphaerum suaveolens (L.) Kuntze*	LAMIACEAE	D	Herb
123.	*Indigofera astragalina DC.*	FABACEAE	D	Shrub
124.	*Indigofera tinctoria L.*	FABACEAE	D	Shrub
125.	*Ipomoea asarifolia (Desr.) Roem et Schult.*	CONVOLVULACEAE	D	Herb
126.	*Ipomoea batatas L.*	CONVOLVULACEAE	D	Herb
127.	*Ipomoea pes-tigridis L.*	CONVOLVULACEAE	D	Herb
128.	*Ixora coccinea L.*	RUBIACEAE	D	Shrub
129.	*Jatropha gossypiifolia L.*	EUPHORBIACEAE	D	Herb
130.	*Khaya senegalensis (Desr) A.Juss.*	MELIACEAE	D	Tree
131.	*Lactuca alaica Kovalevsk.*	ASTERACEAE	D	Herb
132.	*Lactuca dregeana DC.*	ASTERACEAE	D	Herb
133.	*Lannea acida A. Rich.*	ANACARDIACEAE	D	Tree
134.	*Lantana camara L.*	VERBENACEAE	D	Shrub

Nº	Species Name	Family	Class	Biological Type
135.	*Leptadenia lancifolia (schumach. & thonn.)*	APOCYNACEAE	D	Herb
136.	*Leptadenia lanceolata (Poir.) Goyder*	APOCYNACEAE	D	Herb
137.	*Leucaena leucocephala (Lam.) Wit.*	FABACEAE	D	Tree
138.	*Luffa aegyptiaca (Mill.)*	CUCURBITACEAE	D	Herb
139.	*Malpighia glabra L.*	MALPIGHIACEAE	D	Tree
140.	*Mangifera indica L.*	ANACARDIACEAE	D	Tree
141.	*Gymnosporia senegalensis (Lam.) Loes.*	CELASTRACEAE	D	Shrub
142.	*Melaleuca leucadandron (L.) L.*	MYRTACEAE	D	Tree
143.	*Mitracarpus hirtus (L.) DC.*	RUBIACEAE	D	Herb
144.	*Momordica balsamina L.*	CUCURBITACEAE	D	Herb
145.	*Momordica charantia L.*	CUCURBITACEAE	D	Herb
146.	*Moringa oleifera Lam.*	MORINGACEAE	D	Tree
147.	*Afromorus mesozygia (Stapf) E.M.Gardner*	MORACEAE	D	Tree
148.	*Musa paradisiaca L.*	MUSACEAE	M	Herb
149.	*Nerium oleander L.*	APOCYNACEAE	D	Shrub
150.	*Ocimum basilicum L.*	LAMIACEAE	D	Herb
151.	*Opuntia engelmanni var linguiformis Griff.*	CACTACEAE	D	Under shrub
152.	*Opuntia tuna (L.)Mill.*	CACTACEAE	D	Under shrub
153.	*Passiflora foetida L.*	PASSIFLORACEAE	D	Liana
154.	*Cenchrus violaceus (Lam.) Morrone*	POACEAE	M	Herb
155.	*Pergularia daemia (Forssk.) Chiov.*	APOCYNACEAE	D	Herb
156.	*Dicliptera paniculata (Forssk.) I.Darbysh.*	ACANTHACEAE	D	Herb
157.	*Petrea volubilis L.*	VERBENACEAE	D	Liana
158.	*Phœnix dactylifera L.*	ARECACEAE	M	Tree
159.	*Phragmites australis (Cav.) Trin. Ex Steud*	POACEAE	M	Herb
160.	*Phyllantus niruri L.*	PHYLLANTHACEAE	D	Herb
161.	*Piliostigma reticulatum (DC) Hochst.*	FABACEAE	D	Shrub
162.	*Pistia stratiotes L.*	ARECACEAE	M	Herb
163.	*Coleus amboinicus Lour.*	LAMIACEAE	D	Herb
164.	*Monoon longifolium (Sonn.) B.Xue & R.M.K.Saunders*	ANNONACEAE	D	Tree
165.	*Portulaca oleracea L*	PORTULACACEAE	D	Herb
166.	*Neltuma chilensis (Molina) C.E.Hughes & G.P.Lewis*	FABACEAE	D	Tree
167.	*Psidium guajava L.*	MYRTACEAE	D	Tree
168.	*Ptychosperma macarthurii (H.Wendl. ex H.J.Veitch) H.Wendl. ex Hook.f.*	ARECACEAE	M	Tree

Nº	Species Name	Family	Class	Biological Type
169.	*Ptychosperma microcarpum Burret*	ARECACEAE	M	Tree
170.	*Plumeria pudica Jacq.*	APOCYNACEAE	D	Tree
171.	*Punica granatum L.*	LYTHRACEAE	D	Tree
172.	*Raphia sudanica A.Chev.*	ARECACEAE	M	Tree
173.	*Rhapis excelsa (Thunb.) A.Henry*	ARECACEAE	M	Herb
174.	*Rhizophora racemosa G.Mey.*	RHIZOPHORACEAE	D	Shrub
175.	*Rhynchosia minima (L.) DC.*	FABACEAE	D	Liana
176.	*Ruellia simplex C. Wright*	ACANTHACEAE	D	Herb
177.	*Sabal minor Pers.*	ARECACEAE	M	Shrub
178.	*Sabal palmetto (Walter) Lodd. ex Schult et Schult.f.*	ARECACEAE	M	Tree
179.	*Nauclea latifolia Sm.*	RUBIACEAE	D	Shrub
180.	*Sclerocarya birrea (A. Rich) Hochst.*	ANACARDIACEAE	D	Tree
181.	*Scoparia dulcis L.*	PLANTAGINACEAE	D	Herb
182.	*Securidaca longipedunculata Fres.*	POLYGALACEAE	D	Tree
183.	*Senegalia ataxacantha DC.*	FABACEAE	D	Tree
184.	*Senegalia mellifera (Vahl) L.A.Silva & J.Freitas*	FABACEAE	D	Tree
185.	*Senegalia senegal (L.) Britton*	FABACEAE	D	Tree
186.	*Senna occidentalis L.*	FABACEAE	D	Shrub
187.	*Senna tora L.*	FABACEAE	D	Under shrub
188.	*Sesbania rostrata Bremek et Oberm*	FABACEAE	D	Shrub
189.	*Sida rhombifolia L.*	MALVACEAE	D	Shrub
190.	*Solanum seaforthianum Andrews*	SOLANACEAE	D	Liana
191.	*Pseudophoenix ekmanii Burret*	ARECACEAE	M	Tree
192.	*Spondias dulcis Sol. Ex Parkinson*	ANACARDIACEAE	D	Tree
193.	*Spondias dulcis L.*	ANACARDIACEAE	D	Tree
194.	*Stevia rebaudiana (Bertoni)*	ASTERACEAE	D	Shrub
195.	*Strophantus sarmentosus DC.*	APOCYNACEAE	D	Shrub
196.	*Syagrus romanzoffiana (Cham.) Glassman*	ARECACEAE	M	Tree
197.	*Talinum paniculatum (Jacq.) Gaertn.*	TALINACEAE	D	Herb
198.	*Tamarindus indica L.*	FABACEAE	D	Tree
199.	*Tamarix senegalensis DC.*	TAMARICACEAE	D	Shrub
200.	*Tapinanthus bangwensis (Engl et Krause)*	LORANTHACEAE	D	Shrub
201.	*Tetrapleura tetraptera (schumach.et Thom)*	FABACEAE	D	Tree
202.	*Trema guineensis (schumach.et Thom)*	CANNABACEAE	D	Tree

Nº	Species Name	Family	Class	Biological Type
203.	*Tridax procumbens L.*	ASTERACEAE	D	Herb
204.	*Turnera diffusa Willd. ex Schult.*	PASSIFLORACEAE	D	Shrub
205.	*Typha domingensis Pers.*	TYPHACEAE	M	Herb
206.	*Vachellia nilotica var adansonii (L.)*	FABACEAE	D	Tree
207.	*Vachellia nilotica var tomentosa (L.)*	FABACEAE	D	Tree
208.	*Vachellia sebieriana (DC.) Kyal. & Boatwr.*	FABACEAE	D	Tree
209.	*Vachellia seyal (Delile) P.J.H.Hurter*	FABACEAE	D	Tree
210.	*Vachellia tortilis (Forssk.) Hayne*	FABACEAE	D	Tree
211.	*Baccharoides adoensis (Sch.Bip. ex Walp.) H.Rob.*	ASTERACEAE	D	Herb
212.	*Waltheria indica L.*	MALVACEAE	D	Herb
213.	*Wodyetia bifurcata A.K.Irvine.*	ARECACEAE	M	Tree
214.	*Yucca aloifolia L.*	ASPARAGACEAE	M	Tree
215.	*Yucca gigantea Lem.*	ASPARAGACEAE	M	Shrub
216.	*Yucca gloriosa L.*	ASPARAGACEAE	M	Shrub
217.	*Ziziphus jujuba Mill.*	RHAMNACEAE	D	Shrub
218.	*Ziziphus mauritiana Lam.*	RHAMNACEAE	D	Tree
219.	*Ziziphus mucronata Willd.*	RHAMNACEAE	D	Tree
220.	*Ziziphus spina-christi (L.) Desf.*	RHAMNACEAE	D	Shrub

3.2 Distribution of Species by Class

Families belonging to the dicotyledonous class accounted for 81.03%, with the remaining 18.96% belonging to the monocotyledonous class (Table 2). In terms of genera, the dicotyledonous class represented 79.50%. In terms of diversity at the specific level, dicotyledons represent 80.45%. The results of the floristic inventories of the botanical garden of the Faculty of Science and Technology (FST, UCAD) showed that the garden is rich in 245 species divided into 190 genera and 71 families. Dicotyledons account for the majority of species (82.4%), genera (81.6%) and families (78.9%). These results are in accordance with our inventory (Diouf et al., 2020).

This analysis shows that the Sahelian zone of the JBN has a high level of specific diversity. This remarkable diversity within families is due not only to the fact that the garden is well maintained, but also to the fact that there has been a strong drive to introduce species since 2003. What's more, the species come from almost all over the world, as in the case of the *Argania Spinosa* from Morocco. The strong presence of species with a wide geographical distribution shows the importance of the Botanical Gardens in their ability to restore ecosystems degraded by their research activities prior to introduction (BGCI, 2000). Table 2 shows distribution of species by class. In the twentyfirst century, gardens will be essential to solving challenges like climate change, food security, biodiversity protection, environmental education, sustainability, and human well-being. Gardens will be required to address problems that go beyond the garden's boundaries to achieve these extended mission areas by making social and environmental responsibility important institutional purpose drives (Demirel et al., 2022). Approaching the contributions of the world-wide sector of scientific institutions to addressing the extinction crisis, botanical gardens and their role in plant conservation brinngs together a diversity of perspectives (Pullaiah & Galbraith, 2023). According to Heywood VH, 2017 (Heywood, 2017) biodiversity will inevitably continue to be lost, despite all our conservation actions and that we must focus on what to save, why and where. It has also been suggested that we need a new approach to conservation in the face of the challenges posed by the Anthropocene biosphere which we now inhabit. Table 2 shows distribution of species by class (Jayakumar et al., 2011).

The Fig. 3 shows distribution of species by class.

Table 2. Distribution of species by class

Class	Families		Genera		Species	
	Number	%	Number	%	Number	%
Dicotyledons	47	81,03	128	79,50	177	80,45
Monocotyledons	11	18,96	33	20,50	43	19,55

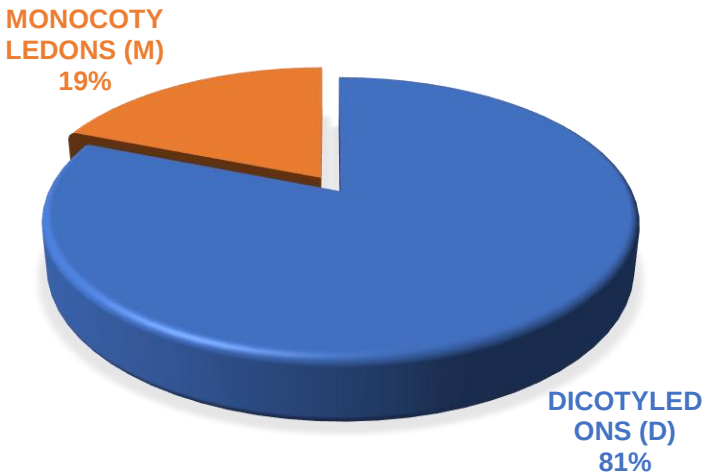

Fig. 3. Distribution of species by class

4. CONCLUSION

Floristic diversity was assessed at the Ngoltongo botanical garden in order to understand the current state and develop effective management strategies for the conservation of plant species. Various sampling techniques and measurement methods are used depending on the objectives of the studies, and in the majority of studies, the size of the garden, money and manpower are the main constraints.

The inventory of the Ngoltongo Botanical garden shows a relatively diverse flora with 220 species in 161 genera and 58 families. The Ngoltongo Botanical Garden appears to be a site of high biodiversity due to the diversity of species planted in a relatively large area. It is therefore important for the success of its conservation, education and scientific research missions to consider : setting up a register to monitor species from their introduction to their disappearance, drawing up a seminum index , ethnobotanical studies of the site to find out which species are threatened in the area and consider transplanting them for ex-situ conservation, the phyto-sociological and phenological study of the site, the construction of a seedbed to enable exchanges with other botanic gardens.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Appolinario, V., Filho, A. T. O., & Guilherme, F. A. G. (2005). Tree population and community dynamics in a Brazilian tropical semideciduous forest. *Revista Brasil, 28,* 347–360.

Botanic Gardens Conservation International. (2000). *International Agenda for Botanic Gardens in Conservation.* Richmond, Surrey.

Demirel, Ö., Bingül Bulut, M. B., & Aydoğan, T. G. (2022). A review on botanic gardens. *Biodiversity Studies (BiSt), 1(2),* 75–83.

Diatta, K. (2010). Contributions to the rehabilitation and restructuring of the Experimental Garden of Useful Plants (JEPU) of the Faculty of Medicine, Pharmacy and Ontodology of the Cheikh Anta Diop University of Dakar [Master's thesis].

Diouf, J., Camara, A. A., Mbaye, M. S., Diouf, N., Diop, D., Ndour, S., Dieng, B., Mballo, R., Bassene, C., & Noba, K. (2020). The Botanical Garden of the Department of Plant Biology (FST/UCAD/SENEGAL): Structure of the flora of a site of high floristic diversity. *International Journal of Development Research, 10(7),* 37997–38004.

Drouin, J. M. (2000). The botanical garden: An image of nature. *Nature Sciences Sociétés, 8(3),* 81–82.

Heywood, V. H. (1995). *Global Biodiversity Assessment.* Cambridge University Press.

Heywood, V. H. (2017). Plant conservation in the Anthropocene: Challenges and future prospects. *Plant Diversity, 39(6),* 314–330. https://doi.org/10.1016/j.pld.2017.10.004

Hobbs, R. J., & Huenneke, L. F. (1992). Disturbances, diversity and invasion: Implications for conservation. *Conservation Biology, 6,* 324–337.

Jayakumar, S., Seong, S. K., & Heo, J. (2011). Floristic inventory and diversity assessment: A critical review. *Proceedings of the International Academy of Ecology and Environmental Sciences, 1(3–4),* 151–168.

Khera, A. N., Kumar, A., Ram, J., & Saxena, K. G. (2001). Plant biodiversity assessment in relation to disturbances in midelevational forest of Central Himalaya, India. *Tropical Ecology, 42,* 83–95.

Lazli, A., Beldi, M., Ghouri, L., & Nouri, N. E. H. (2019). Ethnobotanical study and inventory of medicinal plants in the Bougous region (El Kala National Park, North-east Algeria). *Bulletin of the Royal Society of Sciences of Liège, 88,* 22–43.

Local Development Plan of the Rural Community of Sindia. (2009–2010).

Miller, J. H., Boyd, R. S., & Edwards, M. B. (1999). Floristic diversity, stand structure, and composition 11 years after herbicide site preparation. *Canadian Journal of Forest Research, 29,* 1073–1083.

Naik, S. B., Chauhan, V., Mohapatra, S. R., & Kapoor. (2020). Floristic diversity assessment of major forest community of Col. Sher Jung National Park in Himachal Pradesh, India. *International Journal of Current Microbiology and Applied Sciences, 9(6),* 682–692. https://doi.org/10.20546/ijcmas.2020.906.087

Ndiaye, A. (2012). Floristic inventory of the botanical garden of Ngoltongo, rural community of Sindia (Senegal) [Doctoral thesis].

Ndiaye, A. (2012). Floristic inventory of the Ngoltongo botanical garden, rural community of Sindia (Senegal) [Doctoral thesis].

Padalia, H., Chauhan, N., Porwal, M. C., & Roy, P. S. (2004). Phytosociological observations on tree species diversity of Andaman Islands, India. *Current Science, 87,* 799–806.

Phillips, O. L., Martinez, R. V., Vargas, P. N., & Baker, T. R. (2003). Efficient plot-based floristic assessment of tropical forests. *Journal of Tropical Ecology, 19,* 629–645.

Pullaiah, T., & Galbraith, D. A. (Eds.). (2023). *Botanical Gardens and Plant Conservation.* CRC Press.

Rawat, G. S. (2009). Current trends in tropical biodiversity research and conservation. *Tropical Ecology, 50,* 5–6.

Samb, A., Mbaye, M. S., Diouf, J., Dieng, B., Camara, A. B., Ka, S. L., Sidybe, M., Diouf, N., Sylla, S. N., & Noba, K. (2020). Bandia Nature Reserve (Sindia / Senegal): Floristic characterization and the state of conservation of plant diversity. *International Journal of Development Research, 10(7),* 38027–38033.

Shynder, O. I., Kolomiychuk, V. P., & Melezhyk, O. V. (2022). Spontaneous flora of O.V. Fomin Botanical Garden of Taras Shevchenko National University of Kyiv, Ukraine. *Environmental and Socio-economic Studies, 10(1),* 38–56. https://doi.org/10.2478/environ-2022-0004

Singh, J. S. (2002). The biodiversity crisis: A multifaceted review. *Current Science, 82,* 638–647.

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