Taxonomic checklist and conservation status of forest woody plants in the Jos Wildlife Park, Nigeria

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Abstract. This study provides a comprehensive taxonomic inventory of the woody plants in the Jos Wildlife Park, Nigeria, with a view of assessing their conservation status and identifying any potential threats to their survival. A combination of walk-in surveys and landscape-defined sampling methods have been used to record the vegetation types and collect plant samples. The study revealed a high level of plant diversity, with 195 identified individual plants, distributed into 137 genera and 52 families. *Rubiaceae* was the most dominant family, with 32 species, followed by *Anacardiaceae* and *Euphorbiaceae,* each with 11 species, respectively. *Ficus* was the most dominant genus, with eight species. Savannah woodlands showed the highest number of woody species, and riparian forests - the lowest. Eight species have been threatened with extinction, including three vulnerable, two near-threatened, two endangered, and one critically endangered. Habitat degradation, overexploitation, and climate change are the main threats. Conservation efforts should focus on habitat protection, regulation of human activities, and promotion of sustainable land-use practices. This study provides essential information on the effective conservation and management of the Jos Wildlife Park's plant resources. The findings highlight the need for urgent conservation actions to protect the Park's flora species and ensure long-term survival of its woody plants.

Key words: biodiversity assessment, floristic survey, Nature Park, trees, vegetation

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Introduction

The Jos Wildlife Park is a protected area in Nigeria which supports diverse forest woody plants within the functioning ecosystems and wildlife habitats (Afolayan & al. 2017). Unfortunately, the Park's flora is threatened by the problems that most plants face: habitat destruction and fragmentation, overexploitation, dumping of refuse, mining activities, pollution, the invasive alien species *Tithonia diversifolia* (Hemsl.) A. Gray, and climate change. These mounting threats to the JWP forest woody plant species require conservation moves (Bakewell & al. 2019). The Park's plant taxa influence the ecosystem services and suitability of the sites as habitats for other organisms. Thus, understanding their diversity is fundamental for support of the effective conservation in that habitat (IUCN 2020). That explains the urgent need in compiling a taxonomic checklist, with the conservation status assessment of these plant taxa for management and protection (Afolayan & al. 2017; IUCN 2020). This paper aims at bridging this gap by providing a taxonomic checklist, with conservation status assessment of the forest woody plant species found in the Jos Wildlife Park. The Jos Wildlife Park is an ecosystem that accommodates a variety of plant and animal species, some of which are endemic to Nigeria (Afolayan & al. 2017).

Recently, the importance of taxonomic checklists has been increasingly acknowledged for understanding plant diversity and conceiving conservation strategies (Adebayo & al. 2018; Meer 2018). In addition to information on classification, distribution and abundance, a taxonomic checklist furnishes an inventory of the plant species (Bakewell & al. 2019). Such information preconditions the formulation of effective conservation strategies and management of protected areas, such as the Jos Wildlife Park. Earlier studies have underscored the relevance of taxonomic checklists in understanding the plant diversity and formulating conservation policies (Adebayo & al. 2018; Meer 2018). In Nigeria, researchers have explored taxonomy and conservation status of the woody plants in different localities, such as game reserves (Adebayo & al. 2018), national parks (Ogunyanwo & al. 2019) and forest reserves (Jimoh & al. 2020). Ampitan & al. (2022) conducted a comparative study of the composition of trees and shrubs in the Jos Wildlife Park, Plateau State, Nigeria.

The present research was aimed at investigating diversity and abundance of the tree and shrub species in the Park, with a focus on information for sustainable management practices. By employing the systematic line transect method, the study revealed a total of 40 plant species belonging to 28 families. The findings provided valuable insights into the current status of tree and shrub composition of the Park. Floristic surveys have been conducted in some forests within the study area, but such data have not been available for JWP. Afolayan & al. (2017) carried out a floristic survey of the Jos Wildlife Park, identifying 120 plant species and 30 woody plant species. However, their study was not presented as a taxonomic checklist, nor did it indicate the conservation status of the listed plants. In a case study of the Niger Delta, Bakewell & al. (2019) highlighted the significance of taxonomic checklists in conservation planning. Meyer (2018) also stressed the importance of taxonomic checklists in understanding the plant diversity and outlining avenues to maintain them. In Nigeria, Ogunyanwo & al. (2019) produced a checklist of the woody plants in the Old Oyo National Park wich is a valuable contribution to the conservation planning and could be expanded into a full-scale taxonomic checklist. Jimoh & al. (2020) also studied the woody plants in a forest reserve and described their uses and conservation status. Their study did not provide a thoroughly documented taxonomic checklist though. Anyway, no study has produced a complete taxonomic checklist, with the conservation status of the forest woody plants in the Jos Wildlife Park. The present study is important because it offers a comprehensive taxonomic checklist and conservation status assessment of the forest woody plants in the Jos Wildlife Park, thus contributing to documentation of Nigeria's biodiversity, informing about the conservation efforts, and providing guidance in park-management decision-making.

Material and methods

The study area

The Jos Wildlife Park is located on the Jos Plateau, on Miango Road, 4 km from the Yakubu Gown Way, Missouri. It is not a national but a state-owned park under the Plateau State Tourism Corporation. It was founded in 1972 and covers an area of 8 km². The Jos Plateau lies in the central part of Nigeria, at 80'30" E and 100'10" N, and covers an area of about 9400 km². At 1250 m a.s.l., it rises some 600 m above the surrounding plains. Its eastern side is drier, particularly in the area drained out by the tributaries of river Gongola. The Jos Plateau borders on the Kano and Kaduna States in the north, Bauchi State in the east, and Kanke and Langtang North Local in the south-east. In the south stretch the Local Government Areas of Mikang, Shendam and Quanpan, with Nasarawa State in the west (Tina & al. 2016).

Sample and sampling procedures

A combination of the general walk-in survey method and the landscape-defined sampling method for plant sample collection and visual observation was used to record the varied vegetation types (savanna forests, rocky outcrops, riparian forests, and mountainous vegetation (Melly & al. 2020).

Between June 2022 and October 2022, floristic studies of the woody species and collection and identification of the specimens were carried out. The most important types of vegetation were identified in the field. The study area was divided into four basic habitats (gallery forest, savannah woodland, rock outcrops, and mountain vegetation). The study covered the entire forest reserve. Trees with flowers or fruit were found and identified. Their habitat, coordinates and collector details were recorded. Unidentified plants were collected and subsequently identified in the Forest Herbarium Jos (FHJ). The conservation status of all collected woody plant species was assessed using the International Union for Conservation of Nature criteria (IUCN 2019 (https://www.iucnredlist.org/). Information about the life forms was obtained from field observations and botanical literature. They were divided into trees (main stem over 3 m tall), shrubs (0.53 m tall plants, with woody stems branching near the ground) and creepers (with tangled herbaceous or woody stems), and herbs (< 0.5 m or < 1 m without permanent plant classified protocols). The taxonomic circumscription and the author's name for each taxon were verified in the *African Plant Database* (version 4.0.0) and POWO (2024).

Conservation status of the woody species

The conservation status of the woody species covered by this study and based on the different IUCN Red List categories are presented in Table 2. The results showed the following conservation categories: Not Evaluated (NE), Data Deficient (DD), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), and Critically Endangered (CR), with the exception of Extinct in the Wild (EW) and Extinct (EX). Of all 195 wood species recorded in the study area, 116 fell into the category of Least Concern (LC), 66 species in Not Evaluated (NE), three species in Vulnerable (VU), two species in Near Threatened (NT), two species in Endangered (EN) and one species in Critically Endangered (CR), three species were data-deficient (DD), and one species was Secure (G5). Most species were in the LC category (116), while CR and G5 had the lowest number of one (1) species each, respectively.

Discussion

The results of this taxonomic checklist have revealed a great diversity of plant species in the Jos Wildlife Park, encompassing a total of 195 individual plants (Table 1). Those findings correspond to the earlier studies which highlighted the rich plant diversity typical of the Nigerian wildlife parks (Meer 2018). Distribution of those plants into 137 genera and 52 families agrees with the earlier reports on the rich generic and familial diversity of the Nigerian flora (Bakewell & al. 2019; Jimoh & al. 2020). Previous research by Afolayan & al. (2017) has identified 120 plant species across 90 genera and 40 families in a comparable setting, reinforcing the idea that the Jos Wildlife Park

Table 1. List of taxa distributed in the Jos Wildlife Park (IUCN abreviations – in the text).

S/N	Taxa	Families	Habit	Habitats	IUCN status
1	*Afzelia africana* Pers.	*Caesalpinaceae*	tree	savanna woodland	VU
2	*Albizia glaberrima* (Schum. & Thonn.) Benth.	*Mimosaceae*	tree	savanna woodland	LC
3	*Albizia lebbeck* (L.) Benth.	*Mimosaceae*	tree	savanna woodland	LC
4	*Albizia zygia* (DC.) J.F. Macbr.	*Mimosaceae*	tree	savanna woodland	LC
5	*Allophylus africanus* P. Beauv.	*Sapindaceae*	shrub	savanna woodland	LC
6	*Allophylus spicatus* (Poir.) Radlk.	*Sapindaceae*	shrub	rocky areas and by streams, especially in the savanna region	NE
7	*Ampelocissus malchairi* De Wild.	*Vitaceae*	climber	savanna woodland and rocky outcrops	NE
8	*Ancylobothrys amoena* Hua	*Apocynaceae*	liana	woodland, on rough rocky ground and also in riparian vegetation	NE
9	*Annona senegalensis* Pers.	*Annonaceae*	shrub	dry open woodland, bush and grassland	LC
10	*Anogeissus leiocarpa* (DC.) Guill. & Perr.	*Combretaceae*	tree	savannah, wooded grassland and bushland and on riverbanks, Often grows gregariously on fertile soil	LC
11	*Anthocleista djalonensis* A. Chev.	*Gentianaceae*	shrub or tree	rocky outcrops	LC
12	*Asparagus africanus* Lam.	*Asparagaceae*	shrub	occurring in clumps in moist sandy savanna.	LC
13	*Asparagus schroederi* Engl.	*Asparagaceae*	shrub	savanna woodland	NE
14	*Bauhinia variegata* (L.) Benth.	*Caesalpiniaceae*	shrub or tree	savanna woodland	NE
15	*Bersama abyssinica* Fresen.	*Francoaceae*	evergreen tree	savanna woodland	LC
16	*Bixa orellana* L.	*Bixaceae*	shrub	terrestrial	NE
17	*Bombax costatum* Pellegr. & Vuillet	*Malvaceae*	tree	savanna woodland	NE
18	*Brillantaisia owariensis* P. Beauv.	*Acanthaceae*	shrub	riparian forest and rocky outcrops	NE
19	*Boswellia dalzielii* Hutch.	*Burseraceae*	tree	savanna woodland and rocky outcrops	T
20	*Bougainvillea glabra* Choisy	*Nyctaginaceae*	liana	terrestrial	LC
21	*Bougainvillea* × *buttiana* Holttum & Standl.	*Nyctaginaceae*	liana	savanna woodland	LC
22	*Breonadia salicina* (Vahl) Hepper & J.R.I. Wood	*Rubiaceae*	tree	riparian or gallery forest	LC
23	*Breynia disticha* J.R. Forst. & G. Forst.	*Phyllanthaceae*	shrub	terrestrial, planted in the park	NE
24	*Bridelia ferruginea* Benth.	*Phyllanthaceae*	shrub	wooded savanna, open forest, forest galleries & thicked	LC

S/N	Taxa	Families	Habit	Habitats	IUCN status
25	*Bridelia micrantha* (Hochst.) Baill.	*Phyllanthaceae*	shrub	savanna woodland, flooded grassland, riverine forest	LC
26	*Caesalpinia pulcherrima* f. flava (F.T. Hubb & Render) H.St. John	*Caesalpiniaceae*	evergreen shrub	terrestrial or woodland	LC
27	*Calliandra haematocephala* Hassk.	*Mimosaceae*	shrub or small tree	open areas, roadsides, often cultivated, forest edges	NE
28	*Canarium schweinfurthii* Engl.	*Burseraceae*	tree	savanna woodland	LC
29	*Canthium mannii* Hiern	*Rubiaceae*	shrub	riparian forest	NE
30	*Carissa edulis* (Forssk.) Vahl	*Apocynaceae*	spiny shrub	woodland, riverine vegetation	LC
31	*Caesalpinia pulcherrima* var. insignis Kuntze	*Caesalpiniaceae*	shrub	wooded savanna	LC
32	*Combretum molle* G. Don	*Combretaceae*	tree	savanna woodland, rocky outcrops	LC
33	*Cascabela thevetia* (L.) Lippold	*Apocynaceae*	shrub	savanna woodland	LC
34	*Cayratia debilis* (Baker) Suess.	*Vitaceae*	climbing subshrub	savanna woodland	NE
35	*Clausena anisata* (Willd.) Benth.	*Rutaceae*	tree	savanna woodland	LC
36	*Clerodendrum capitatum* (Willd.) Schumach.	*Lamiaceae*	scrambling shrub	savanna woodland, rocky outcrops	LC
37	*Cochlospermum tinctorium* A. Rich.	*Bixaceae*	subshrub	dry savanna, preferring rocky and annually burnt regions	NE
38	*Codiaeum variegatum* (L.) A. Juss. 'zanzibar'	*Euphorbiaceae*	shrub	terrestrial	LC
39	*Codiaeum variegatum* (L.) A. Juss.. 'Pie Crust')	*Euphorbiaceae*	shrub	terrestrial	LC
40	*Combretum nigricans* Guill. & Perr.	*Combretaceae*	shrub	savanna woodland, riparian forest and rocky outcrops	LC
41	*Corymbia torelliana* (F. Muell.) K.D. Hill & L.A.S. Johnson	*Myrtaceae*	tree	open woodlands	LC
42	*Craterispermum laurinum* (Poir.) Benth.	*Rubiaceae*	shrub	riparian or beside streams	NE
43	*Croton macrostachyus* Delile	*Euphorbiaceae*	tree	woodland and wooded grassland, often on rocky hillsides, on termitaria	LC
44	*Croton pseudopulchellus* Pax	*Euphorbiaceae*	shrub	hot and dry woodland, often on rocky or sandy soils	LC
45	*Cupressus lusitanica* Mill.	*Cupressaceae*	evergreen, monoecious tree	woodland, it does not tolerate waterlogged soil	LC
46	*Cussonia arborea* A. Rich.	*Araliaceae*	tree	woodland, rocky out crops and mountain vegetation	LC
47	*Cyphostemma vogelii* (Hook. f.) Desc.	*Vitaceae*	climbing tuberous geophyte	wooded savanna	NE

S/N	Taxa	Families	Habit	Habitats	IUCN status
48	*Dalbergia hostilis* Benth.	*Papilionaceae*	scandent shrub	upper margins of montane forest	LC
49	*Dalbergia* sp.	*Papilionaceae*	scandent shrub	riparian forest	LC
50	*Delonix regia* (Hook.) Raf.	*Caesalpiniaceae*	tree	dry savannah	LC
51	*Desmodium velutinum* (Willd.) DC.	*Papilionaceae*	shrub	grassland, wooded grassland and woodland	NE
52	*Dichrostachys cinerea* Wight & Arn.	*Mimosaceae*	semi-deciduous shrub	wooded grassland, rocky out crops, raparian and savanna areas	LC
53	*Dictyandra involucrata* (Hook. f.) Hiern	*Rubiaceae*	shrub	savanna woodland and riparian forest	NE
54	*Diospyros heudelotii* Hiern	*Ebenaceae*	shrub	riparian forest	LC
55	*Dissotis canescens* (Graham) Hook. f.	*Melastomataceae*	shrub	woodland	LC
56	*Dodonaea viscosa* Jacq.	*Sapindaceae*	shrub	woodland	LC
57	*Dombeya* cf. *ledermannii* Engl.	*Malvaceae*	tree	savanna woodland	CR
58	*Duranta erecta* L.	*Verbenaceae*	shrub	terrestrial	LC
59	*Duranta erecta* L. 'Varegata'	*Verbenaceae*	shrub	terrestrial	LC
60	*Combretum sericeum* G. Don	*Combretaceae*	shrub	savanna woodland	NE
61	*Ekebergia senegalensis* A. Juss.	*Meliaceae*	tree	savanna woodland	LC
62	*Erythrina senegalensis* DC.	*Papilionaceae*	tree	wooded grassland in savanna	LC
63	*Erythrina sigmoidea* Hua	*Papilionaceae*	small tree	wooded grassland in savanna	LC
64	*Eucalyptus camaldulensis* Dehnh.	*Myrtaceae*	tree	woolands	NT
65	*Empogona coriacea* (Sond.) Tosh & Robbr.	*Rubiaceae*	thrub	riparian	NE
66	*Euphorbia cotinifolia* L.	*Euphorbiaceae*	shrub or small tree	planted as ornamental in the park, prefers a well-drained soil and full sun	LC
67	*Euphorbia desmondii* Keay & Milne-Redh.	*Euphorbiaceae*	shrub or tree	rocky outcrops in savanna/ terrestrial habitat	DD
68	*Eriocoelum kerstingii* Engl.	*Sapindaceae*	tree	riparian forest	LC
69	*Euphorbia milii* Des Moul.	*Euphorbiaceae*	semi succulent subshrub or shrub	dry shrub land biome	LC
70	*Euphorbia milii* var. tananarivae (Leandri) Ursch & Leandri	*Euphorbiaceae*	semi succulent subshrub or shrub	dry shrub land biome	LC
71	*Euphorbia poissonii* Pax	*Euphorbiaceae*	succulent shrub	rocks and stony soils in open woodland	NE

S/N	Taxa	Families	Habit	Habitats	IUCN status
72	*Euphorbia tirucalli* L.	*Euphorbiaceae*	shrub	bush veld and open savanna	LC
73	*Faurea speciosa* Welw.	*Proteaceae*	shrub	savanna woodland	LC
74	*Ficus ovata* Vahl	*Moraceae*	tree	fringing forest in the savanna regions, often planted	NE
75	*Ficus coronata* Spin	*Moraceae*	tree	rocky outcrops, mountain vegetation and riparian forest	LC
76	*Ficus thonningii* Blume	*Moraceae*	tree	terrestrial or hemi-epiphytic	LC
77	*Ficus glumosa* Delile	*Moraceae*	shrub or small tree	rocky outcrops, cliffs in woodlands and wooded grasslands	LC
78	*Ficus lutea* Vahl	*Moraceae*	tree	woodland and riparian forest	LC
79	*Ficus sur* Forssk.	*Moraceae*	tree	woodland	LC
80	*Ficus vallis-choudae* Delile	*Moraceae*	tree	mostly by streams in the savanna regions	DD
81	*Garcinia ovalifolia* Oliv.	*Clusiaceae*	shrub	fringing forest in the savanna regions	LC
82	*Gardenia erubescens* Stapf & Hutch.	*Rubiaceae*	shrub	wooded savanna	LC
83	*Smilax anceps* Willd.	*Smilacaceae*	slimbing shrub	forest margins, scrubland. It is a typical constituent of the transitional ecotone between forest and grassland	NE
84	*Gardenia subacaulis* Stapf & Hutch.	*Rubiaceae*	shrub	savanna woodland	NE
85	*Gardenia ternifolia* Schumach. & Thonn.	*Rubiaceae*	shrub	savanna woodland	NE
86	*Gardenia ternifolia* subsp. jovis-tonantis (Welw.) Verdc	*Rubiaceae*	tree	savanna woodland	LC
87	*Gmelina arborea* Sm.	*Lamiaceae*	shrub	savanna woodland	LC
88	*Grewia bicolor* Juss.	*Malvaceae*	shrub	savanna woodland	NE
89	*Hamelia patens* Jacq.	*Rubiaceae*	tree	savanna woodland	LC
90	*Harungana madagascariensis* Poir.	*Hypericaceae*	shrub or tree	mountain vegetation	LC
91	*Hibiscus rosa-sinensis* L.	*Malvaceae*	tree	rocky outcrops	NE
92	*Holarrhena floribunda* (G. Don) T. Durand & Schinz	*Apocynaceae*	tree	savanna woodland and mountain vegetation	LC
93	*Hoslundia opposita* Vahl	*Lamiaceae*	shrub	riparian forest	NE
94	*Hymenocardia acida* Tul.	*Phyllanthaceae*	tree	savanna woodland	LC
95	*Hymenodictyon floribundum* (Hohst. & Steud.) B.L Rob.	*Rubiaceae*	shrub	mountain vegetation and rocky outcrops	LC
96	*Ixora coccinea* L.	*Rubiaceae*	shrub	terrestrial	LC

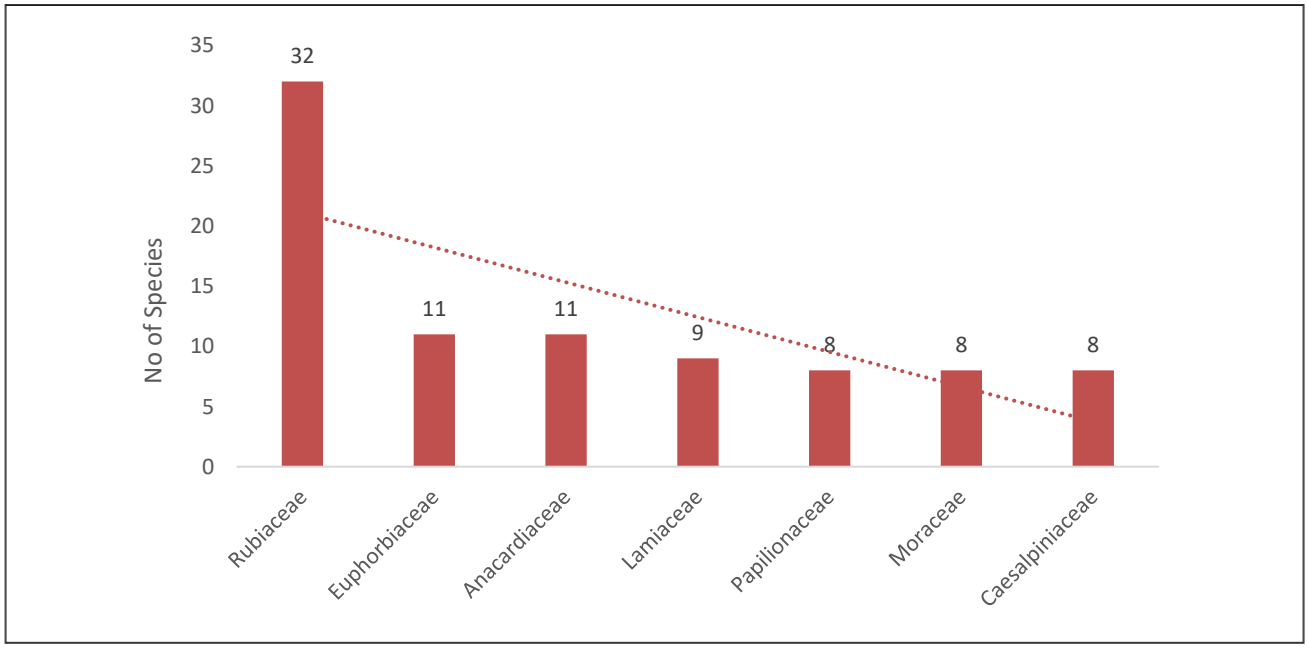
S/N	Taxa	Families	Habit	Habitats	IUCN status
97	*Jacaranda mimosifolia* D. Don	*Bignoniaceae*	tree	savanna woodland	VU
98	*Jasminum dichotomum* Vahl	*Oleaceae*	shrub	savanna woodland	NE
99	*Keetia cornelia* (Cham. & Schltdl.) Bridson	*Rubiaceae*	shrub	rocky outcrops	NE
100	*Keetia venosa* (Oliv.) Bridson	*Rubiaceae*	shrub	savanna woodland, riparian forest	LC
101	*Lannea acida* A. Rich.	*Anacardiaceae*	shrub	savanna woodland	LC
102	*Lannea barteri* (Oliv.) Engl.	*Anacardiaceae*	shrub	rocky outcrops	NE
103	*Lannea edulis* (Sond.) Engl.	*Anacardiaceae*	shrub	savanna woodland, mountain vegetation	LC
104	*Lannea microcarpa* Engl. & K. Krause	*Anacardiaceae*	tree	savanna woodland	NE
105	*Lannea schimperi* (A. Rich.) Engl.	*Anacardiaceae*	tree	savanna woodland	NE
106	*Lannea* sp.	*Anacardiaceae*	shrub	mountain vegetation	NE
107	*Lantana camara* L.	*Verbenaceae*	shrub	savanna woodland, mountain vegetation and rocky outcrops	G5
108	*Lophira lanceolata* Keay	*Ochnaceae*	tree	savanna woodland	LC
109	*Macrosphyra longistyla* (DC.) Hiern	*Rubiaceae*	liana or scandent shrub	mountain vegetation, rocky outcrops, riparian forest and savanna woodland	NE
110	*Mangifera indica* L.	*Anacardiaceae*	evergreen tree	wooded savanna	DD
111	*Manilkara multinervis* (Baker) Dubard	*Sapotaceae*	tree	riparian forest and rocky outcrops	NE
112	*Margaritaria discoidea* (Baill.) G.L. Webster	*Phyllanthaceae*	tree	savanna woodland and mountain vegetation	LC
113	*Maytenus senegalensis* (Lam.) Exell	*Celastraceae*	shrub	savanna woodland and mountain vegetation and rocky outcrops	NE
114	*Melaleuca citrina* (Curtis) Dum. Cours.	*Myrtaceae*	tree	savanna woodland	NE
115	*Mucuna poggei* var. pesa (De Wild.) Verdc.	*Papilionaceae*	liana	woodland and riverine and evergreen forest margins	NE
116	*Mussaenda arcuata* Poir.	*Rubiaceae*	erect or scrambling shrub	in forest and beside streams	NE
117	*Mussaenda erythrophylla* Schumach. & Thonn.	*Rubiaceae*	liana	riparian	LC
118	*Ochna afzelii* Oliv.	*Ochnaceae*	tree	woodland, riparian and mountain vegetation	LC
119	*Ochna schweinfurthiana* F. Hoffm.	*Ochnaceae*	tree	rocky outcrops	LC
120	*Olax subscorpioidea* Oliv.	*Olacaceae*	shrub	rocky outcrops, savanna woodland, mountain vegetation and riparian forest	NE

S/N	Taxa	Families	Habit	Habitats	IUCN status
121	*Ficus stuhlmannii* Warb.	*Moraceae*	shrub or small tree	woodland and on rocky out crops	LC
122	*Flacourtia flavescens* Willd.	*Salicaceae*	tree	savannah regions by rocks and in fringing forest	NE
123	*Oncoba spinosa* Forssk.	*Salicaceae*	shrub	savanna woodland	LC
124	*Opilia celtidifolia* (Guill. & Perr.) Walp.	*Opiliaceae*	liana	varieties of habitat, woodland, rocky outcrops and fringing forest in the savanna	NE
125	*Ozoroa insignis* Delile	*Anacardiaceae*	shrub	savanna woodland and rocky outcrops	LC
126	*Ozoroa pulcherrima* (Schweinf.) R. Fern. & A. Fern.	*Anacardiaceae*	shrub	savanna woodland and mountain vegetation	NE
127	*Parinari curatellifolia* Benth.	*Chrysobalanaceae*	shrub	savanna woodland and rocky outcrops	NE
128	*Parkia biglobosa* (Jacq.) G. Don	*Mimosaceae*	tree	woodland and mountain vegetation	LC
129	*Paullinia pinnata* L.	*Sapindaceae*	liana	savanna woodland and Riparian forest	NE
130	*Pavetta corymbosa* (DC.) F.N. Williams	*Rubiaceae*	shrub	woodland, fringing forest and forest margins	NE
131	*Pavetta crassipes* K. Schum.	*Rubiaceae*	shrub	savanna woodland	LC
132	*Pericopsis laxiflora* (Baker) Meeuwen	*Papilionaceae*	tree	savanna woodland, often on rocky ground, sometimes in fringing forest	LC
133	*Persea americana* Mill.	*Lauraceaea*	tree	terrestrial	LC
134	*Phoenix reclinata* Jacq.	*Arecaceae*	tree	riverbanks and swamps some times in woodland	LC
135	*Phyllanthus muellerianus* (Kuntze) Exell	*Phyllanthaceae*	shrub	terrestrial habitat in woodland savanna	NE
136	*Piliostigma thonningii* (Schumach.) Milne-Redh.	*Caesalpiniaceae*	shrub	open woodland and wooded grasslands	NE
137	*Pinus caribaea* Morelet	*Pinaceae*	tree	woodland	LC
138	*Plumeria rubra* L.	*Apocynaceae*	shrub	savanna woodland and rocky out crops	LC
139	*Polysphaeria arbuscula* K. Schum.	*Rubiaceae*	tree	savanna (fringing forest)	NE
140	*Psychotria peduncularis* (Salisb.) Steyerm.	*Rubiaceae*	shrub	riparian	LC
141	*Psydrax lividus* (Hiern) Bridson	*Rubiaceae*	shrub	wooded savanna	LC
142	*Psychotria psychotrioides (A. Heller)* Fosberg	*Rubiaceae*	shrub	beside streams in savanna	LC
143	*Rutidea orientalis* Bridson	*Rubiaceae*	scrambling shrub	riparian forest	NE
144	*Psydrax acutiflorus* (Hiern) Bridson	*Rubiaceae*	climbing or scrambling shrub	savanna woodland	NE
145	*Psydrax schimperianus* (A. Rich.) Bridson	*Rubiaceae*	tree	mountain vegetation and rocky outcrops	LC

S/N	Taxa	Families	Habit	Habitats	IUCN status
146	*Pterocarpus erinaceus* Poir.	*Papilionaceae*	tree	savanna woodland, rocky outcrops	EN
147	*Rhoicissus verdickii* De Wild.	*Vitaceae*	liana	savanna woodland and mountain vegetation	NE
148	*Rhus longipes* Engl.	*Anacardiaceae*	shrub	savanna woodland	LC
149	*Rhus natalensis* Bernh.	*Anacardiaceae*	shrub	savanna woodland and mountain vegetation	LC
150	*Rytigynia senegalensis* Blume	*Rubiaceae*	shrub	savanna woodland	LC
151	*Rytigynia uhligii* (K. Schum. & K. Krause) Verdc.	*Rubiaceae*	shrub	savanna woodland and rocky outcrops	LC
152	*Saba comorensis* (A. DC.) Pichon	*Apocynaceae*	liana	savanna woodland	NE
153	*Sabicea brevipes* Wernham	*Rubiaceae*	scrambling shrub	riparian forest	NE
154	*Santaloides afzelii* (Planch.) G. Schellenb.	*Connaraceae*	liana	savanna woodland and mountain vegetation	NE
155	*Sapium ellipticum* (Hochst.) Pax	*Euphorbiaceae*	tree	savanna woodland	LC
156	*Sarcocephalus latifolius* (Sm.) E.A. Bruce	*Rubiaceae*	scandent, straggling shrub	savanna woodland	LC
157	*Sarcostemma viminale* (L.) R. Br.	*Apocynaceae*	climbing shrub	rocky outcrops	LC
158	*Securidaca longepedunculata* Fresen.	*Polygalaceae*	shrub	savanna woodland and mountain vegetation	LC
159	*Senegalia ataxacantha* (DC.) Kyal. & Boatwr.	*Mimosaceae*	shrub	savanna woodland and rocky outcrops	LC
160	*Senna siamea* (Lam.) H.S. Irwin & Barneby	*Caesalpiniaceae*	tree	savanna woodland	LC
161	*Senna singueana* (Delile) Lock	*Caesalpiniaceae*	shrub	savanna woodland, rocky outcrops and mountain vegetation	LC
162	*Sericanthe chevalieri* (K. Krause) Robbr.	*Rubiaceae*	shrub	riparian forest	NE
163	*Spathodea campanulata* P. Beauv.	*Bignoniaceae*	tree	savanna woodland	LC
164	*Stachytarpheta mutabilis* (Jacq.) Vahl	*Lamiaceae*	subshrub	savanna woodland	NE
165	*Steganotaenia araliacea* Hochst.	*Apiaceae*	tree	savanna woodland, mountain vegetation and rocky outcrops	LC
166	*Sterculia tragacantha* Lindl.	*Malvaceae*	tree	savanna woodland	LC
167	*Stereospermum kunthianum* Cham.	*Bignoniaceae*	tree	savanna woodland	LC
168	*Strychnos floribunda* Gilg	*Loganiaceae*	liana	savanna woodland	NE
169	*Strychnos spinosa* Lam.	*Loganiaceae*	spiny deciduous tree	savanna woodland, rocky outcrops and mountain vegetation	NE
170	*Syzygium guineense* (Wild.) DC. var. *guineense*	*Myrtaceae*	tree	fringing forest and on stream banks in savannah regions	LC

S/N	Taxa	Families	Habit	Habitats	IUCN status
171	*Syzygium guineense* var. *macrocarpum* Engl.	*Myrtaceae*	tree	savanna woodland	NE
172	*Tecoma stans* (L.) Kunth	*Bignoniaceae*	shrub	savanna woodland	LC
173	*Tectona grandis* L. f.	*Lamiaceae*	tree	savanna woodland	EN
174	*Terminalia avicennioides* Guill. & Perr.	*Combretaceae*	shrub	savanna woodland	LC
175	*Terminalia glaucescens* Benth.	*Combretaceae*	tree	savanna woodland	LC
176	*Tetracera alnifolia* Willd.	*Dilleniaceae*	liana or multi-stemmed climber	savanna woodland, riparian forest or coastal swamps	NE
177	*Thuja plicata* D. Don	*Cupressaceae*	shrub	terrestrial or woodland	LC
178	*Thunbergia erecta* (Benth.) T. Anderson	*Acanthaceae*	shrub	terrestrial	NE
179	*Tinnea rhodesiana* S. Moore	*Lamiaceae*	shrub	savanna woodland	NE
180	*Tricalysia okelensis* Hiern	*Rubiaceae*	shrub	riparian forest	LC
181	*Trichilia emetica* Vahl	*Meliaceae*	tree	mountain vegetation and savanna woodland	LC
182	*Uapaca togoensis* Pax	*Phyllanthaceae*	tree	riparian forest	LC
183	*Uvaria chamae* P. Beauv.	*Annonaceae*	liana	savanna woodland, rocky outcrops and riparian forest	LC
184	*Vernonia adoensis* Walp.	*Asteraceae*	shrub	rocky outcrops	NE
185	*Vernonia amygdalina* Delile	*Asteraceae*	shrub	woodland or terrestrial	NE
186	*Vitellaria paradoxa* C.F. Gaertn.	*Sapotaceae*	tree	savanna woodland and mountain vegetation	VU
187	*Vitex doniana* Sweet	*Lamiaceae*	tree	savanna woodland and rocky outcrops	LC
188	*Vitex grandifolia* Gürke	*Lamiaceae*	tree	savanna woodland	LC
189	*Vitex simplicifolia* Oliv.	*Lamiaceae*	shrub	savanna woodland and mountain vegetation	LC
190	*Xylopia parviflora* Spruce	*Annonaceae*	shrub	riparian forest	LC
191	*Xylopia rubescens* Oliv.	*Annonaceae*	shrub	savanna woodland	LC
192	*Zanha golungensis* Hiern	*Sapindaceae*	tree	savanna woodland and riparian forest	LC
193	*Zanthoxylum leprieurii* Guill. & Perr.	*Rutaceae*	tree	savanna woodland	NE
194	*Zanthoxylum zanthoxyloides* (Lam.) Zepern. & Timler	*Rutaceae*	prickly shrub	savanna woodland (Thicket)	LC
195	*Ziziphus abyssinica* A. Rich	*Rhamnaceae*	shrub	savanna woodland	LC

Fig. 1. Dominant plant families in the Jos Wildlife Park.



merits a significant ecological value. The results presented in Fig. 1 credibly indicate that the *Rubiaceae* family dominates in the Park, featuring 32 species. That dominance can be attributed not only to that family's members adaptability to various habitats and wide distribution in the tropical regions (Jimoh & al. 2020), but also to some important adaptive features. The *Rubiaceae* species often display high fecundity, profuse flowering and abundant fruiting, which are essential for the seed dispersal mechanisms involving animals that can carry the seeds over long distances. Many species within that family are known to possess edible fruits, serving as a vital food source for a wide variety of fauna members, including birds and mammals, which, in turn, facilitate an effective seed dispersal (Adebayo & al. 2018). The secondary metabolites produced by them also withstand the herbivores and pathogens, thus enhancing the plants' survival in competitive environment (Meer 2018). These adaptive traits explain why the *Rubiaceae* species remain prevalent in the Park's ecosystem, with respective implications for the IUCN categorization, particularly when some species are assessed as vulnerable or threatened due to habitat loss or overexploitation.

The *Anacardiaceae* and *Euphorbiaceae* families, represented by 11 species each, also contribute to the Park's biodiversity, although they have specific habitat preferences which may reduce their numbers. Some species within these families, such as the cashew tree *Anacardium occidentale*, are economically valuable as sources of food and raw materials, which indicates their role in local economies. However, their more specialized habitat requirements may pose risks, particularly under the changing environmental conditions.

Ficus stands out as best represented among the genera, with eight species (Fig. 2), followed by *Lannea* and *Euphorbia* with six species respectively. The results obtained by the authors are in agreement with the findings of Bakewell & al. (2019) and Meer (2018), who reported that genus's ability to produce figs, a crucial food source for frugivorous animals, which supports the broad seed dispersal. The *Ficus* species tend to exhibit exceptional reproductive success and even development of symbiotic relationship with some of the pollinating wasps, which further enhance their fecundity (Onuminya & al. 2017). Furthermore, from an ecological viewpoint, some *Ficus* species pro-

Fig. 2. Dominant plant genera in the Jos Wildlife Park.

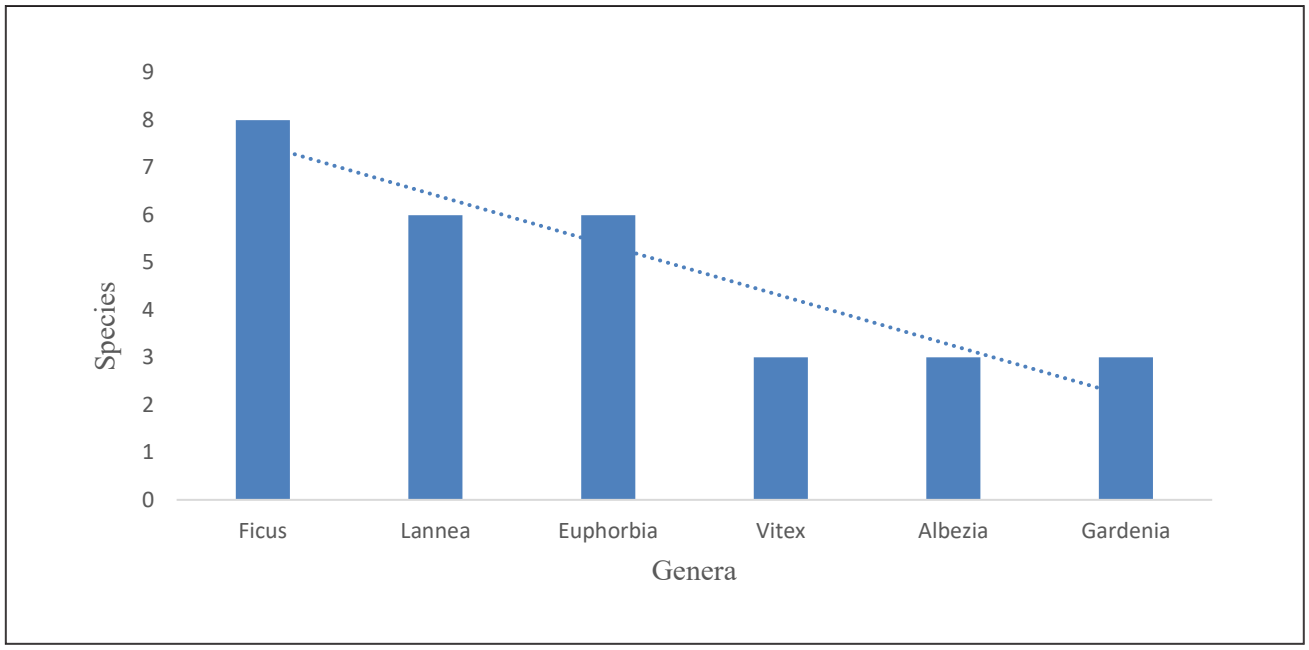
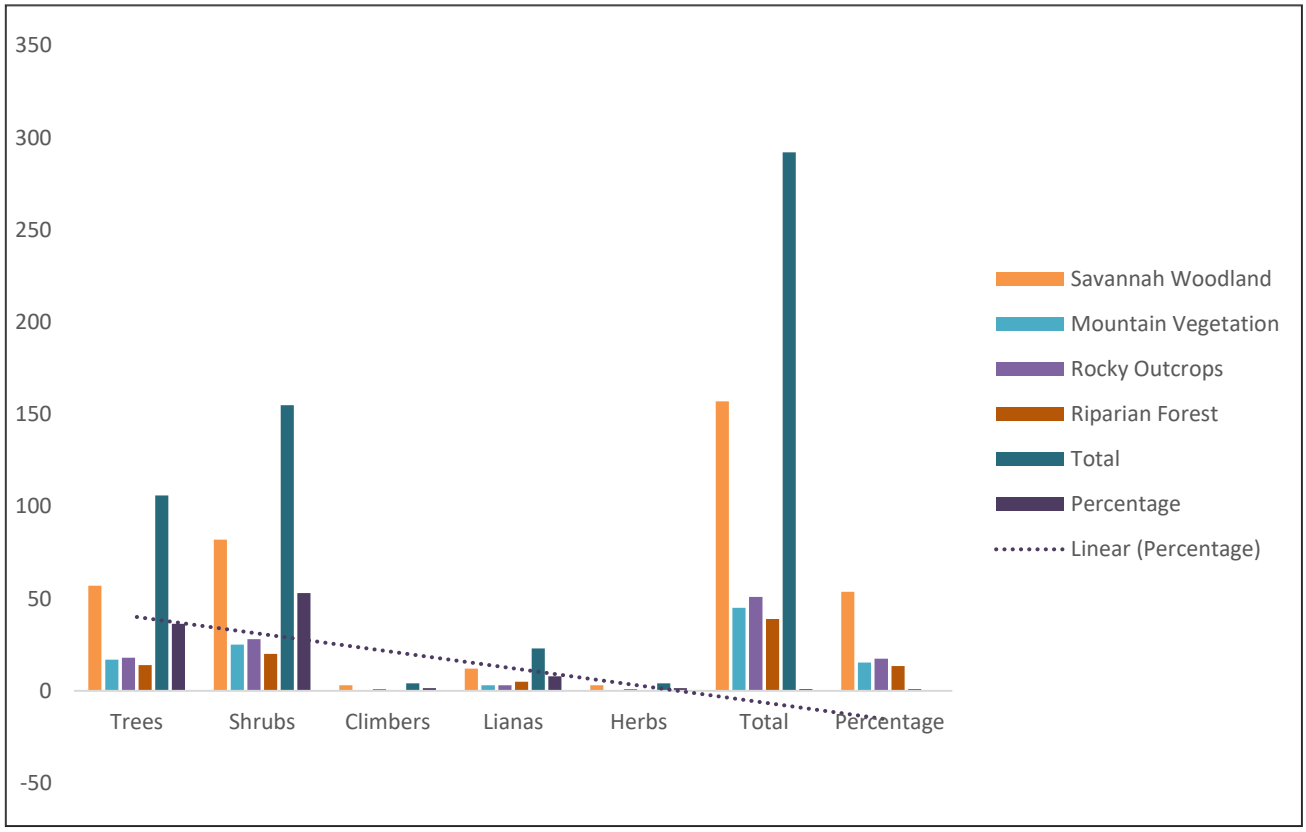


Fig. 3. Growth habits across the various vegetation types in the Jos Wilslife Park.



Savanna woodland had the highest number of trees (57), shrubs (82), lianas (12), climbers (3) at 53.8%, followed by rock outcrops at 17.5%, mountain vegetation (15.4), and riparian forest (13.4) respectively.

vide essential habitats and nutritional resources for different wildlife. That fact reinforces their ecological significance, as well as the potential conservation concerns if those species face threats.

Analysis of the habitat types in the Park has shown (Fig. 3) that the savannah woodlands boast the highest number of woody species amounting on 53.8% - a finding consistent with the high species richness usually observed in the savannah ecosystems (Afolayan & al. 2017; Bakewell & al. 2019). Their unique combination of grassland and woody vegetation fosters a wide variety of habitats, which support diverse plant species and higher trophic levels. Notably, many tree species there are also harvested for timber and non-timber products, reflecting human dependence on that ecosystem and the pressures that may threaten their conservation status (Jimoh & al. 2020). In contrast, the riparian zone has shown the lowest number of woody species amounting on 13.4%, which corroborates the common trends noted in the riparian habitats worldwide (Bakewell & al. 2019). The specific ecological conditions there, such as flooding and soil saturation, may limit diversity and productivity, but still play a vital role in water filtration and habitat connectivity.

According to the IUCN (2020) Red List categories, shown in Table 2, eight woody species in the Jos Wildlife Park are at risk. The categorization includes three species listed as Vulnerable (VU), two as Near-Threatened (NT), two as Endangered (EN), and one as Critically Endangered (CR). That alarming status calls for urgent conservation efforts to combat habitat degradation, overexploitation, and climate changes which threaten those species (Adebayo & al. 2018). The high number of species in the Least Concern (LC) category (116) shows that, while the Park retains a relatively healthy population of woody plants, vigilance is essential to prevent slippage into more threatened categories. Similar challenges face other protected areas in Nigeria (Jimoh & al. 2020), underscoring the need in developing some vital conservation strategies tailored to mitigate those threats and protect the Park's rich biodiversity. Integrated sustainable land-use practices, enforcement of protective regulations and promotion of local engagement in the conservation efforts can ensure a long-term survival of the Park's invaluable flora. The present discussion provides a deeper insight into the ecological role and pressures facing the species within the Jos Wildlife Park and links directly those factors to the IUCN categorizations.

Conclusion

In conclusion, the taxonomic checklist of the Jos Wildlife Park has revealed a rich array of plant species, with 195 identified individual plants, distributed into 137 genera and 52 families. Dominance of the *Rubiaceae* family suggests adaptability and evolutionary success, while the high species richness in the

Table 2. Summary of threatened species recorded in Jos Wildlife Park, according to the IUCN (2020).

Categories	**IUCN**
Critically endangered (CR)	1
Endangered (EN)	2
Vulnerable (VU)	3
Near threatened (NT)	2
Least concern (LC)	116
Data deficient (DD)	3
Not Evaluated (NE)	66
Secure (G5)	1
Total	**195**

savannah woodlands highlights the importance of habitat diversity. However, the presence of threatened species indicates some conservation challenges owing primarily to habitat degradation, overexploitation and climate change. To mitigate those threats, the conservation efforts should focus on habitats protection, regulation of human activities, and promotion of sustainable land-use practices. The present study contributes to understanding the plant diversity and conservation status in the Nigerian wildlife parks, and emphasizes the need in effective conservation strategies in support of biodiversity and long-term survival of woody plants in the Jos Wildlife Park.

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References

Adebayo, A.A., Olowokudejo, J.D. & Olaniran, O.S. 2018. Taxonomic study of woody plants in a Nigerian game reserve. – J. Pl. Taxon. Geogr., **73**(2): 147-164.

Afolayan, S.S., Agbelusi, E.A. & Jimoh, S.O. 2017. Floristic diversity and vegetation structure of Jos Wildlife Park, Nigeria. – J. Ecol. Nat. Environm., **9**(3): 53-66.

African Plant Database (version 4.0.0). Conservatoire et Jardin botaniques de la Ville de Genève and South African Nat. Biodivers. Inst., Pretoria. http://africanplantdatabase.ch

Ampitan, T.A., Adekanmbi., D.I., Ampitan, A.A., Adelakun, K.M. & Kazeem-Ibrahim, F. 2022. Comparative study on the trees and shrubs composition in Jos Wildlife Park, Plateau State, Nigeria. – J. Forest. Res. Managem., **19**(4): 69-78.

Bakewell, A.M., Ajayi, E.O. & Azila, J.J. 2019. Taxonomic checklists as a tool for conservation planning: A case study from the Niger Delta. – J. Appl. Ecol., **56**(5): 1231-1242. doi: 10.1111/1365-2664.13374

IUCN. 2019. IUCN Red List Categories and Criteria. Version 2019. (link unavailable) downloaded on 25.02.2020.

IUCN. 2020. The IUCN Red List of Threatened Species. Version 2020-2.

Jimoh, S.O., Akindele, O.F., Ogundipe, O.T. & Adedire, M.O. 2020. Floristic composition and diversity of a tropical forest in Nigeria. – J. Trop. Ecol., **36**(3), 253-265. doi: 10.1017/S0266467420000169

Malami, A.A. & Abdullahi, S. 2015. Checklist and conservation status of woody tree species on some selected landscapes in old Sokoto state, northwest, Nigeria. – J. Global Biosci., **4**(5): 2133-2141.

Meer, B.B. 2018. Threats and conservation status of woody plant species in different ecological zones of Taraba State, Nigeria. – Advances Pl. Agric. Res., **8**(6): 442-447.

Melly, D.K., Kipkoech, S., Muema, B.W., Kamau, P., Malombe, I., Hu, G. & Wang, Q-F. 2020. An annotated checklist of the vascular flora of South and North Nandi Forests, Kenya. – PhytoKeys, **155**: 87-139. doi: 10.3897/phytokeys.155.51966

Meyer, S.E. 2018. Taxonomic checklists: Essential tools for understanding plant diversity and informing conservation. – Pl. Diversity, **40**(3): 97-105. doi: 10.1016/j.pld.2018.04.003

Ogunyanwo, O.O., Awodiran, M.O. & Adedire, M.O. 2019. Taxonomic checklist of vascular plants in Old Oyo National Park, Nigeria. – J. Bot., 1-15. doi: 10.1155/2019/5974158

Onuminya, T.O., Afolayan, A.J. & Ndip, R.N. 2017. Diversity and distribution of *Ficus* species in Nigeria. – J. Bot., 1-13. doi: 10.1155/2017/7568403

POWO. 2024. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet. https://powo.science.kew.org/. Retrieved November 2024.

Tina, O., Iirmdu, S.E., Jumbo, T.K., Gontul, I.G.U., Ayuba, P. & Kabir, A.K. 2016. Effects of deforestation on the Jos Wildlife Park ecosystems, Plateau State, Nigeria. – Benin J. Social Sci., **21**(1): 1-15.