A Survey of the Terrestrial Angiospermic Indigenous Flora of College of Education, Agbor, Delta State, Nigeria

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Abstract

Seeking to explore the impact of developmental activities on plant biodiversity, a survey was embarked upon to document plant species naturally occurring on the College of Education (now University of Delta), Agbor, Delta State, Nigeria. A total of 48 species were recorded on Campus I, and 54 species were recorded on Campus II, belonging to 20 and 26 families respectively. On campus I, the family Poaceae had the highest number of plant species of 12, representing 25% of the entire taxa followed by Asteraceae and Euphorbiaceae which had 6 species each and both contributed 25%, Cyperaceae and Amaranthaceae had 12.5% while the remaining (18) had 37.5%. On campus II, the family Asteraceae had the highest plant species of 14.81%, Poaceae 11.11% and Euphorbiaceae 9.26%. Cyperaceae, Mimosaceae and Rubiaceae contributed 5.56% each, while others contributed 48.15%. *Andropogon gayanus* had the highest relative abundance on campus II while on campus I, *Gomphrena celosioides* recorded the highest relative abundance. Based on habits on both campuses, herbs were represented by 19 and 26 spp., shrubs 10 and 13 spp., grasses 12 and 6 spp., climbers 3 and 3 spp., sedges 3 and 3 spp. and trees 1 and 3 spp. on old and new sites (Campus I and II) respectively. Twenty-six plant species were common to both campuses and Jaccard's similarity coefficient between both campuses was 0.366. The results clearly depicted varying degrees of human interference on both campuses altering species composition and vegetation structure. This suggests the need to evolve effective methods for conserving nature whilst exploring its resources for development.

Keywords: Agbor; Conservation; Delta state; Development; Plants

Introduction

The United Nations World Council for Environment and Development defines sustainable development as the development which meets the need of the present generation without compromising the ability of future generations to meet their own

needs (World Commission on Environment and Development, 1987). The need to advocate for and entrench the principles of sustainable development in our society cannot be overemphasised now as mankind currently contends with several environmental and socioeconomic crises and draws near to the target date for achieving the United Nations Sustainable Development Goals (UN SDGs) (United Nations, 2020). The quest to advance the economy, industrialise, boost agricultural productivity, create infrastructures, develop our communities and meet present needs, have often been pursued at the expense of environmental and future good. All such activities though may appear to bring about development yet such development is unsustainable and if not properly addressed will lead to environmental and socioeconomic disasters. Amongst the numerous environmental consequences of unsustainable development is the constant gap between the present generation and the reality of nature. Nature is steadily declining and unfavourably altered by anthropogenic factors. The natural home of many plants and animals have been lost as a result of such unsustainable development. This has led to loss of many indigenous species and steady decline in biodiversity.

The 2020 International Day of Biodiversity was tagged: "Our Solutions are in Nature" (Convention for Biological Diversity Secretariat, 2020). Realising that nature holds numerous answers to our challenges, man must rise urgently to ensure the protection of nature. A report released in the year 2020 estimated that anthropogenic forces have led to the loss of over 80% of wild animals and 50% of plants globally (World Economic Forum, 2020). The present rate of species loss is alarming. Because of the indispensable role plants and animals serve in the environment, loss of biodiversity holds numerous potential risks to mankind and the entire planet. Such risks among others include climate change, reduced ecosystem services and food insecurity (plants are the main food source for humans and animals).

It, therefore, becomes imperative for mankind to develop strategies and policies that protect the environment from becoming the opportunity cost for developmental activities. Mankind needs a drastic change in its relationship and understanding of the concepts of nature and development.

This study seeks to explore the impact of developmental activities on the natural environment. In this study, the focus is placed on the terrestrial angiosperm flora (plants) of the College of Education (now known as University of Delta), in Agbor, Delta State, Nigeria. Plants are important in any area because they contribute significantly to the unique local character of an area, serve as important food source and habitat to fauna, serve as habitat corridors and help to mitigate habitat fragmentation. Loss of flora could lead to unfavourable alteration of ecosystem composition and a loss of ecosystem equilibrium. Autotrophs (plants) are the foundation of the food chain in any ecosystem, and a loss in flora significantly affects and disrupts the food chain.

The close connection between the environment and human survival calls for great care and cautiousness before large or small scale projects are established so as to avert deleterious impact on plant communities and their environment. It is already reported that forest depletion which disrupts environmental balance as well as leads to eroding of priceless genetic resources, is a major challenge in Southern Nigeria (Kolawole, Bello,

Chukwuma & Gani, 2021). Diverse studies have been undertaken to record flora and/or identify how developmental activities affect forest structure and plant communities in different areas (Kolawole et al., 2021; Nodza, Anthony, Onuminya & Ogundipe, 2021; Chukwuma, Chukwuma & Adio, 2020; Soladoye, Chukwuma, Fagbenro & Adelagun, 2015). Taking inventory of plant species found in an area is important for monitoring the ecosystem, assessing impact of human activities and other forms of changes, as well as for informing conservation policies and actions (Chukwuma et al., 2020). At the College of Education Campuses in Agbor, there is rapid removal of vegetation due to provision of lecture halls, laboratories, football fields and other pitches for sports. College of Education campuses have relatively small acreage and are bordered by developed land. On the college campuses, natural areas exist that act as a refuge for native species, both plants and animals. However, little information is known about the species composition and distribution within these areas. The close proximity of these lands to development and disturbance spurred this study. The objective of the study is to document the naturally occurring plants found in both campuses of the College of Education, compare the plant species composition on both campuses within the college, and provide a basis for comparison in the future, in the event of a shift in speciation due to human activities or climate change.

Methodology

Study Areas

College of Education campuses are located in Agbor (6^{o} 14^{1}N and 6^{o} 10^{1}E) in Ika South Local Government Area of Delta State in Southern Nigeria. Agbor lies in a humid low land tropical rainforest and it experiences distinct dry and wet seasons. The dry season starts in November and ends in March. It experiences two rainfall peaks in July and September with a short dry spell in August known as August break.

Sampling Technique

College of Education has two campuses (Campuses I and II) situated along Agbor-Obiaruku- Abraka road. Campus (1) (Old Site) constituted a single sample area. Campus II (New Site) was divided into four sample areas, based on the varying degrees of human interference. Two types of quadrats were used in sampling the fields: 1m x 1m quadrat was used in sampling plants on campus 1 (old site). On campus II (new site) 10m × 10m quadrat was used to sample fallow areas, while 1m × 1m quadrant was used in sampling grassland. On campus II, four line transects were cut diagonally to ensure adequate coverage.

In all, 200 quadrats were laid along all line transects. One hundred quadrats were laid on Campus II. Sixty of them were 10m x 10m while forty were 1m x 1m. This gave a total area sampled on campus II as 6,040m^2. On campus I, 100 quadrats were also laid, each quadrat was 1m x 1m giving a total area of 100m^2. A distance of 5m was left at the edge of each sampling area to minimise edge effects. The distance between one quadrat

and the other was 10m in the fallow areas while in the developed areas, it was 5m. The measures were taken to ensure adequate coverage.

Plants enumerated during surveys were collected. Some plant species were identified in the field, while those that could not be identified immediately were properly labelled, put in black polythene bags and taken to the Department of Plant Science and Biotechnology, Ambrose Alli University, Ekpoma Herbarium for identification. Taxa were identified using standard reference materials by Hutchinson and Dalziel (1958-1968), Keay *et al* (1964) and Akobundu and Agyakwa (1987).

Analysis of Data

Data generated in the field were summarised using the following parameters: frequency, relative frequency, density (all quadrats and occurrence quadrats), abundance and relative abundance following standard methods (Sharma, 2009). Jaccard's similarity coefficient was used to calculate the similarity between campuses I and II as described by Chao, Chazdon, Colwell & Shen (2006).

Frequency is defined as the number of quadrats in which a species occurs in at least one quadrat expressed as a percentage of the total number of quadrats laid. Relative frequency is defined as species frequency /total of frequency value for all species X 100. Density was recorded as the number of plants per m^2 for each plant, expressed over all the fields surveyed. Density (All quadrats) means number of species per m^2 for each species expressed over all quadrats laid. Density (Occurrence quadrats) means number of species per m^2 for each species expressed over only those quadrats in which the species occurred. Abundance is the total number of each species enumerated during the survey and recorded species by species. The last quantitative measure calculated was the relative abundance which compared the individual plant species relative to each other. This was calculated from the frequency, density and density occurrence quadrats measured as follows:

$$\text{Relative Frequency for Species K (RFk)} = \frac{\text{Frequency value of species k}}{\text{Frequency value for all species}} \times \frac{100}{1}$$

$$\text{Relative density for occurrence quadrats for species K (RODk)} = \frac{\text{Occurrence density value of species k}}{\text{Occurrence density values for all species}} \times \frac{100}{1}$$

$$\text{Relative density for all quadrats for species K (RDk)} = \frac{\text{Field density value of species k}}{\text{Field density value for all species}} \times \frac{100}{1}$$

$$\text{Relative abundance for Species K (RAk)} = RFk + RDk + RODk$$

Relative abundance was also used to rank the plants enumerated on the campuses.

Results and Discussion

Tables 1 – 6, shows the results obtained from the study. While Table 1 shows the plant species enumerated in the old site (Campus I), Table 2 shows the species enumerated in the new site (Campus II). The species are arranged in descending order of relative abundance in Tables 1 and 2. Plants enumerated only in Campus I are shown in Table 3, the species peculiar to Campus II are shown in Table 4 while the plant species common to Campus I and II are listed in Table 5. Table 6 highlights various ethnobotanical uses of

the plants encountered in the study. Altogether, the number of species in campus I plus the number of species in campus II was 102 plant species (48 on campus I and 54 on campus II), belonging to 20 and 26 families respectively. However, considering both sites as one, i.e. not recounting any species more than once, the total number of species encountered would be 71.

Figure 1 depicts the growth habits of the various plant species enumerated in the study, Figure 2 shows the number of species per family and Figure 3 shows the relative abundance per family. On campus I, the family Poaceae had the highest number of plant species of twelve (12) representing 25%, followed by Asteraceae, Euphorbiaceae, Amranthaceae and Cyperaceae. Poaceae species also showed high abundance. The family with the highest relative abundance was Poaceae with a value of 100.24, and following this was Euphorbiaceae with a value of 30.82; while the family with the least value of relative abundance was Nyctaginaceae, with a value of 3.26 (Figure 3). Poaceae (grasses) are known to be ubiquitous and tolerant, hence they are able to thrive better than many other plants in human disturbed sites (Sustek-Sánchez *et al* 2023; Nodza *et al* 2021; Dashora & Gosavi, 2013). Grasses are also known to be among the earliest colonisers after lichens and mosses in a plant community during succession, especially after a major disturbance of the habitat. The result from this survey is quite similar to that of Obadoni & Remison (2002, 2004) that documented the weed flora of lowland and upland rice ecologies in Edo State. According to their study, one of the communities had a total of 109 different species belonging to 31 families of which Poaceae contributed 21 species (19.3%) followed by Asteraceae 12 (11.1%) and Amaranthaceae 8 (7.3%), Eupborbiaceae 7 (6.4%) and Cyperaceae 5 (4.6%).

Comparing the number of species encountered in this study with that of Kolawole *et al* (2021) who reported a checklist of the angiospermic flora of Federal University of Kashere (FUK), Gombe State in North East Nigeria, it could be deduced that biodiversity in Agbor campuses was quite low. Kolawole *et al* (2021) reported a total of 76 species across 38 families in FUK, Gombe. Higher number of plant species should have been the case in Southern Nigeria in an area known for experiencing much higher rainfall and humidity than what holds in Northern Nigeria where the savannah vegetation prevails.

The species in Agbor campuses were lower than the total of 472 plant species which belonged to 113 families of which the most diverse were grasses (Poaceae) with 42 species followed by Euphorbiaceae (32 species), Asteraceae (20 species), Fabaceae (19 species), Leguminosae (18 species), Moraceae (16 species), Cyperaceae (16 species), Solanaceae (12 species), Rubiaceae (12 species) and Malvaceae (11 species), recorded by Durugbo, Oyetoran and Oyejide (2012) on the vegetation inventory of the Redemption Camp, Ogun State, Nigeria.

For the survey carried out on campus II, the family Asteraceae had the highest plant species, contributing 8 species (13.46%) of the total species, followed by Poaceae (6 species), and then Cyperaceae, Mimosaceae and Rubiaceae with 3 species each. Poaceae was one of the most dominant families recording an abundance of 4,214 out of the total 19,057 enumerated. Poaceae also had a relative abundance of 54.37, with Asteraceae

closely following with a relative abundance of 53.35. This result also varied markedly from the results of Soladoye, Sonibare, Nadi & Alabi (2005) who documented one hundred and thirty-eight species (138) belonging to fifty-five (55) families with the family Leguminosae reported to be dominant, followed successively by Rubiaceae and Euphorbiaceae in their survey of the indigenous angiosperm biodiversity of Olabisi Onabanjo University, permanent site in Ago-Iwoye, Ogun State. The above variations in species richness could be attributed to differences in latitude and locations, altitude, variations in the degree of human interference and other micro-climatic factors.

The number of species recorded in the present study appeared quite similar to the report by Soladoye *et al* (2015) on angiosperm diversity of Bowen University Campus, Iwo, Osun State, Nigeria. They recorded a total of 110 species in 86 genera and 42 plant families; with the family Asteraceae emerging dominant (with 9 genera and 10 species), followed by Euphorbiaceae and Poaceae, Amaranthaceae and Verbanaceae respectively.

Table 1: Plant Species Enumerated in the Old Site of College of Education, Agbor (Campus I)

Name of Species	Family	Abundance	(%)	Density (m^2) All Quadrats	Density (m^2) Occurrence Quadrats	Relative Frequency	Relative Density (Occurrence Quadrats)	Relative Density (All Quadrats)	Relative Abundance	Habits
Gomphrena celosiodes Mart	Amaranthaceae	340	60	3.40	5.70	6.12	2.92	9.99	19.03	herb
Cynodon dactylon (Linn.) pers.	Poaceae	228	20	2.28	11.40	2.04	5.83	6.70	14.57	grass
Cyperus difformis Linn	Cyperaceae	148	90	1.48	1.64	9.18	0.84	4.34	14.36	sedge
Talinum triangulare (jacq) wild	Portulacaceae	250	25	2.50	10.00	2.55	5.12	7.34	12.15	herb
Cynodon nlemfuensis	Poaceae	196	30	1.96	6.50	3.06	3.33	5.76	12.15	grass
Eragrostis tenella (Linn.) P.beauv Roem and schult.	Poaceae	150	40	1.50	3.75	4.08	1.92	4.41	10.41	grass
Phyllanthus amarus Schum et Thoun	Euphorbiaceae	80	60	0.80	1.33	6.12	0.68	2.35	9.15	herb
Cenchrus biflorus Roxb.	Poaceae	126	30	1.26	4.20	3.06	2.15	3.76	8.91	grass
Eragrostis ciliaris (Linn) R. Br.	Poaceae	70	6	0.70	11.70	0.61	5.99	2.06	8.66	grass
Andropogon gayanus Kunth Var. gayanus	Poaceae	68	6	0.68	11.33	0.61	5.80	2.00	8.41	grass
Axonopus compressus (Sw) P. Beauv	Poaceae	90	10	0.90	9.00	1.02	4.61	2.64	8.27	grass
Setaria barbata (Lam) kunth	Poaceae	82	12	0.82	6.83	1.23	3.49	2.41	7.13	grass
Sorghum arundinaceum (Desv) stapf	Poaceae	80	15	0.80	5.33	1.53	2.73	2.35	6.61	grass
Dactyloctenium aegyptium (linn). P. Beauv	Poaceae	82	21	0.82	3.90	2.14	3.84	2.41	6.55	grass
Tridax procumbens Linn.	Asteraceae	60	33	0.60	1.82	3.36	0.93	1.72	6.01	herb
Asystasia gangetica (Linn.) T. Anders	Acanthaceae	55	8	0.55	6.88	0.81	3.52	1.62	5.95	herb
Starchytarpheta cayennaensis (L.C. Rich) Schev.	Verbenaceae	59	30	0.59	1.96	3.06	1.01	1.73	5.80	shrub
Chromolaena odorata (L.) R.M. King and Robinson (=*Eupatorium odoratum* L.)	Asteraceae	60	12	0.60	5.00	1.22	2.01	1.72	5.50	shrub
Euphorbia hyssopifolia Linn.	Euphorbiaceae	60	12	0.60	5.00	1.22	2.56	1.72	5.50	herb

Fluerya aestuans (linn.) ex mig	Urticaceae	30	4	0.40	7.50	0.41	3.84	1.18	5.43	herb
Emilia praetermissa milne- Redhead	Asteraceae	57	25	0.57	2.30	2.55	1.18	1.68	5.41	herb
Paspalum orbiculare Forst. (=P. commersonii Lam).	Poaceae	30	4	0.30	7.50	0.41	3.84	0.88	5.13	grass
Aspillia africana (pers) C.D. Adams	Asteraceae	52	11	0.52	4.73	1.12	2.42	1.53	5.07	herb
Fimbristylis ferruginea (Linn) vahl	Cyperaceae	50	24	0.50	2.10	2.45	1.08	1.47	5.00	sedge
Sida corymbosa R.E. fries	Malvaceae	54	18	0.54	3.0	1.84	1.54	1.59	4.97	shrub
Mart	Mimosaceae	52	14	0.52	3.71	1.43	1.90	1.53	4.86	shrub
mia Linn	Loganiaceae	50	20	0.50	2.50	2.04	1.28	1.47	4.79	herb
crata P. Beauv.	Convolvulaceae	30	20	0.30	1.50	2.04	1.77	0.88	4.69	climber /creeper
Momordica charantia Linn.	Cucurbitaceae	30	20	0.30	1.50	2.04	1.77	1.88	4.69	Climber/ creeper
Stachytarpheta indica (Linn) vahl	Verbernaceae	40	24	0.40	1.67	2.45	0.86	1.18	4.49	shrub
Ipomoea triloba Linn, syn .I. webbit coutinbo)	Convolvulaceae	37	25	0.37	1.48	2.55	0.76	1.09	4.40	climber /creeper
Melanthera scandens (schum and thonn.). Roberty.	Asteraceae	40	21	0.40	1.90	2.14	0.97	1.18	4.29	herb
Euphorbia heterophylla Linn.	Euphorbiaceae	40	10	0.40	4.00	1.02	2.05	1.18	4.25	herb
Desmodium scorpiurus (Sw) DESV. (=*Hedysarum Scorpiuru* Sw DESV).	Fabaceae	40	20	0.40	2.00	2.04	1.02	1.18	4.24	herb
Mallotus oppositifolius (Geisel) mull. Arg	Euphorbiaceae	40	20	0.40	2.00	2.04	1.12	1.18	4.24	shrub
Solenostemon monostachyus (P. Beauv.) Brig.	Lamiaceae	40	20	0.40	2.00	2.04	1.02	1.18	4.24	shrub
Manniophyton fulvum Mull. Arg	Euphorbiaceae	38	23	0.35	1.65	2.34	0.84	1.03	4.21	shrub
Synedrella nodiflora Gaertn	Asteraceae	32	14	0.32	3.28	1.43	1.68	0.94	4.05	herb
Platostoma africanum P. Beauv	Lamiaceae	38	13	0.38	2.93	1.32	1.50	1.12	3.94	herb
Cyathula prostrata (L.) Blume	Amaranthaceae	32	13	3.20	2.46	1.33	1.26	0.94	3.53	herb
Alchornea cordifolia (schum and thonn).mull. Arg	Euphorbiaceae	25	6	0.25	4.17	0.61	2.13	0.73	3.47	shrub
Diodia scandeus Sw	Rubiaceae	30	16	0.30	1.88	1.63	0.96	0.88	3.47	herb
Brachiaria lata (Schumach) C.E. Hubbard	Poaceae	30	10	0.30	3.00	1.02	1.54	0.88	3.44	grass
Icacina trichantha Oliv.	Icacinaceae	30	15	0.30	2.00	1.53	1.02	0.88	3.43	shrub
Amaranthus spinosus Linn.	Amaranthaceae	30	15	0.30	2.00	1.53	1.02	0.88	3.43	herb
Ficus exasperata vahl.	Moraceae	30	15	0.30	2.00	1.53	1.02	0.88	3.43	Tree
Boerhavia erecta Linn	Nyctaginaceae	26	8	0.26	3.30	0.81	1.69	0.76	3.26	herb
Mariscus alternifolius valic (=M. umbellatus vahl.)	Cyperaceae	25	12	0.25	2.10	1.22	1.08	0.73	3.03	sedge

Table 2 Plant Species Enumerated in The New Site of College of Education, Agbor (Campus Ii).

Name of species	Family	Abundance	(%)	Density (m^2) All Quadrats	Density (m^2) Occurrence Quadrats	Relative Frequency	Relative Density (Occurrence Quadrats)	Relative Density (All Quadrats)	Relative Abundance	Habit
Andropogon gayanus kunth var gayanus	Poaceae	2100	80	21.00	26.25	4.10	4.54	11.02	19.66	grass
Talinum triangulare (Jacq) willd	Portulucaceae	1450	54	14.50	26.85	2.77	4.65	7.61	15.03	herb
Andropogon tectorum Schum & Thonn.	Poaceae	1350	46	13.50	29.35	2.40	5.08	7.08	14.56	grass
Chromolaena odorata (L.) R.M. king and Robinson (=*Eupatonum odoratum* L)	Asteraceae	1100	80	11.00	13.75	4.10	2.38	5.77	14.56	shrub
Gomphrema celosioides Mart.	Amaranthaceae	1116	71	11.16	15.72	3.64	2.72	5.86	12.22	herb
Cynodon dactylon (Linn.) Pers	Poaceae	667	70	6.67	9.53	3.58	1.65	3.50	8.73	grass
Aspillia africana (pers) C,D, Adams	Asteraceae	580	80	5.80	7.25	4.10	1.26	3.04	8.40	herb
Tridax procumbens Linn	Asteraceae	552	60	5.52	9.20	3.08	1.59	2.90	7.57	Herb
Euphorbia hyssipofolia Linn.	Euphorbiaceae	440	30	4.40	14.67	1.51	2.54	2.31	6.36	herb
Boerhavia diffusa L.	Nyctaginaceae	316	15	3.16	21.07	0.77	3.65	1.66	6.08	herb
Melochia corchorifolia Linn	Sterculiaceae	214	87	2.14	2.46	4.46	0.43	1.12	6.01	Herb
Icacina trichantha oliv.	Icacinaceae	300	71	3.00	4.23	3.64	0.73	1.57	5.94	shrub
Portulaca quadrifida Linn.	Portulacaceae	325	60	3.25	5.42	3.08	0.94	1.71	5.73	Herb
Schrankia leptocarpa Dc.	Mimosaceae	112	4	1.12	28.00	0.21	4.85	0.59	5.65	herb
Maricus alternifolius vahl (=M. unbellatus vahl) alterni	Cyperaceae	325	20	3.25	16.25	1.03	2.81	1.71	5.55	sedge
Alchornea laxiflora (Benth.) Pax and K. Hoffin	Euphorbiaceae	360	38	3.60	9.44	1.94	1.64	1.89	5.47	shrubs
Clappertonia ficifola (wild)) Decine.	Tiliaceae	130	5	1.30	26.07	0.26	4.50	0.68	5.44	shrub
Emilia praetermissa milne-Redhead	Asteraceae	354	30	3.54	11.80	1.51	2.04	1.86	5.41	herb

Richardia brasiliensis Gomez	Rubiaceae	242	40	2.42	6.05	2.10	1.05	1.27	5.32	Herb
Dactylocterium aegyptium (Linn) P.Beauv	Poaceae	267	15	2.67	17.80	0.77	3.08	1.40	5.25	grass
Mimosa invisa Mart	Mimosaceae	140	6	1.40	23.33	0.31	4.04	0.74	5.09	shrub
Cyperus difformis Linn	Cyperaceae	200	10	2.00	20.00	0.51	3.46	1.05	5.02	sedge
Anthonotha macrophylla P. Beauv	Caesalpiniaceae	310	30	3.10	10.33	1.54	1.79	1.57	4.96	shrub
Euphorbia heterophylla Linn.	Euphorbiaceae	300	25	3.00	12.00	1.28	2.08	1.63	4.93	herb
Platostoma africanum P. Beauv.	Lamiaceae	321	30	3.21	10.70	1.51	1.85	1.57	4.92	Herb
Ficus exasperata vahl.	Moraceae	300	38	3.00	7.90	1.95	1.37	1.57	4.89	tree
Melanthera scandens (schum & Thonn) Robberty	Asteraceae	300	30	3.00	10.00	1.51	1.73	1.57	4.81	Herb
Oldenlandia herbacea (Linn.) Roxb.	Rubiaceae	172	65	1.72	2.65	3.33	0.46	0.90	4.69	Herb
Momordica charantia Linn	Cucurbitaceae	250	45	2.50	5.56	2.30	0.96	1.31	4.57	Climber
Erigeron floribundus H.B.and K.) Sch.bep. (=Conyza floribunda H.B. and K	Asteraceae	250	20	2.50	12.50	1.03	2.16	1.31	4.50	herb
Combretum racemosum P.Beauv	Combretaceae	146	40	1.46	3.65	2.10	0.63	1.77	4.50	Shrubs
Stachytarpheta coyennensis (L.C. Rich) Schan	Verbenaceae	260	30	2.60	8.67	1.54	1.50	1.36	4.40	Herb
Panicum maximum Jacq.	Poaceae	310	28	3.10	10.07	1.03	1.74	1.63	4.40	Grass
Phyllanthus amarus schum, et Thonn.	Euphorbiaceae	230	20	2.30	11.50	1.03	1.99	1.21	4.23	Herb
Diodia scandeus Sw	Rubiaceae	225	41	2.25	5.49	2.10	0.95	1.18	4.23	Herb
Bidens pilosa Linn.	Asteraceae	200	30	2.00	6.67	1.54	1.54	1.05	4.13	herb
Sida corymbosa R.E. flies	Malvaceae	230	28	2.30	8.21	1.44	1.42	1.21	4.07	Shrub
Sida acuta burn .F	Malvaceae	224	25	2.24	8.96	1.28	1.55	1.18	4.01	Shrub
Scleria verrucosa willd	Cyperaceae	140	18	1.40	7.78	0.92	1.35	1.74	4.01	Sedge
Synedrella nodiflora Gaertn.	Asteraceae	140	22	1.40	6.36	1.13	1.10	1.74	3.97	herb
Spigella anthelmia Linn.	Loganiaceae	150	50	1.50	3.00	2.56	0.52	0.79	3.87	herb
Aneilema beniniense	Commelinace	180	40	1.80	4.50	2.10	0.78	0.95	3.83	Herb

(P. Beauv.) Kunth	ae									
Commelina diffusa burm f. subsp. diffusa J.K morton sny (= c. nudifolia L)	Commelinaceae	150	48	1.50	3.13	2.50	0.54	0.79	3.83	herb
Albizia zygia (DC) J.F. macher	Mimosaceae	180	34	1.80	5.29	1.74	0.91	0.95	3.60	tree
Ipomea triloba Linn	Convolvulaceae	150	40	1.50	3.75	2.10	0.65	0.79	3.54	Climber/creeper
Alchornea cordifolia (schum and thonn) Mull. Arg.	Euphorbiacea e	180	30	1.80	6.00	1.54	1.04	0.95	3.53	shrub
Hippocratea pallens Plauch ex oliv	Celastraceae	165	30	1.65	5.50	1.51	0.95	0.87	3.33	shrub
Cnestis ferruginea (DC)	Connaraceae	130	30	1.30	6.50	1.51	1.13	0.68	3.32	shrub
Cassia hirsuta Linn	Caesalpinacea e	140	14	1.40	10.00	0.72	1.73	0.74	3.19	shrub
Elaeis guinesis Jacq.	Arecaceae	110	10	1.10	11.00	0.51	1.90	0.58	2.99	tree
Merremia aegyptia (Linn) urban	Convolvulaceae	130	20	1.30	6.50	1.03	1.13	0.68	2.84	climber
Stachytearpheta indica (Linn) vahl	Verbenaceae	124	18	1.24	6.89	0.92	1.19	0.65	2.76	Herb
Dissotis rotundifolia (Sm.) Triana	Melastomataceae	200	30	2.00	6.67	1.51	1.15	0.05	2.71	herb
Oxytenanthera albyssinica	Poaceae	120	20	1.20	6.00	0.10	1.04	0.63	1.77	Grass

Table 3: Plant Species Found Only in Old Site of College of Education, Agbor

Species	**Family**	**No**	**Habit**
Asystasia gangetica (Linn) T. Anderson	Acanthaceae	55	Herb
Amaranthus spinosus L.	Amaranthaceae	30	Herb
Axonopus compressus (Sw) P. Beauv.	Poaceae	90	Grass
Brachiavria alata (Schumach) C.E Hubbard	Poaceae	30	Grass
Boerhavria erecta L.	Nyctaginaceae	26	Herb
Cyathula prostrata (L) Blume	Amaranthaceae	32	Herb
Cenchrus bifforus Roxb	Poaceae	126	Grass
Cynodon nlemfuensis Vanderyst	Poaceae	196	Grass
Desmodium scorpinrus (Sw) Desv (= Hedysarum scorpinrus Sw.	Fabaceae	40	Herb
Eragrostis tenella (L.) Roem and Schult	Poaceae	150	Grass

Eragrostis ciliaris (L.) R.Br	Poeceae	70	Grass
Fimbristylis ferruginea (L.) Vahl	Cyperaceae	50	Sedges
Fluerya aestuans (L.) Gaud	Urticaceae	30	Herb
Ipomea involucrata P. Beauv	Convolvulaceae	30	Climbers/creeper
Ipomea triloba L.	Convolvulaceae	37	Herb/climbers
Maniophyton fulvum Mull, Arg.	Euphorbcaceae	38	Shrub
Mallotus oppositifolius (Geisel). Mull. Arg.	Euphorbiaceae	40	Shrub
Paspalum orbiculare G. Forst. (= p commersonii Lam).	Poaceae	30	Grass
Sorghum arundinaceum (Desv) Sapf.	Poaceae	80	Grass
Setaria barbata (Lam) Kunth	Poaceae	82	Grass

Table 4: Plant Species Found Only in New Site of College of Education Agbor

Name of the Species	**Family**	**No**	**Habit**
Anthonotha macrophylla P. Beauv	Caesalpinaceae	310	Shrub
Andropogon tectorum Schum and Thonn	Poaceae	1350	Grass
Alchornea laxiflora (Benth) Pax & K. Hoffin	Euphorbiaceae	360	Shrub
Albisia zygia (DC) J.F. Macbr.	Mimosaceae	180	Tree
Aneilema beniniense (P. Beauv.) Kunth	Commelinaceae	180	Herb
Boerhavia diffusa L.	Nyctaginaceae	316	Herb
Oxytenanthera albyssinica	Poaceae	20	Grass
Bideus pilosa Linn.	Asteraceae	200	Herb
Cynodon dactylon (L.) Pers.	Poaceae	667	Grass
Clappertonia ficifolia (Wild). DC	Tilaceae	130	shrub
Commelina diffusa Burm f. morton sny. (=C. nudi flora L.)	Commelinaceae	150	Herb
Combretum racemosum P. Beauv.	Combretaceae	146	Shrub
Cassia hirsuta L.	Caesalpinaceare	140	Shrub
Cnestis ferruginea Vahlex DC	Connaraceae	130	Shrub
Dissotis rotundifolia (Sm.) Triana	Melastomataceae	200	Herb
Erigeron floribundus (Kunth) Sch. Bip. (=coryza floubunda H.B. and K)	Asteraceae	250	Herb
Elaeis guinenis (Jaeq)	Arecaceae	110	Tree
Melochia corchoifolia L.	Sterculiaceae	214	Herb
Panicum maximum Jacq.	Poaeceae	310	Grass
Portulaca quadrifida L.	Portulacaceae	325	Herb
Hippocratea pallens Planch ex Oliv.	Celastraceae	165	Shrub
Richardia brasiliensis Gomes	Rubiaceae	242	Herb
Sida acuta Burm .f.	Malvaceae	224	Shrub
Scleria verrucosa willed.	Cyperaceae	140	Sedge

Schrankia leptocarpa DC	Mimosaceae	112	Herb

Table 5: Plants Species Common to both Campuses

Names of the Species	Family	Habit
Aspilia africana (Pers) C.D. Adams	Asteraceae	herb
Andropogon gayanus Kunth var gayanus	Poaceae	grass
Alchornea cordifolia (Schum & Thonn) Mill.Arg	Euphorbiaceae	shrub
Cynodon dactylon (L.) Pers.	Poaceae	grass
Chromolaena odorata (L.) R.M. King & Robinoson (Eupatorium odoratum L.)	Asteraceae	shrub
Cyperus difformis L.	Cyperaceae	sedge
Dactyloctenium aegyptium (L.) Willd	Poaceae	grass
Diodia scandeus Sw	Rubiaceae	herb
Emilia praetemissa Milne Redhead	Asteraeceae	herb
Euphorbia heterophylla L.	Euphorbiaceae	herb
Euphorbia hyssopofolia L.	Euphorbiaceae	herb
Ficus exasperata Vahl.	Moraceae	tree
Gomphrena celosiodes Mart	Amaranthaceae	shrub
Maricus alternifolius vahl (=M. Umbellatus vah) auct. Non Vahl	Cyperaceae	sedge
Melanthera scandens (Schum & Thonn.) Robbery	Asteraceae	herb
Momordica charantia L.	Cucurbitaceae	herb
Mimosa invisa Mart. Ex Colla	Mimosaceae	herb
Phyllanthus amarus Schum et Thonn	Euphorbiaceae	herb
Platostoma africanum P. Beauv	Lamiaceae	herb
Sida corymbosa R.E Fries	Malvaceae	shrub
Synedrella nodiflora Gaertn.	Asteraceae	herb
Spigella anthelima Linn.	Loganiaceae	herb
Stachytarpheta indica (Linn.) vahl	Verbenaceae	herb
Stachytarpheta cayennensis (L.C. Rech) Schan	Verbenaceae	herb
Talinum triangulare (Jacq) wild	Portulacaceae	herb
Tridax procumbens Linn.	Asteraceae	herb

Table 6: Ethnobotanical Uses of Plants Enumerated in College of Education Campuses, Agbor, Delta State

Scientific Name	Common Name	Local Name	Uses
Albizia zygia (DC) J. F. Macbr.	African Walnut	----------	Food, Ornamental and Medicine
Alchornea cordifolia (Schum & Thonn) Mill. Arg	Christmas bush	Ububo (Igbo)	Medicine, Timber, Dyes and tannin
Alchornea laxiflora	Lowveld bead-	Nkpakokpa (Igbo)	Medicine and Timber

(Benth) Pax & K.	string		
Amaranthus spinosus L.	Spiny amaranth	Nenenme (Igbo)	Food and Medicine
Andropogon gayanus Kunth var gayanus	Ganbagrass	Ikpo agu (Igbo)	Forage, Fibre and Medicine
Andropogon tectorum Schum and Thonn	Giant bluestern	Irunwun (Edo)	Medicine, Fibre
Aneilema beniniense (P. Beauv.) Kunth	Benin aneilema	Obo-ogu uku (Igbo)	Medicine
Anthonotha macrophylla P. Beauv.	----------	Ububa (Igbo)	Food, Timber and Medicine
Aspilia africana (Pers) C.D. Adams	Haemorrhage plant	Auwilinwani	Forages, Medicine
Asystasia gangetica (Linn) T. Anderson	Chinese violet	Ukpom (Igbo)	Ornamental, Medicine and Forage
Axonopus compressus (Sw) P. Beauv.	Broad leaf carpet grass	----------	Forage, Ornamental
Bideus pilosa L.	Cobbler's-pegs	Abere-oloko (Yoruba)	Vegetable, Medicine, Spices and Condiments, Forages
Boerhavia diffusa L.	Red spiderling	Azuigwe (Igbo)	Medicinal and Forage
Boerhavia erecta L.	Erect spiderling	----------	Medicinal and Forage
Brachiaria lata (Schumach) C.E Hubbard	Signal grass	----------	Forages, cereal and pulses
Cassia hirsuta L.	Stinking cassia	Arunfofo (Yoruba)	Food, Medicinal
Cenchrus bifforus Roxb	Burgrass	_____	Forage
Chromolaena odorata (L.) R.M. King & Robinoson (*Eupatorium odoratum* L.)	Siam weed	Nngbuakpu	Medicinal Plant
Clappertonia ficifolia (Wild). D.	Bolo-bolo	----------	Ornamental
Cnestis ferruginea Vahlex DC	Cnestis	Alankite (Igbo)	Ornamental, Medicinal
Combretum racemosum P. Beauv.	Christmas rose	Akoso (Edo)	Ornamental, Medicinal
Commelina diffusa	Climbing day	Ohiowu (Edo)	Forage, Medicinal

Burm f. Morton sny. (=C> nudi Flora L.)	flower		
Cyathula prostrata (L) Blume	Pasture weed	----------	Medicine
Cynodon nlemfuensis Vanderyst	Giant star grass	----------	Forage, Ornamental
Cyperus difformis L.	Flat sedge	Alubasa-igbo	Forage
Dactyloctenium aegyptium (L.) Wild	Beach wire grass	----------	Forage, Medicinal
Desmodium scorpinrus (Sw) Desv (=Hedysarum scorpinrus Sw.	Scorpion ticktrefoil	Isaweworimi (Edo)	Forages
Diodia scandeus Sw	----------	----------	----------
Dissotius rotundifolia (Sm). Triana	Pink lady	Oddor (Igbo)	Medicine
Elaeis guineenis (Jacq)	Oil palm	Nkwu (Igbo)	Food, Medicine
Emilia praetermissa Milne Redhead	Emilia	Nte-ana (Igbo)	Vegetable, Medicine
Eragrostis ciliaris (L.) R.Br	Lovegrass	----------	----------
Eragrostis tenella (L.) Roem and Schult	Feathery lovegrass	----------	----------
Erigeron floribundus (Kunth) Sch. Bip. (=coryza Floubunda H.B. and K)	Fleabane	----------	----------
Euphorbia heterophylla L.	Milkweed	Ogbara-ohu (Igbo)	Medicine, Ornamentals, Essential Oils
Euphorbia hyssopofolia L.	----------	----------	----------
Ficus exasperata V.	Sand paper tree	Anwilinwa (Igbo)	Fibre, Ornamental, Fruit, Medicine
Fimbristylis ferruginea (L.) Vahl	West Indian fimbry	----------	Fibres
Fluerya aestuans (L.) Gaud	Tropical nettleweed	Odoukoko (Igbo)	Medicine
Gomphrena celosiodes Mart	Bachelor's button	Ipopo ale (Yoruba)	Medicine
Hippocratea pallens Planch ex Oliv.	----------	----------	----------

Icacina trichantha	Icacina	Nbilogwu	Medicine
Ipomea involucrata P. Beauv	Morning glory	Eriri-aqwo (Igbo)	Medicine, Forage, Stimulant, Vegetable
Ipomea triloba L.	Threelobe morning glory	----------	Medicine
Mallotus oppositifolius (Geisel). Mull. Arg.	Indian Kamila	Okpokirinyan, Okwe (Igbo)	Medicine, Timber, Forage
Maniophyton fulvum Mull. Arg.	Manniophyton	Egennu (Igbo)	Medicine, Forage
Mariscus alternifolius vahl (=M. Umbellatus vah) Auct. Non Vahl	Mariscus	----------	Spices and Condiments, Fibre, Forage,
Melanthera scandens (Schum & Thonn.) Robbery	Melanthera	Azuzo (Igbo)	Medicine, Forage, Fibre, Vegetable
Melochia corchorifolia L.	Chocolate weed	Emimo-agba (Yoruba)	Vegetable, Forage, Fruit, Medicine
Mimosa invisa Mart. Ex Colla	Giant sensitive plant	----------	----------
Momordica charantia L.	African cucumber	Akpanaudene (Igbo)	Medicine
Oxytenanthera albyssinica	----------	----------	----------
Panicum maximum Jacq.	Guinea grass	Iken, Ikin (Yoruba)	Forage, Food, Medicine
Paspalum orbiculare G. Forst. (=p commersonii Lam).	Ditch millet	----------	----------
Phyllanthus amarus Schum et Thonn	Carry me seed	Egu oza Ngwusunnta (Igbo)	Medicine
Plastostoma africanum P. Beauv	Plastosoma	Eborukhu (Edo)	Medicine
Portulaca quadrifida L.	Ten O'clock plant	Idinle (Yoruba)	Vegetable, Ornamental, Forages,
Richardia brasilensis Gomes	Mexican-Clover	Irawole (Yoruba)	Auxilliary Plant
Schrankia leptocarpa DC	Sensitive Plant	----------	Auxilliary Plant
Scleria verrucosa willed.	----------	----------	----------

Setaria barbata (Lam) Kunth	East Indian bristlegrass	Ele ododo, Nkwono (Igbo)	Forage, Medicine
Sida acuta Burm. f.	Common wireweed	Udo (Igbo)	Medicine, Forage
Sida corymbose R.E Fries	----------	----------	----------
Solenostemon monostachyus (P. Beauv.) Brig.	Catnip	Utolonkpi	Vegetables, Ornamentals, Medicine
Sorghum arundinaceum (Desv) Stapf	Wild Sorghum	Akpakpa enyi miri (Igbo)	Forages, Food, Dyes, Tannins, Medicine, Fuel Plant, Fibre
Spigella anthelima Linn.	Worm weed	Aran, Aparan (Yoruba)	Medicine
Stachytarpheta cayennensis (L.C. Rech) Schan	Blue snakeweed	Obibo (Yoruba)	Medicine, Spices and Condiments
Stachytarpheta indica (Linn.) vahl.	Light-blue snakeweed	Iru-alangba (Yoruba)	Vegetables, Forages, Medicince, Stimulants
Synedrella nodiflora Gaertn.	Pig grass	Ogwu-afo (Igbo)	Medicine, Vegetable, Forages
Talinum triangulare (Jacq) wild	Water leaf	Kpologi (Igbo)	Food
Tridax procumbens Linn.	Coatbuttons	Igbalode (Yoruba)	Forage, Medicine

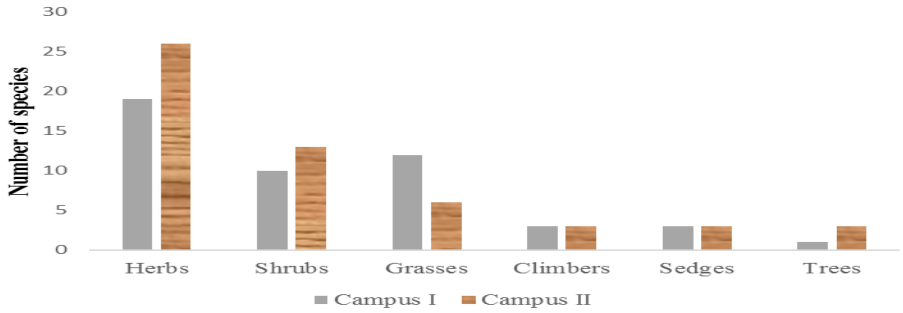

Figure 1: Growth habit of plants species in Campus I and Campus II of College of Education, Agbor, Delta State.

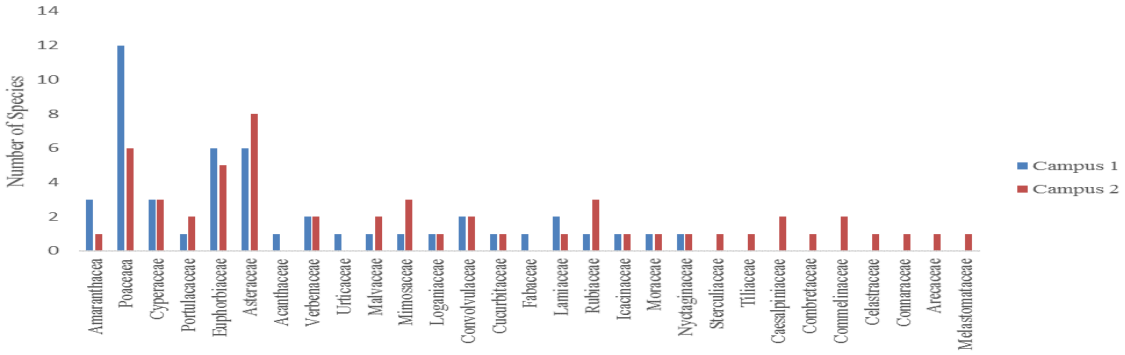

Figure 2: Number of Species of the various Plant Families identified in College of Education, Agbor, Delta State

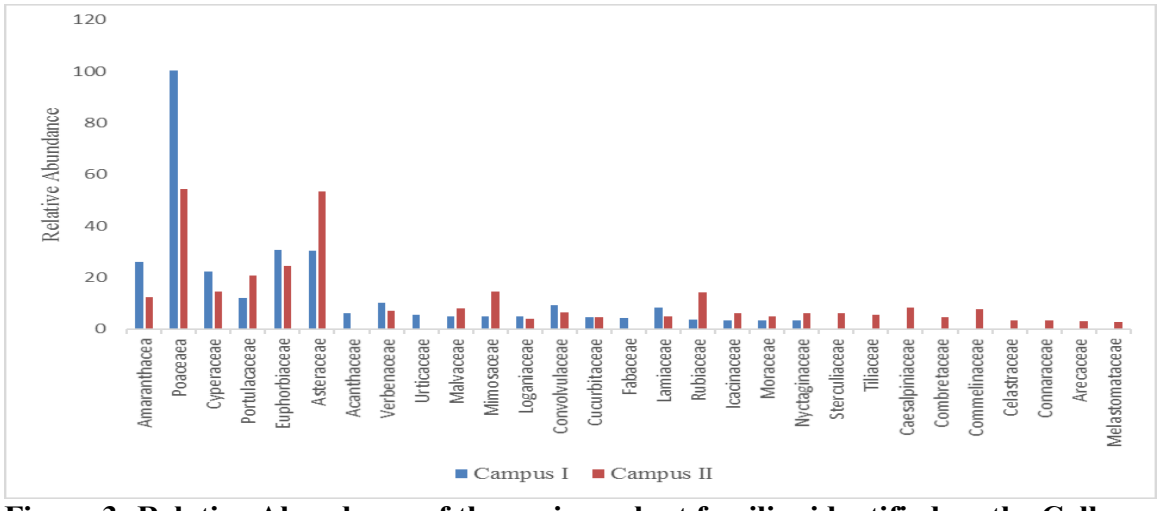

Figure 3: Relative Abundance of the various plant families identified on the College of Education, Agbor, Delta State

Comparing the results of growth habits of plants from Campus I and Campus II, it is clear that Campus I suffers greater disturbance considering the fact that it has a greater number of grass species (12) and just one (1) tree species (Figure 1). Grasses are usually abundant in the first stages of secondary succession because of their tendency to adapt to harsh conditions. They often prepare the way for trees and less tolerant plant species to thrive.

The plant species collected from the two campuses were similar in habits ranging from trees, shrubs, herbs, climbers, grasses and sedges. However, considering the similarity of the vegetation of both sites using Jaccard's similarity coefficient, a value of 0.366 was obtained. The Jaccard's similarity index uses presence and absence data to measure similarity of two vegetation sites. The value of 0.366 obtained shows that there is little similarity between the two sites, with respect to species composition. Results of the study showed that Campus I (old site) had 20 species which were not found in Campus II (new site), while the new site had 25 species unique to it (Tables 3 and 4). This difference in vegetation composition between both sites cannot be attributed to atmospheric, edaphic or topographic factors (since both sites have similar features in this respect), but rather to varying degrees of anthropogenic influences on both sites. The level of similarity (36.6%) between both campuses is due to similar abiotic factors (altitude, soil type and rainfall).

Campus II had more species than campus I and the overall value for relative abundance for Campus II exceeded that of Campus I (Figures 2 and 3). This is possibly because there has been less degradation of the natural environment in Campus II since structural developmental activities were still in progress. Generally, the entire vegetation was heavily impacted by uncontrolled human activities. Prior to the establishment of the College of Education Campuses, Agbor, the areas were covered with huge lush rainforest. But the rapid development from the 1980s onwards which resulted in the construction of lecture halls, administrative buildings, sports facilities and roads have decimated the indigenous flora of the areas.

The main drivers of deforestation have been outlined and highlighted by several authors to be agriculture, logging and mining, use of fuel wood amongst others (Peprah, 2022; FAO & UNEP, 2020; Durugbo *et al* 2012; Alamu & Agbeja, 2011; Pelemo, Akintola, Temowo, Akande & Akoun, 2011; NBSAP, 2011). These factors pose various degrees of threats to biodiversity conservation in Nigeria. In this study, however, habitat degradation for development of several infrastructural facilities in order to satisfy the insatiable human wants, have been identified to be the key problem facing the flora of this area. Increase in population often leading to enrolling more students into the college has resulted into developing more infrastructural facilities for conducive learning environment. Consequently, this encourages continuous degradation of the remnant vegetation to pave away for these infrastructural facilities which put the continued existence of vegetation especially indigenous plant species growing in this area in jeopardy. This agrees with the report published by Orebamijo & Njoku (1968) that the population of several indigenous species are declining to the detriment of man. Schmelzer & Gurib-Fakim (2008) also stated that loss of indigenous knowledge on plants is increasing, especially in Africa as a result of the socio-cultural transformation of societies as well as the demise of the older people who possess this knowledge. As man continues to urbanise, develop structures and utilise the rich flora diversity, priority must be given to conservation, protection and sustainable use of plant species so as to conserve the resources for the coming generation.

Conclusion

The result of this study showed that the number of plant species in the old and new sites of the College of Education, Agbor campuses were one hundred and two (102) species. Habit analysis showed that herbs, shrubs, climbers, grasses, sedges and trees are represented by 45, 23, 6,18, 6 and 4 species respectively on both campuses. The plant species were dominated by Poaceae, Asteraceae, and Euphorbiaceae families. The result of the study reflected poor plant biodiversity in the College of Education, Agbor campuses and great deviation from its expected vegetation structure considering the prevailing climatic conditions of the area. The loss in flora diversity in both campuses can be attributed to the degradation of the natural environment for construction purposes and indiscriminate utilisation of the plant species which is exacerbated by immigration and population growth in the area. Although, development of new structures to meet the goal of quality education is commendable, yet there is a need to evolve an effective means of conserving the species while meeting the educational need. Also, increasing awareness of the values of biodiversity to humans and helping people understand the roles and functions of species and the ecosystem as a whole, as well as the present and future consequences of destruction and over-exploitation of nature would go a long way in curbing habitat loss. Conservation is essential to human welfare and by extension human survival. Failure to conserve the natural flora of any area would lead to an increase in the number of endangered species or those facing extinction.

Recommendations

It is recommended that government bodies enact and enforce policies that make it mandatory for organisations/individuals championing construction projects to make room for protection of the natural biodiversity of the area. Policies should be enacted that give room for ecological experts to work in order to ensure that urbanisation and developmental activities do not alter ecosystem equilibrium in any area. In addition, concerted efforts should be made to manage and protect indigenous plant species effectively by restoring the endangered species through enrichment planting, improving botanical gardens collections and proper storing of germplasm for conservation in appropriate repositories.

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