



Vegetation Status and Conservation Capacity of Flora Adjoining the Wire Mesh Perimeter Fences in Idah L. G. A, Kogi State, Nigeria.

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ABSTRACT

Artificial structure such as wire-mesh fences support unique flora when left undisturbed by humans and animals. Field survey were carried out between the month of November and December, 2021 in four sites in order to determine the floristic composition and structure at different sites of the fences which were obtained from visual surveillance and sample quadrats measuring 100 cm X 100 cm (10000 cm²). Collectively, 36 plants were inventoried. The plants distributed into 20 families had Asteraceae (12) followed by Euphorbiaceae (8), Malvaceae (7), Fabaceae (7) as the most prevalent. Growth form distributions were: shrubs (22.2%), vines (5.6%), herbs (55.6%), trees (5.6%) and lianas (2.8%). Spatial dispersion of these unique floras was determined using Principal Component Analysis (PCA). Structurally, Site A was most species rich while Site C was most diverse and Site B least diverse. Among the plants identified, 4 were recognized as rare to the urban environment, suggesting that the fence may have protected them from weeding, grazing and other anthropogenic activities. This demonstrates that perimeter fences in urban areas could serve as conservation sanctuary for rare native plants and that routine surveys of such sites may yield relics of endemic, rare or endangered native floras in urban setting.

KEYWORDS: Flora, conservation, perimeter fence, endangered, diversity

Introduction

Human activities have radically altered the earth's surface, oceans and atmosphere, especially over the past 200 years. Following human occupation, there have been introductions of exotic plants and animals in a deliberate or accidental manner with consequent alteration of the natural ecological communities. Deforestation, expanding agriculture, illegal fishing and hunting, unplanned tourism and pollution by pesticides have also caused a progressive deterioration of natural habitat (Shende *et al.*, 2015). Human disturbances, particularly from the overexploitation of biological resources generally have negative impacts on species diversity at a global scale (Abadie *et al.*, 2011).

Anthropogenic disturbances could induce habitat degradation by changing soil hydrological conditions, biogeochemical cycles and temperature regime which resulted in the replacement of diverse plant assemblages by widespread tolerant species. Thus over the past two decades, the effects of anthropogenic disturbance on floristic homogenization has become an emerging hotspot in ecology (Blouin *et al.*, 2019).

The knowledge of the state of vegetation in the urban environment will allow for the proper monitoring and detection of ecosystem degradation which will lead to assessing the impacts of habitat loss of vegetation in Nigeria. Artificial structures such as a wire-mesh fence in an open disturbed site often serve as support for spontaneous climbing weedy plants as well as providing protection for opportunistic plants against regular weeding interventions (Aigbokhan and Agianaku, 2015).

MATERIALS AND METHOD

Study Area

The study areas were Ofukolo, Ayeja, Federal Polytechnic Idah (behind Department of Hospitality Management and Technology and also the school field) in Idah Local Government Area of Kogi State.

Idah is a town in Kogi State (Guinea savanna), Nigeria, on the eastern bank of the Niger River in the middle belt region of Nigeria. It is the head-quarter of the Igala Kingdom, and also a Local Government Area with an area of 36 km². Idah had a population of 79,815 at the 2006 census. Modern Idah remains a major trading centre (palm produce, yams, cassava, rice, maize, fish) at the Ega market around the River Niger.

RESULTS

Table 2. Numbers of species found at site A (Ofukolo)

S/No	Name of Species	Total No Of Plant Species (A)	No Of Quadrat Which Each Species Occupy	Total No Of Quadrat Studied	%Frequency	Frequency Class	Density
1	<i>Luffa cylindrical</i>	75	10	10	100	E	7.5
2	<i>Azadirachta indica</i>	61	9	10	90	E	6.1
3	<i>Urena lobata</i>	55	9	10	90	E	5.5
4	<i>Mariscus sp</i>	48	7	10	70	D	4.8
5	<i>Bidens bipinnata</i>	50	8	10	80	D	5.0
6	<i>Crotalaria retusa</i>	68	9	10	90	E	6.8
7	<i>Gomphrena celosioides</i>	61	8	10	80	D	6.1
8	<i>Senna occidentalis</i>	69	9	10	90	E	6.9
9	<i>Boerhavia diffusa</i>	57	7	10	80	D	5.7
10	<i>Side acuta</i>	54	7	10	70	D	5.4
11	<i>Chromolaena odorata</i>	71	9	10	90	E	7.1
12	<i>Cassia sp</i>	67	7	10	70	D	6.7
13	<i>Ficus apiocarpa</i>	54	7	10	70	D	5.4
14	<i>Asystasis gangetica</i>	56	8	10	80	D	5.6
15	<i>Caladium bicolor</i>	36	6	10	60	C	3.6
16	<i>Chlerodendrum splendens</i>	53	8	10	80	D	5.3
17	<i>Jatropha gossypifolia</i>	33	6	10	50	C	3.3
18	<i>Tithonia diversifolia</i>	55	9	10	90	E	5.5
19	<i>Laportea aestuans</i>	24	6	10	60	C	2.4
20	<i>Centrosema pubescens</i>	34	7	10	70	D	3.4
21	<i>Adenopus breviflorus</i>	33	6	10	60	C	3.3
22	<i>Macrosphyra longistyla</i>	36	6	10	60	C	3.6

Table 3. Numbers of species found at site B (Ayeja)

S/No	Name Of Species	Total No Of Plant Species (A)	No Of Quadrat Which Each Species Occupy	Total No Of Quadrat Studied	%Frequency	Frequency Class	Density
1	<i>Jatropha heterophyllum</i>	41	8	10	80	D	4.1
2	<i>Amaranthus spinosus</i>	35	6	10	60	C	3.5
3	<i>Datura stramonium</i>	47	9	10	90	E	4.7
4	<i>Calotropis procera</i>	24	5	10	50	C	2.4
5	<i>Side acuta</i>	45	8	10	80	D	4.5
6	<i>Biden bipinnata</i>	50	7	10	70	D	5.0

Table 4. Numbers of species found at site C (Behind Department of Hospitality & Mgt.)

S/No	Name Of Species	Total No Of Plant Species (A)	No Of Quadrat Which Each Species Occupy	Total No Of Quadrat Studied	%Frequency	Frequency Class	Density
1	<i>Alternanthera brasiliana</i>	38	7	10	70	D	3.8
2	<i>Biden bipinnata</i>	51	8	10	80	D	5.1
3	<i>Centrosema pubescens</i>	45	7	10	70	D	4.5
4	<i>Ipomoea involucrate</i>	52	9	10	90	E	5.2
5	<i>Vernonia amygdalina</i>	21	6	10	60	C	2.1
6	<i>Mariscus sp</i>	48	8	10	80	D	4.8
7	<i>Gomphrena sp</i>	22	5	10	50	C	2.2

8	<i>Euphorbia heterophylla</i>	44	8	10	80	D	4.4
9	<i>Tithonia diversifolia</i>	68	10	10	100	E	6.8
10	<i>Tridax procumbens</i>	39	6	10	60	C	3.9
11	<i>Cassia sp</i>	21	8	10	80	D	2.1
12	<i>Pennisetum pedicellatum</i>	16	8	10	80	D	1.6
13	<i>Azadirachta indica</i>	5	4	10	40	B	5.0
14	<i>Spigelia anthelmia</i>	6	5	10	50	C	6.0
15	<i>Euphorbia hirta</i>	19	7	10	70	D	1.9
16	<i>Side acuta</i>	16	6	10	60	C	1.6

Table 5: Numbers of species found at site D (Federal Polytechnic Idah football field)

S/No	Name Of Species	Total No Of Plant Species (A)	No Of Quadrat Which Each Species Occupy	Total No Of Quadrat Studied	%Frequency	Frequency Class	Density
1	<i>Centrosema pubescens</i>	49	9	10	90	E	4.9
2	<i>Pennisetum pedicellatum</i>	41	8	10	80	D	4.1
3	<i>Tridax procumbens</i>	102	10	10	100	E	10.2
4	<i>Azadirachta indica</i>	47	8	10	80	D	4.7
5	<i>Chromolaena odorata</i>	42	7	10	70	D	4.2
6	<i>Euphorbia heterophylla</i>	44	8	10	80	D	4.4
7	<i>Asystasis gangetica</i>	31	6	10	60	C	3.1
8	<i>Panicum maximum</i>	19	5	10	50	C	1.9
9	<i>Urena lobata</i>	33	7	10	70	D	3.3
10	<i>Side acuta</i>	58	9	10	90	E	5.8
11	<i>Vitex doniana</i>	35	7	10	60	C	3.5

Table 6. Abundance of Individual species for the four locations

	Site A	Site B	Site C	Site D
<i>Luffa cylindrica</i>	75	0	0	0
<i>Azadirachta indica</i>	61	0	5	47
<i>Urena lobata</i>	55	0	0	33
<i>Mariscus sp.</i>	48	0	48	0
<i>Bidens bipinnata</i>	50	50	51	0
<i>Crotalaria retusa</i>	68	0	0	0
<i>Gomphrena celosoides</i>	61	0	22	0
<i>Senna occidentalis</i>	69	0	0	0
<i>Boerhavia diffusa</i>	57	0	0	0
<i>Sida acuta</i>	54	45	16	58
<i>Chromolena odorata</i>	71	0	0	42
<i>Cassia sp.</i>	67	0	21	0
<i>Ficus apiocarpa</i>	54	0	0	0
<i>Asystasis gangetica</i>	56	0	0	31
<i>Caladium bicolor</i>	36	0	0	0
<i>Chlerodendrum splendens</i>	53	0	0	0
<i>Jatropha gossypifolia</i>	33	0	0	0
<i>Tithonia diversifolia</i>	55	0	68	0
<i>Laportea aestuans</i>	24	0	0	0
<i>Centrosema pubescens</i>	34	0	45	49
<i>Adenopus breviflorus</i>	33	0	0	0
<i>Macrosphyra longistyla</i>	36	0	0	0
<i>Jatropha curcas</i>	0	41	0	0
<i>Amaranthus spinosus</i>	0	35	0	0
<i>Datura stramonium</i>	0	47	0	0
<i>Calotropis procera</i>	0	24	0	0

<i>Alternanthera brasiliana</i>	0	0	38	0
<i>Ipomoea involucreta</i>	0	0	52	0
<i>Vernonia amygdalina</i>	0	0	21	0
<i>Euphorbia heterophylla</i>	0	0	44	44
<i>Tridax procumbens</i>	0	0	39	102
<i>Pennisetum pedicellatum</i>	0	0	16	41
<i>Spigellia anthelmia</i>	0	0	6	0
<i>Euphorbia hirta</i>	0	0	19	0
<i>Panicum maximum</i>	0	0	0	19
<i>Vitex doniana</i>	0	0	0	35
Number of species	22	6	16	11
Number of individuals	1150	242	511	501

Table 7. Distribution of growth form of vegetation found at wire mesh

Growth form/habit	No of species	Relative (%)
Sedge	1	2.8
Grass	2	5.6
Liana	1	2.8
Tree	2	5.6
Herb	20	55.6
Shrub	8	22.2
Vine	2	5.6
Total	36	

Table 8: Summary of mean estimates of different vegetation indices derived from ten quadrat samples at the different sites of the wire-mesh fence

Vegetation Index	Site_A	Site_B	Site_C	Site_D
Taxa_S	22	6	16	11
Individuals	1150	242	511	501
Dominance_D	0.04867	0.1744	0.08218	0.1091
Simpson_1-D	0.9513	0.8256	0.9178	0.8909
Shannon_H	3.054	1.767	2.602	2.311
Evenness_e^H/S	0.9632	0.9751	0.8435	0.9165
Brillouin	3.002	1.713	2.531	2.257
Menhinick	0.6487	0.3857	0.7078	0.4914
Margalef	2.98	0.9109	2.405	1.609
Equitability_J	0.9879	0.9859	0.9386	0.9636
Fisher_alpha	3.859	1.114	3.138	1.988
Berger-Parker	0.06522	0.2066	0.1331	0.2036

Table 9. Common and Uncommon plant species found at the different sites of the perimeter fence

Common plant species	Uncommon plant species
<i>Luffa cylindrica</i>	<i>Chlerodendrum splendens</i>
<i>Azadirachta indica</i>	<i>Adenopus breviflorus</i>
<i>Urena lobata</i>	<i>Macrosphyra longistyla</i>
<i>Mariscus sp.</i>	<i>Alternanthera brasiliana</i> (Invasive)
<i>Bidens bipinnata</i>	
<i>Crotalaria retusa</i>	
<i>Gomphrena celosiodes</i>	
<i>Senna occidentalis</i>	
<i>Boerhavia diffusa</i>	

Sida acuta
Chromolena odorata
Cassia sp.
Ficus apiocarpa
Asystasis gangetica
Caladium bicolor
Jatropha gossypifolia
Tithonia diversifolia
Laportea aestuans
Centrosema pubescens
Jatropha curcas
Amaranthus spinosus
Datura stramonium
Calotropis procera
Ipomoea involucrata
Vernonia amygdalina
Euphorbia heterophylla
Tridax procumbens
Pennisetum pedicellatum
Spigelia anthelmia
Euphorbia hirta
Panicum maximum
Vitex doniana

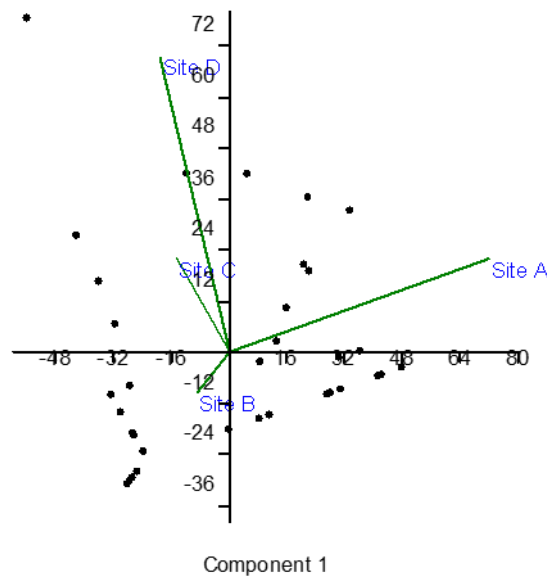


Figure 2: Principal Component Analysis (PCA) comparing spatial displacement of the different sites of the perimeter wire-mesh fence based on presence or absence of plant taxa.

DISCUSSION

A total of 36 plants were found in all the location as shown in Table 6. Table 2, 3, 4 and 5 shows the number of species found at different sites (Site A, Site B, Site C and Site D). The identified plants were distributed into 20 families. Members of the Asteraceae were the most represented (12) followed by Euphorbiaceae (8), Malvaceae (7) and Fabaceae (7). Frequency distribution of family grouping around the wire mesh at different sites is shown in Figure 4.

Overall relative frequency distribution of the growth habit of the observed plants (Table 7) shows that herbs was the most predominant categories each with 20 species or 55.6%, followed by shrubs with 8 (22.3%), grass, trees, vine had 2 (5.6%), while sedge and lianas had 1 (2.8%) respectively. Collectively, climbers (vines and lianas) accounted for 3 (8.4%), woody shrubs and trees 10 (27.8%), and herbaceous plants 23 (64.0%). Cumulative plant growth form distribution at different site of the fences is shown in Figure 5.

Estimates of plant community structure using different parameters are shown in Table 8. Fewer number of plant taxa (6) and fewer individuals (242) were recorded from Site B of the fence than in others sites. More individuals were recorded for Site A and Site A also had the highest number of plant taxa (22). The Shannon Weiner indicate that the highest plant diversity (3.054) was evident at the Site A, also Simpson's indices had the highest plant diversity (0.9513) at Site A. Site B had the most dominance (0.1744) (Suding, 2001; Calvo *et al.*, 2011).

Scatter diagram obtained from the Principal Component Analysis (PCA) which indicates the presence and absence of data of plant species from the different sites is shown in Figure 2. Dispersion along PC1 axis were mainly influenced due to the presence of *Luffa cylindrica* (47.554), *Senna Occidentalis* (41.911), *Crotalaria retusa* (40.97); and the absence of *Tridax procumbens* (-56.33), *Euphoria heterophylla* (-42.615), *Pennisetum pedicellatum* (-36.453). For PC2 axis, dispersion observed were due to the presence of *Tridax procumbens* (78.531), *Centrosema pubescens* (42.075), *Siden acuta* (41.937) and the absence of *Datura stramonium* (-30.905), *Jatropha curcas* (-30.154), *Amaranthus spinosus* (-29.402). The increases in plant diversity were due to habitat heterogeneity arising from abundance of disturbance-generated establishment opportunities linked to human activities (Tredici, 2010).

Table 9 lists 32 common plant species and 4 uncommon plants rare to the urban environment of Idah Local Government Area, Kogi State metropolis. Among the rare plants, the following three species *Adenopus breviflorus*, *Macrosphyra longistyla* and *Chlerodendrum splendens* were considered as extremely rare.

CONCLUSION

This study provides information on the vegetation status and conservation potential of flora adjoining the wire mesh perimeter fences in Idah L. G. A, Kogi State, Nigeria. The identification of the vegetation has greatly improved our knowledge about vegetation and their significance; this is a vital component in the development of green environment.

The wire-mesh in the study areas supports conservation and preservation of endangered and rare flora.

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APPENDIXES

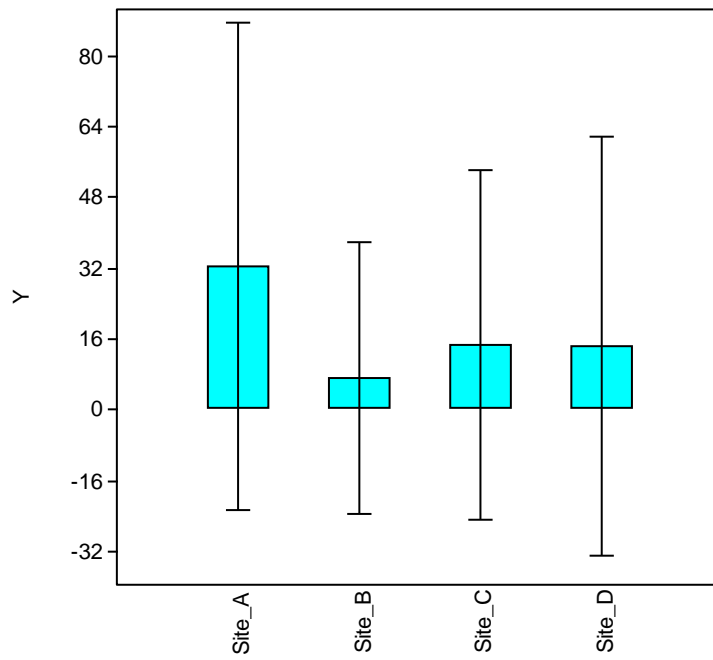


Figure 3: Bar plot for the Sites with Standard Deviation

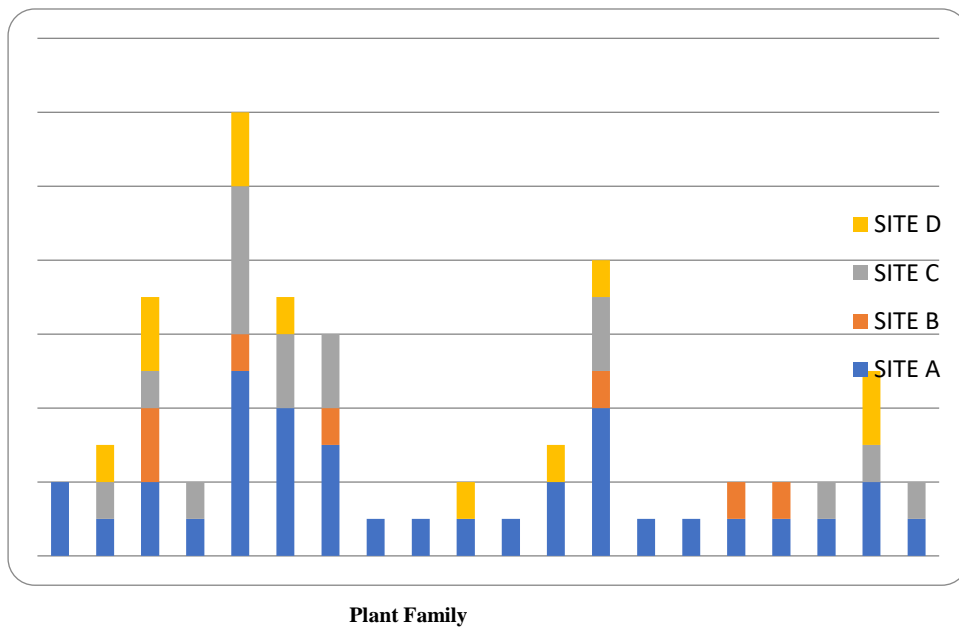


Figure 4: Frequency distribution of family grouping around the wire mesh at different sites

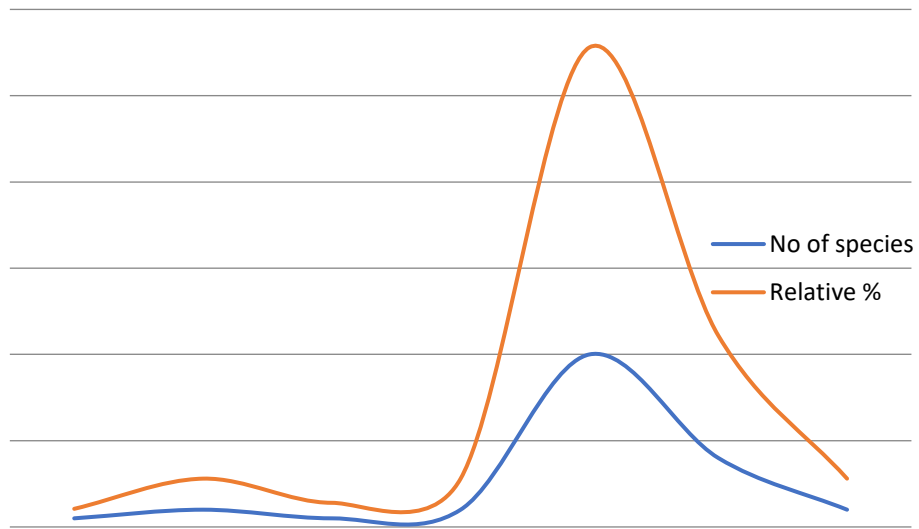


Figure 5: Cumulative plant growth form distribution

Unidentified plants found in the precinct of Site A of the wire -mesh perimeter fence.

Plate 1



Plate 2



Plate 3

