UNDER PEER REVIEW

Original Research Article

Systematic Composition, Life Forms and Chorology of Parklands of Commune of Mayahi, Niger West Africa

ABSTRACT

Botanical assessment plays an important role in managing and conserving phytodiversity. This study tried to determine the systematic composition, life forms, and chorology of parklands in the commune of Mayahi in Niger. The parklands constitute the major vegetation type in the commune of Mayahi. It consists of agricultural landscapes and pastoral zones with the scattered woody species. We used quadrat method based on sampling approach to inventory vegetation within the parklands in September and October 2013. The size of the plots was 50mx50m along the transect. The floristical analysis revealed that 230 species and 139 genera distributed in 48 families were recorded. This showed that the parklands are floristically diverse in biodiversity. But the most represented are Poaceae (16.02%), Fabaceae (12.12%), Caesalpiniaceae (6.06%) and Mimosaceae (5. 63%). This showed that the legume species are numerically the important species of the parklands of the commune of Mayahi. The Shannon Weaver Diversity Index (H') calculated based on 56 plots was 2.82 bits. Further, the analysis of life forms revealed that therophyte (57.82%) and phanerophyte (29%) are the dominant life form in the parklands of the commune of Mayahi. Therefore, the phytoclimate of the commune of Mayahi is therophanerophytic. Furthermore, the dominance of therophyte explains the adjustment of the flora to water balance of the area. Added to that, the predominance of the phanerophyte is an indicator of the presence woody species and the good level of management of the parklands of the farmers. Moreover, the chorological analysis showed that there were predominance Sudano-Zambezians species (SZ),53.70% and Guineo-Congolese-Sudano-Zambezians (GC-SZ) 31.02% in the flora of the parklands. The present study recommends further research that touches the impact of anthropogenic activities on the dynamics of the parklands in the commune of Mayahi.

Keywords*:* Systematic composition; life form; Chorology; Parklands; Mayahi

1. Introduction

Niger is a Sahelian landlocked country which is one of the largest in West African covering an area of 1,267,000km^2. But the three fourths of the country are desert. Niger population was estimated at 17.7million people and growing at 3.9% (INS,2011). About 80% of the Nigeriens live in the rural milieu(INS). Niger is characterized by four climatic zones which are Sahel and Sudan zone, Sahel and Sahara zone, Sahara zone and Sahel zone resulting in high biodiversity within the country.

Parklands constitute the dominant vegetation type in Niger. It consists of agricultural landscape and grazing areas with the scattered woody species. Parklands play a major role in the socio-economic life of rural people in Niger. For instance, the parklands are of the main sources of energy in Niger rural areas (Mahamane,1997, Dan Guimbo et al., 2010; Laouali et al., 2014; Massaoudou & Larwanou ,2015). Added to that, the parklands provide to the rural the Nigeriens timber, products of traditional medicine, raw material, animal fodder, foods such as fruits and leaves (Mahamane,1997, Dan Guimbo et al., 2010; Laouali et al., 2014; Moussa & Larwanou ,2015; Soulé et al,2016). In addition, the parklands play also in major role in fighting wind and

UNDER PEER REVIEW

soil erosion. However, the parklands in Niger are under pressure due to human activities and climatic factors (; Larwanou, 2005; Dan Guimbo,2011; Katakoré, 2011). For instance, Larwanou (2005) stated that many species were lost and others are threatened.

Studying the floristic composition of parklands is of paramount importance. As the parklands in Niger are under pressure due to unsustainable land use practices such as the use of fire, inappropriate use of fertilizers, illegal logging. Added to that a lot of botanical studies have been carried concerning the floristic composition of parklands in Mayahi department. But majority of them concerned only the woody floristic composition of parklands in Mayahi department (Massaoudou & Larwanou 2015; Massaoudou et al.,2016). Further no one of them deal combined floristic composition (herbaceous and woody). Furthermore, the life form, chorology of parklands of commune of Mayahi are not known. This study aims at determining the systematic composition, life form, chorology of parklands of commune of Mayahi. Further, it aims at providing comprehensive contribution to the flora of parklands of commune of Mayahi. This goes also to provide floristic information in order to promote sustainable management of parklands biodiversity. Systematic composition refers to the number of species, genera and botanical families found in given ecosystem. Systematic composition plays a crucial role in providing floristic information. It is crucial for the sustainable vegetation management. Life from is an expression of the phytoclimate of an area (Raunkiaer (1934). Life form is an important indicator of vegetation description (Khan et al.,2014). It describes the physiognomy of the vegetation. Life form expresses also the floristic diversity of life form of given vegetation(Saadou,1990). While chorology is defined as geographical distribution of species.

2. Materials and Methods

2.1 Study area

The commune of Mayahi is situated in Maradi region of Niger republic. The commune of Mayahi has an estimated population of 94,160 inhabitants in 2011(PDC,2011). The commune has fifty-nine (59) administrative villages and tribes. The capital of the commune is Mayahi. Agriculture is the main economic activity of the population of the commune of Mayahi. *Pennisetum glaucum* (millet) and *Sorghum bicolor* (sorghum) are the main food crops for the people of commune of Mayahi. While *Vigna unguiculata* (cowpea); *Arachis hypogaea* (peanut); *Sesamum indicum* (sesame) and *Cyperus esculentus* constitute the cash crops. Livestock is the

UNDER PEER REVIEW

second economic activity of the people of the commune of Mayahi. The population of the commune of Mayahi exploit various parklands services such as firewood, forage to livestock, food (fruits, leaves). They exploit the parklands for therapeutic purposes. The climate of the commune of Mayahi is the Sahelian type, characterized by a short rainy season usually three to four months from June to September. The total amount of rainfall received in 2015 was 380,9mm (Agricultural direction of Mayahi,2015). The vegetation type consists dominantly of parklands. It consists also of the forest of Goulki N'kaba. There are three types of soil in the commune of Mayahi: Compacted soils scattered throughout the urban commune area; Sandy soils occupying most of the commune and The sandy clay soils located in the River Valley Goulki N'kaba.They study sites were Mayahi urban commune, Digaba, Guidan Sani, Guidan Alou, Koren Habjia, Loda, Dan Amaria, Achalou, Kotaré, they were randomly selected.

2.2. Parklands inventory

The inventory of plant species took place in September which corresponds to the optimum period of vegetation development in Sahel (Saadou,1990). We used systematic sampling approach because of the homogeneity of the milieu. Plot method based on transect approach was used collect the parklands floristic data. The size of the plots was 50mX50m which corresponds to the minimal area of inventorying agroecosystems adopted by (Project SUN,2008). On each transect our plots were distant from 500 m in order to capture the heterogeneity of the milieu (Saadou and larwamou,2011). Pole and tape meter were used the delimitation of the plot size. The plots were shown in Fig1. Within each plot the herbaceous species were firstly recorded and secondly the woody species were recorded. The flora of Hutchinson, Adventrop (Bourgeois &Merlier,1995) and Michel Arbonnier (2009) book were used for the identification of the species. We used Cronquist system for the botanical classification. For the unknown species we produced the herbarium and submit to the Department of biology University Dan Dicko Dan Koulodo of Maradi for the specie identification. We took pictures of fruits, leaves and the entire plant of the unknown species for further identification. We used and applied the life form Raunkier's method used by (Saadou,1990) and Soulé et al.,2016. The method classifies the life from into five types: The method classifies the life form into five types:

1. **Phanerophytes (Ph):** Woody plant that the renewal bud above 50cm from soil surface. The subdivision such as Nanophanerophytes (NnPh 0.5 to 2 m); Microphanerophytes (McPh 2 to

UNDER PEER REVIEW

8 m); Mesophanerophytes (MsPh, 8 to 30 m) and Megaphanerophytes (MPh, more than 30 m) constitutes the phanerophytes (Ph).

2. **Chamephytes (Ch):** woody plant or suffrutescent perennial that the renewal bud situated at 50cm above of the soil.
3. **Hemicryptophytes (H):** Perennial plant that the renewal bud is at the soil surface.
4. **Geophytes (G):** Plant that the renewal bud is buried within the soil.
5. **Therophytes (Th**): Annual plants that form their spores or seeds within only one period of life. **Therophytes Liana (L**). Among the five life form types, they can be hydrophytes (Hy) which are the plants that the renewal bud is situated at the bottom of the water.

To identify the chorological types of the parklands of the commune of Mayahi, the study used are those defined by (White, 1983) and Saadou (1990) at African scale. They chorotypes used are: Guineo-Congolese-Sudano-Zambezians (GC-SZ); Sudano-Zambezians (SZ); Sudano-Zambezians –Saharo-Sindians (SZ-Sah.S); Saharo-Sindians (Sah.S); Saharo-Sindians-Mediterranean (Sah.S-Med); Sudano-Zambezians-Saharo-Sindians-Mediterranean (SZ-Sah.S.med), Sudanian: S and Introduced Species: i .

The Shannon diversity index (H') was used to characterize species diversity in parklands using this formula:

$$H' = -\sum_{i=1}^{S} p_i \left(\log_2 p_i\right)$$

S = total number of species pi = (ni / N) relative frequency of species (Σpi = 1). ni = relative frequency of species i in the sampling unit N = sum of the specific relative frequencies.

The relative frequency of each botanical families, species' life form and chorotypes were calculated using the number of species using Excel.

UNDER PEER REVIEW

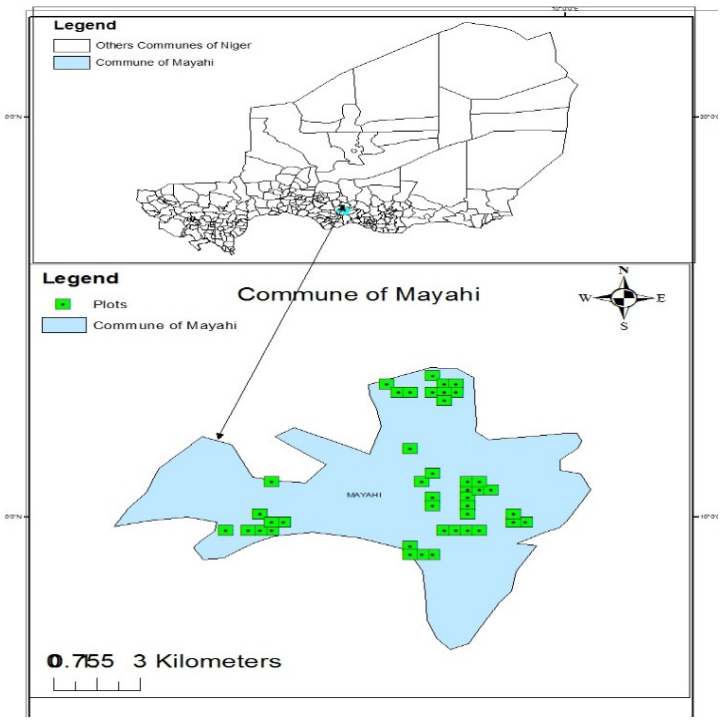

Fig1. Location of the study area

3. Results and Discussion

3.1 Systematic composition

The floristic inventory of the parklands of the commune of Mayahi gave 230 species and 139 genera distributed in 48 families. This shows that the parklands of Mayahi are floristically diverse in phytodiversity. The most represented are Poaceae (16.02%), Fabaceae (12.12%), Caesalpiniaceae (6.06%) and Mimosaceae (5.63%). But in general the flora of the parklands of the commune of Mayahi is essentially composed of legume species. For these two most important families in this study (Poaceae and Fabaceae), similar results were found by authors such as Boulweydou (2008), Morou (2010). This study shows that families of Poaceae and Fabaceae are the best represented in the parklands of the commune of Mayahi. Our floristic findings confirm the finding found by Soulé et al.,2016 who revealed that Poaceae and Fabaceae were most represented in the parklands of Aguié department. Furthermore, the predominance of Poaceae and Fabaceae agrees with the results found by Khalik et al.,2013 in Saudi Arabia. The Shannon Diversity Index (H') calculated based 56 plots was low with 2.82 bits. But this index was greater than (2,55 bits) what was found by Soulé et al.,2016 in the parklands of Aguié

UNDER PEER REVIEW

department in Maradi region. During our botanical survey *Pterocarpus erinaceus* was not recorded at all. The people of the commune of Mayahi during our discussion with them affirm that *Pterocarpus erinaceus* has disappeared from their terroirs.

Table 1. Systematic composition

Families	**Genera**	**%**	**Species**	**%**
Poaceae	21	15.11	37	16.09
Fabaceae	12	8.63	28	12.17
Caesalpiniaceae	6	4.32	14	6.09
Mimosaceae	5	3.60	12	5.22
Convolvulaceae	3	2.16	9	3.91
Euphorbiaceae	4	2.88	9	3.91
Amaranthaceae	6	4.32	8	3.48
Asteraceae	7	5.04	8	3.48
Cyperaceae	4	2.88	8	3.48
Malvaceae	4	2.88	8	3.48
Cucurbitaceae	5	3.60	7	3.04
Capparaceae	4	2.88	6	2.61
Rubiaceae	4	2.88	6	2.61
Asclepiadaceae	4	2.88	5	2.17
Combretaceae	3	2.16	5	2.17
Tiliaceae	3	2.16	5	2.17
Acanthaceae	4	2.88	4	1.74
Aizoaceae	3	2.16	4	1.74
Pedaliaceae	3	2.16	4	1.74
Caryophyllaceae	1	0.72	3	1.30
Lamiaceae	2	1.44	2	0.87
Anacardiaceae	2	1.44	2	0.87
Arecaceae	2	1.44	2	0.87
Burseraceae	1	0.72	2	0.87
Commelinaceae	1	0.72	2	0.87
Meliaceae	2	1.44	2	0.87
Molluginaceae	1	0.72	2	0.87
Moraceae	1	0.72	2	0.87
Portulacaceae	1	0.72	2	0.87
Rhamnaceae	1	0.72	2	0.87
Scrofulariaceae	1	0.72	2	0.87
Solanaceae	2	1.44	2	0.87
Amarillidaceae	1	0.72	1	0.43
Annonaceae	1	0.72	1	0.43

UNDER PEER REVIEW

Apocinaceae	1	0.72	1	0.43
Balanitaceae	1	0.72	1	0.43
Bignoniaceae	1	0.72	1	0.43
Bombacaceae	1	0.72	1	0.43
Bombaceae	1	0.72	1	0.43
Boraginaceae	1	0.72	1	0.43
Liliaceae	1	0.72	1	0.43
Loganiaceae	1	0.72	1	0.43
Loranthaceae	1	0.72	1	0.43
Nyctaginaceae	1	0.72	1	0.43
Polygalaceae	1	0.72	1	0.43
Sterculiaceae	1	0.72	1	0.43
Tribulaceae	1	0.72	1	0.43
Zygophyllaceae	1	0.72	1	0.43
Total	**139**	100.00	**230**	100.00

3.2 Life Form

The overall analysis of the biological spectrum of the flora inventoried of the commune of Mayahi shows a dominance of therophytes (57.82%) followed by phanerophytes (29%).The predominance of therophytes indicates that the flora of the commune of Mayahi is composed highly with species annual. It indicates also the adjustment of the flora to water balance. The predominance of phanerophytes expresses that the flora is secondly dominated with woody plants (shrub and trees). It also shows the level of woody flora management by the farmers such as trees ownship, the use of woody species as green fertilizers and assisted natural regeneration. The phytoclimate of the commune of Mayahi is therophanerophytic. In addition, Chamephytes present the third life form of the flora. This indicates also the adjustment of the flora to water balance. Other life forms are less represented in the table 2. Our results, the predomince of therophyte and phanerophtyte are similar to the findings of Reddy et al.,2011 and Soulé et al.,2016 who found respectively that the phytoclimate of their study areas was therophanerophytic.

Table 2. Biological spectrum

Life form	**Th**	**Ph**	**Ch**	**Hy**	**H**	**G**	**L**	**Total**
Number	133	67	16	4	3	5	2	230
Percentage(**%**)	57.82	29	6.92	1.73	1.29	2.16	0.86	100

3.3 Chorology

UNDER PEER REVIEW

There is a predominance of species Sudano-Zambezians(SZ),53.70% followed by species Guineo-Congolese-Sudano-Zambezians (GC-SZ) 31.02% and species Sudano-Zambezians – Saharo-Sindians (SZ-Sah.S) 7.87%. Such distribution shows that the study area is humid. This agrees with the findings found by Saadou (1990) in the North sudanian zone in Southern west of Niger. The introduced species present the third chorotype of the flora. This expresses the level of human activity in terms of parklands management within the parklands of the commune. Other phytogeographical types are less represented in the table 3.

Table 3. Phytogeographical spectrum

Chorotypes	GC-Sah.S	GC-SZ	I	GC-Sah.S	SZ	SZ-Sah.S	S	Sah.S	SZ-Sah.S-Med	Total
Number	1	67	8	1	116	17	1	1	4	216
Percentage(%)	0.46	31.02	3.70	0.46	53.70	7.87	0.46	0.46	1.85	100.00

Conclusion

The parklands of the commune of Mayahi are floristically diverse in biodiversity. The systematic composition of the parklands of the commune is rich in species, genera and botanical families. But Poaceae and Fabaceae are the best represented botanical families in the parklands of the commune of Mayahi. The flora of the parklands of the commune of Mayahi is dominated by legume species. Besides that, the life forms are diverse but the therophyte and phanerophtyte are the dominant. Their predominance makes the phytoclimate of Mayahi therophanerophytic. In addition, the Sudano-Zambezians and Guineo-Congolese-Sudano-Zambezians present the dominant chorotypes of the parklands of the commune of Mayahi. The study recommends further study that will examine the impact of anthropogenic activities on the dynamics of the parklands of the commune of Mayahi.

List of recorded species

Species	Families	Life form	Chorotypes
Leucas martinicensis (Jacq.) Ait.f.	Lamiaceae	Th	GC-SZ
Leonotis africana T.K. Morton	Lamiaceae	Th	GC-SZ
Peristrophe bicalyculata (Retz) Nees Ruellia Patula Jacq.	Acanthaceae	Th	SZ
Monechma ciliatum (Jacq.) Milne-Redhead	Acanthaceae	Th	GC-SZ
Blepharis maderaspatansis (L.) Heyne ex Roth.	Acanthaceae	Th	GC-SZ

UNDER PEER REVIEW

Achyrantes aspera L.	Acanthaceae	Th	GC-Sz
Trianthema portulacastrum L.	Aizoaceae	Th	SZ
Limeum viscosum (Gay.) Hermerl.	Aizoaceae	Th	SZ-Sah.S
Limeum pterocarpum (Gay.) Heimerl.	Aizoaceae	Th	SZ
Gisekia pharnaceoides L.	Aizoaceae	Th	SZ
Pupalia lappacea(L.) Juss.	Amaranthaceae	Th	GC-SZ
Pandiaka involucrata (Moq .) Hook.f.	Amaranthaceae	Th	GC-SZ
Celosia trigina L.	Amaranthaceae	Th	GC-SZ
Amaranthus viridis L.	Amaranthaceae	Th	GC-SZ
Amaranthus spinosus L.	Amaranthaceae	Th	GC-SZ
Amaranthus graecizans L.	Amaranthaceae	Th	GC-SZ
Alternanthera sessilis Dc.	Amaranthaceae	Th	GC-SZ
Aerva javanica (Bura.f.) Juss.ex.Schult.	Amaranthaceae	np	SZ-Sah.S
Crinum ornatum (Ait.) Bury.	Amarillidaceae	G	Pan
Sclerocarya birrea (A. Rich.) Hochst.	Anacardiaceae	mP	S
Lannea microcarpa Engl. Et K. Krause	Anacardiaceae	mp	GC-SZ
Annona senegalensis Pers.	Annonaceae	np	SZ
Caralluma dalzielii N.E. Br	Apocinaceae	Ch	SZ
*Hyphaene thebaic*a (L.) Mart.	Arecaceae	mp	SZ
Borassus aetiopum Mart.	Arecaceae	mP	GC-SZ
Pergularia tomentosa (L.) Mant.	Asclepiadaceae	np	SZ-Sah.S
Leptadenia pyrotechnica (Forsk.) Decne	Asclepiadaceae	np	SZ
Leptadenia hastata (Pers.) Decne	Asclepiadaceae	mp	SZ
Glossonema boveanum Decne.	Asclepiadaceae	Ch	SZ-Sah.S
Calotropis procera (Ait.) R. Br.	Asclepiadaceae	mp	Sah.S
Vernonia perrottetii Schb. Bip.	Asteraceae	Th	SZ
Vernonia pauciflora(Willd.).Less.	Asteraceae	Th	SZ
Dicoma tomentosa Cass.	Asteraceae	Th	SZ
Centaurea perrottetii Dc.	Asteraceae	np	SZ
Blainvillea gayana Cass.	Asteraceae	Th	SZ
Bidens pilosa L.	Asteraceae	Th	GC-SZ
Aspilia kotschyi (Sch.Bip.).oliv	Asteraceae	Th	SZ
Acanthospermum hispidum Dc	Asteraceae	Th	GC-SZ
Balanites aegyptiaca (L.) Del.	Balanitaceae	mp	SZ-Sah.S
Stereospermum kynthianum Cham.	Bignoniaceae	mp	SZ

UNDER PEER REVIEW

Adansonia digitata L.	Bombacaceae	mP	SZ
Bombax costatum Pellegr.	Bombaceae	mP	SZ
Heliotropium strigosum Willd.	Boraginaceae	Ch	SZ-Sah.S
Commiphora pedunculata (Kotschy. Peyr.) Engl.	Burseraceae	mp	A
Commiphora africana (A. Rich.) Engl.	Burseraceae	mp	SZ
Tamarindus indica L.	Caesalpiniaceae	Th	SZ
Piliostigma reticulatum (Dc.) Hochst	Caesalpiniaceae	mp	SZ-Sah.S
Parkinsonia aculeata L.	Caesalpiniaceae	mp	i
Delonix regia (Hook.) Raf.	Caesalpiniaceae	mp	i
Cassia singueana Del.	Caesalpiniaceae	mp	SZ
Cassia sieberiana DC.	Caesalpiniaceae	mp	GC-SZ
Cassia siamea L.	Caesalpiniaceae	mp	i
Cassia occidentalis L.	Caesalpiniaceae	np	GC-SZ
Cassia obtusifolia L.	Caesalpiniaceae	Th	GC-SZ
Cassia nigricans Vahl.	Caesalpiniaceae	Th	SZ
Cassia mimosoides L.	Caesalpiniaceae	Th	GC-SZ
Cassia italica (Mill.) Lam. Ex Fw.Andr	Caesalpiniaceae	Ch	SZ
Cassia absus L.	Caesalpiniaceae	Th	GC-SZ
Bauhinia rufescens Lam.	Caesalpiniaceae	mp	SZ
Maerua crassifolia Forsk.	Capparaceae	mp	SZ-Sah.S
Maerua angolensis Forsk.	Capparaceae	mp	SZ
Gynandropsis gynandra (L.) Briq	Capparaceae	Th	GC-SZ
Cleome viscosa L.	Capparaceae	Th	GC-SZ
Cleome monophylla L.	Capparaceae	Th	SZ
Boscia senegalensis (Pers.) Lam. Ex poir .	Capparaceae	mp	SZ
Polycarpaea linearifolia (Dc) Dc.	Caryophyllaceae	Th	SZ
Polycarpaea eryantha Hochst ex A. Rich.	Caryophyllaceae	Th	SZ
Polycarpaea corymbosa (L.) Lam.	Caryophyllaceae	Th	SZ
Terminalia avicennioides Guill. et Pers.	Combretaceae	mp	SZ
Guiera senegalensis J.F.Gmel.	Combretaceae	mp	SZ
Combretum micranthum G. Don	Combretaceae	mp	SZ
Combretum glutinosum Perr. ex Dc	Combretaceae	mp	SZ
Combretum aculeatum Vent	Combretaceae	mp	SZ
Commelina forskalaei Vahl.	Commelinaceae	Th	SZ
Commelina benghalensis L.	Commelinaceae	Th	GC-SZ

UNDER PEER REVIEW

Jacquemontia tamnifolia (L.) Griseb.	Convolvulaceae	Th	GC-SZ
Ipomoea vagans Bak.	Convolvulaceae	Th	SZ
Ipomoea pes-tigridis L.	Convolvulaceae	Th	SZ
Ipomoea eriocarpa R. Br.	Convolvulaceae	Th	SZ
Ipomoea dichroa Hochst. Ex Choisy	Convolvulaceae	Th	SZ
Ipomoea coscinosperma Heehst. Ex Choisy	Convolvulaceae	Th	SZ
Ipomoea coptica (L.) Roth.	Convolvulaceae	Th	GC-SZ
Ipomoea asarifolia (Desr.) Roem. Et Schult	Convolvulaceae	Ch	GC-SZ
Evolvulus alsinoides (L.) L.	Convolvulaceae	Th	GC-SZ
Mukia maderaspatana (L.) Roem.	Cucurbitaceae	Th	GC-SZ
Momordica balsamina L.	Cucurbitaceae	Th	SZ
Merremia tridentata (L.) Hallier	Cucurbitaceae	Th	GC-SZ
Merremia pinnata (Hochst.) Hallier	Cucurbitaceae	Th	GC-SZ
Lagenaria seceraria(Molina) Standl.	Cucurbitaceae	Lth	Pan
Citrillus lanatus (Thunb.) Matsumara et Makai	Cucurbitaceae	Ch	SZ
Citrillus colocinthis (L.) Schrad.	Cucurbitaceae	Ch	SZ
Kyllinga squamulata Thonn.ex Vahl.	Cyperaceae	Th	GC-Sz
Kyllinga pumila Michaux	Cyperaceae	Th	Ant
Fimbristylis hispidula (Vahl.) Kunth.Subsp. *Hispidula*	Cyperaceae	Th	GC-SZ
Cyperus rotondus L.	Cyperaceae	G	GC-SZ
Cyperus iria L.	Cyperaceae	Th	Pan
Cyperus esculentus L.	Cyperaceae	G	Cos
Cyperus amabilis Vahl.	Cyperaceae	Th	GC-SZ
Bulbostylis barbata (Rottb.) C.B. Cl.	Cyperaceae	Th	GC-SZ
Phyllanthus pentandrus Schum. Et Thonn.	Euphorbiaceae	Th	SZ
Euphorbia poissonii Pax	Euphorbiaceae	np	SZ
Euphorbia hirta L.	Euphorbiaceae	Ch	GC-SZ
Euphorbia glomerifera (Millsp.) L.C. Wheeler	Euphorbiaceae	Th	
Euphorbia forskalii Gay	Euphorbiaceae	Th	SZ-Sah.S-Med
Euphorbia convolvuloides Hochst. Ex. Benth.	Euphorbiaceae	Ch	SZ
Euphorbia balsamifera Ait.	Euphorbiaceae	mp	SZ-Sah.S-Med
Chrozophora brocchiana Vis	Euphorbiaceae	np	SZ

UNDER PEER REVIEW

Acalypha ciliata Forsk.	Euphorbiaceae	Th	GC-SZ
Zornia glochidiata Reichb.ex Dc.	Fabaceae	Th	GC-SZ
Voandzeia subterranea (Thouars (L.)) Verdec.	Fabaceae	Th	SZ
Vigna unguiculata (L.) Walp.	Fabaceae	Th	GC-SZ
Tephrosia purpurea (L.) Pers.ssp. Leptostachya	Fabaceae	Th	GC-SZ
Tephrosia obcordata(Lam.ex Poir.)	Fabaceae	Ch	SZ
Tephrosia lupunifolia DC.	Fabaceae	Ch	SZ
Tephrosia linearis (Willd.) Pers.	Fabaceae	Ch	SZ
Tephrosia bracteolata Guill. Et Perr.	Fabaceae	Th	SZ
Stylosanthes erecta P.Beauv.	Fabaceae	mp	GC-SZ
Sesbania pachycarpa Dc.	Fabaceae	Th	SZ
Indigofera tinctoria L.	Fabaceae	np	GC-SZ
Indigofera stenophylla Guill. Et Perr.	Fabaceae	Th	SZ
Indigofera pilosa Poir.	Fabaceae	Th	SZ
Indigofera nummulariifolia (L.) Liv. ex Alston	Fabaceae	Th	SZ
Indigofera hirsuta Var.hirsuta	Fabaceae	Th	SZ-Sah.S
Indigofera diphylla Vent.	Fabaceae	Th	SZ-Sah.S
Indigofera dendroides Jacq.	Fabaceae	Th	GC-SZ
Indigofera bracteolata DC.	Fabaceae	Th	SZ
Indigofera berhautiana Gillet	Fabaceae	Th	SZ
Indigofera astragalina Dc.	Fabaceae	Th	SZ
Crotalaria senegalensis (Pers.) Bak. Ex.DC.	Fabaceae	Th	SZ-Sah.S
Crotalaria retusa L.	Fabaceae	Th	GC-SZ
Crotalaria goreensis Guill. Et Perr.	Fabaceae	Th	GC-SZ
Canavalia rosea (L.) DC.	Fabaceae	Lmp	i
Arachis hypogaea L.	Fabaceae	Th	i
Alysicarpus ovalifolius (Schum. Et Thonn.)	Fabaceae	Th	GC-SZ
Aeschynomene indica L.	Fabaceae	Hy	GC-SZ
Crotalaria podocarpa DC.	Fabaceae	Th	SZ
Dipcadi tacazzeanum (Hochst.ex.K. Rich.) Bak.	Liliaceae	G	SZ
Strychnos spinosa	Loganiaceae	mp	Pan
Tapinanthus dodoneifolus (DC.) Danser	Loranthaceae	mp	GC-SZ
Wissadula amplissima (L.) R.E.	Malvaceae	mp	GC-SZ

UNDER PEER REVIEW

Fries Var rostrata (Schum. Et Thonn.) R .E. Fries			
Sida rhombifolia L.	Malvaceae	Ch	GC-SZ
Sida cordifolia L.	Malvaceae	Th	GC-SZ
Sida alba L.	Malvaceae	Ch	GC-SZ
P*avonia hirsuta* Guill. Et Pers.	Malvaceae	np	SZ
Hibiscus sabdarifa L.	Malvaceae	Th	Pan
Hibiscus cannabus L.	Malvaceae	Th	Pan
Hibiscus asper Hook.F.	Malvaceae	Th	GC-SZ
khaya senegalensis	Meliaceae	mP	SZ
Azadirachta indica A.Juss.	Meliaceae	mp	i
Prosopis juliflora (SW) DC.	Mimosaceae	mp	i
Prosopis africana (Guill. Et Perr.) Taub.	Mimosaceae	mp	SZ
Faidherbia albida Del.	Mimosaceae	mp	SZ-Sah.S
Dichrostachys cinerea (L.) Wight et Arn.	Mimosaceae	np	GC-SZ
Albizia lebbeck(L.) Benth.	Mimosaceae	mp	i
Albizia chevalieri Harms.	Mimosaceae	mp	SZ
Acacia tortilis Subsp.*raddiana*	Mimosaceae	mp	SZ-Sah.S
Acacia sieberiana DC.	Mimosaceae	mp	SZ
Acacia seyal Del.	Mimosaceae	mp	SZ
*Acacia senega*l (L.) Willd.	Mimosaceae	mp	SZ
Acacia nilotica(L.) Willd. Ex Del.Subsp.nilotica	Mimosaceae	mp	SZ
Acacia ataxacantha Dc.	Mimosaceae	mp	SZ
Mollugo nudicaulis Lam.	Molluginaceae	Th	GC-SZ
Mollugo cerviana (L.) Seringe	Molluginaceae	Th	SZ-Sah.S-Med
Ficus platyphylla Del…	Moraceae	mp	SZ
Ficcus dekdekena (Mig.) Steud. Ex. A. Rich.	Moraceae	mP	GC-SZ
Boerhavia repens L.	Nyctaginaceae	Th	SZ-Sah.S
Sesamum indicum L.	Pedaliaceae	Th	SZ
Martinia annua L.	Pedaliaceae	Th	Pan
Ceratotheca sesamoides Endl.	Pedaliaceae	Th	SZ
Sesamum alatum Thon.	Pedaliaceae	Th	SZ
Zea mays L.	Poaceae	Th	GC-SZ
Sorghum bicolor (L.) Moench	Poaceae	Th	SZ
Schoenefeldia gracilis Kunth	Poaceae	Th	SZ
Schizachyrium exile (Hochst.) Pilger	Poaceae	Th	SZ

UNDER PEER REVIEW

Pennisetum thypoides (Burm.) Stapf & C. E. Hubb.	Poaceae	Th	SZ
Pennisetum pedicellatum Trin.	Poaceae	Th	SZ
Panicum turgidum Forsk.	Poaceae	Ch	SZ-Sah.S
Panicum subalbidum Kunth.	Poaceae	Hy	SZ
Panicum nigerense Hitchc.	Poaceae	Th	SZ
Panicum laetum Kunth	Poaceae	Th	SZ
Panicum anabaptistum	Poaceae	Ch	SZ
Microchloa indica (L. f.) P. Beauv.	Poaceae	Th	SZ
Eragrostis turgida (Schumach.) De Wild.	Poaceae	Th	SZ
Eragrostis tremula Steud.	Poaceae	Th	SZ
Eragrostis tenella (L.) Roem. & Schult.	Poaceae	Th	GC-SZ
Eragrostis atrovirens (Desf.) Steud.	Poaceae	Hy	SZ
Eleusine indica (L.) Gaertn.	Poaceae	Th	GC-SZ
Echinochloa colona (L.) Link	Poaceae	Hy	SZ
Dinebra retroflexa (Vahl.) Panzer	Poaceae	Th	SZ
Digitaria horizontalis Willd.	Poaceae	Th	GC-SZ
Digitaria gayana Kunth (A.) Chev.	Poaceae	Th	SZ
Digitaria argillacea Hitch. et Chase) Fern.	Poaceae	Th	SZ
Dactyloctenium aegyptium (L.) P. Beauv.	Poaceae	Th	GC-SZ
Cynodon dactylon (L.) Pers	Poaceae	G	GC-SZ
Ctenium elegans Kunth	Poaceae	Th	SZ
Chloris prieurii Kunth.	Poaceae	Th	SZ
Chloris pilosa Schumach	Poaceae	Th	GC-SZ
Cenchrus ciliaris L.	Poaceae	Th	SZ-Sah.S-Med
Cenchrus biflorus Roxb.	Poaceae	Th	SZ-Sah.S
Brachiaria xantholeuca (Hack. ex. Schinz) Stapf	Poaceae	Th	SZ
Brachiaria ramosa (L.) Stapf.	Poaceae	Th	SZ
Aristida stipoides Lam.	Poaceae	Th	SZ
Aristida siberiana Trin.	Poaceae	H	SZ
Aristida mutabilis Trin et Rupr.	Poaceae	Th	SZ
Aristida adscencionis L.	Poaceae	Th	SZ
Anthephora nigritana Stapf. et Hubb.	Poaceae	H	SZ
Andropogon gayanus Kunth. Var. gayanus	Poaceae	H	SZ

UNDER PEER REVIEW

Polygala arenaria Willd.	Polygalaceae	Th	GC-SZ
Portulaca oleracea L.	Portulacaceae	Th	
Portulaca grandiflora	Portulacaceae	Th	
Ziziphus spina-christi (L.) Desf.	Rhamnaceae	mp	Pal
Ziziphus mauritiana Lam.	Rhamnaceae	mp	SZ-Sah.S
Mitracarpus villosus (Swartz) de Candolle	Rubiaceae	Th	GC-Sah.S
Kohautia senegalensis Chamsso et Schelchtendal	Rubiaceae	Th	
Feretia apodantera	Rubiaceae	mp	SZ
Borreria stachydea (DC.)Hutch. Et Dalz.	Rubiaceae	Th	SZ
Borreria scabra (Schum. Et Thonn.) K. Schum.	Rubiaceae	Th	SZ
Borreria radiata DC.	Rubiaceae	Th	SZ
Striga hermontheca(Del.) Benth.	Scrofulariaceae	Th	SZ
Striga gesnerioides(Willd.) Valke	Scrofulariaceae	Th	SZ
Solanum incanum L.	Solanaceae	np	SZ
Datura innoxia Mill	Solanaceae	np	SZ
Waltheria indica L.	Sterculiacera	np	GC-SZ
Grewia villosa Willd.	Tiliaceae	np	SZ
Grewia cissoides	Tiliaceae	mp	SZ
Corchorus tridens L.	Tiliaceae	Th	SZ
Corchorus olitorius L.	Tiliaceae	Th	SZ
Corchorus fascicularis Lam.	Tiliaceae	Th	SZ
Tribulus terrestris L.	Tribulaceae	Th	SZ
Triumpheta pentandra A.Rich.	Zygophyllaceae	Th	GC-SZ

References

INS.2011. Rapport du Recensement. Institut National de la Statistique du Niger. French;

Boulweydou., A (2008) : Caractérisation de l'habitat de la tortue sillonnée (Geochelone sulcata, Miller, 1979) dans le massif de Termit (Zinder- Niger).Mémoire de D.E.A. Université de Niamey ,118p.

Dan Guimbo I., Mahamane A., Ambouta K. J-M., 2010. Peuplement des parcs à Neocarya macrophylla (Sabine) Pranceet à Vitellaria paradoxa (Gaertn. C.F.) dans le sud-ouest nigérien: diversité, structure et régénération. Int. J. Biol. Chem. Sci. 4 (5): 1706-1720.

Dan Guimbo I., 2011. Fonction, dynamique et productivité des parcs à Vitellaria paradoxa C.F. Gaertn. et à Neocarya macrophylla (Sabine) Prance dans le sud-ouest du Niger. Thèse de Doctorat, Université de Abdou Moumouni de Niamey, Niger; 135 P.

UNDER PEER REVIEW

Agricultural direction of Mayahi.2015. Rainfall annual report.

Hutchinson, J. & J.M. Dalziel (1972). Flora of West Tropical Africa: Second Edition 3[2]: 305.

Katakoré B., 2011. Biodiversité végétale de la forêt classée de Dazga (Matamaye/Zinder. Mémoire de Master2, Faculté d'Agronomie, Université Abdou Moumouni de Niamey(Niger); 90P.

Laouali A., Dan Guimbo I., Larwanou M., Inoussa M. M., & Mahamane A., 2014. Utilisation de Prosopis africana (G. et Perr.) Taub dans le sud du département d'Aguié au Niger: les différentes formes et leur importance; Int. J. Biol. Chem. Sci. 8(3): 1065-1074.

Larwanou M., 2005. Dynamique de la végétation dans le domaine sahélien du Niger occidental suivant un gradient d'aridité: Rôles des facteurs écologiques, sociaux et économiques. Thèse de Doctorat, Université Abdou Moumouni de Niamey, 229 p.

Larwanou M, Saadou M. 2011. The role of human interventions in tree dynamics and environmental rehabilitation in the Sahel zone of Niger. Journal of Arid Environments 75, 194-200.

Mahamane A., 1997. Structure fonctionnement et dynamique des parcs agroforestiers dans l'Ouest du Niger. Thèse de Doctorat, Université de Ouagadougou, 213 p.

Moussa M. & Larwanou M.,2015. Caractérisation des peuplements ligneux des parcs à Faidherbia albida (Del) A. Chev. et à Prosopis africana (Guill., Perrot et Rich.) Taub. du Centre-Sud Nigérien. Journal of Applied Biosciences 94:8890 – 8906.

Moussa M., Larwanou M., Karim S., &Saadou M.2016. Resilience to stress of woody species in Faidherbia albida (Del)A. Chev. and Prosopis africana (Guill., Perrot and Rich.) Taub. parklands in the Sahelian Niger. Journal of Biodiversity and Environmental Sciences. Vol. 8, No. 3, p. 107-124.

Soulé. M, Ado A. M.2, Ibrahima D. B. & Saadou M. 2016. Systematic Composition, Life Forms and Chorology of Agroforestry Systems of Aguié Department, Niger, West Africa. Journal of Applied Life Sciences International. 8(4): 1-12, 2016.

Michel A. 2009. Arbres, arbustes et lianes des zones sèches d'Afrique de l'Ouest.

Khalik KA, El-sheikh M, El-aidarous A. 2013. Floristic diversity and vegetation analysis of Wadi Al-Noman, Mecca, Saudi Arabia. 894-907.Available:http://doi.org/10.3906/bot-1209-56.

Project SUN-UE, workshop of Niger. 2008. Synthèse sur l'harmonisation des méthodes d'étude et d'analyse de la flore et de la végétation tropicale, Niamey, 67p

UNDER PEER REVIEW

Khan M, F. Hussain, S. Musharaf .2014. Floristic Composition and Ecological Characteristics of Shahbaz Garhi, District Mardan, Pakistan. Global Journal of Science Frontier Research: C Biological Science. Volume 14 Issue 1 Version 1.0.

Raunkiaer C. 1934. The life form of plants and statistical plant geography. The Clarendon Press,. Oxford,632 p.

Saadou, M .1990. La végétation des milieux drainés à l'Est du fleuve Niger. Thèse de Doctorat, Université de Niamey.393p

Bourgeois, T. le; Merlier, H .1995 . Adventrop. les adventices d'afrique soudano-sahelienne. French Edition.

White F., (1983)**.** The vegetation of Africa. *In* Unesco/AETFAT/UNSO (Ed), Unesco, Paris, 356p.

Sudhakar Reddy.C , Hari Krishna. P , Meena. S.L , Ruchira Bhardwaj & Sharma. K.C. 2011. Composition of Life forms and Biological spectrum along climatic gradient in Rajasthan, India. International Journal of Environmental Sciences Volume 1, No 7.