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ASSESSMENT OF FLORISTIC COMPOSITION OF FOREST UNDERGROWTH OF INTERNATIONAL INSTITUTE OF TROPICAL AGRICULTURE (IITA) FOREST RESERVE IBADAN, NIGERIA.

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ABSTRACT
Assessment of understorey species of a tropical rainforest ecosystem in South-western Nigeria, exemplified by International Institute of Tropical Agriculture (IITA) forest reserve, Ibadan. A total of twenty-four permanent sample plots of 0.0625 ha were used for the assessment of understorey composition, density and frequency. Relative frequency, Relative Density and Importance Value Index (IVI), similarity, diversity and Detrended Correspondence Analaysis (DCA) statistics were used to analyse the data. The result showed a total of 3,833 individual from 128 species and 44 families (28 shrub, 57 trees, 33herbs, 2 grasses and 8 climbers) were identified. Papilonaceae had the height number of species (11) followed by Moraceae (10), Albizia zygia had the height frequency of occurency (24), density of 169.33/ha. However Culcasia scandens had the height density of 299.33/ha. Highest Importance value index of 13.82 was recorded for Culcasia scandens, followed by Chromolaena odorata (11.80). The least (IVI) 0.18 was recorded for Blepharis maderaspatensis, Carica papaya, Cissus piñata. Similarity between paired plots varied from 0.16 to 0.75, Simpson diversity (0.9529) and dominance of 0.0471, number of species present in each of the plot ranged from 0-39. Plot 84 had the heighest species (39), high Eigen value (73.7%), length of ordination space (-2 to 6) and the location of all the plots in the first quadrant indicated that the environment was stable indicative of minimal variation in floristic composition between plots and high heterogeneity of the site and species respectively. These findings showed that the IITA forest is diverse in species composition and the diversity of the understory may act as a catalyst for successful natural forest succession. Hence may be creating a more favourable environment for the establishment of native forest flora and habitat for fauna. Ultimately may be leading to conserving biological diversity. The study eventually concluded that a proper protection from human interferences and scientific management of undergrowth of the study area may lead to biodiversity rich site in the country.

INTRODUCTION
The loss and fragmentation of tropical forest is the single greatest threat to the world's biological diversity (Whitemore 1990, Huston 1994). The conservation on biological diversity 1992 highlighted that measures must be implemented for the conservation of natural ecosystems, especially for the tropical forests, which are famous for being the most species rich in ecosystems on earth.

Tropical rainforests are in class by themselves as the earth's most species-rich vegetation areas not only do they have many more tree species than any other vegetation type, but they are also exceedingly rich in non-tree species (Gentry and

Dodson, 1987). The non- tree species in tropical rainforests comprises the largest proportion of the forest diversity and tends to be strongly responsive to the environmental gradients. It may be used as an indicator of altered edaphic and environmental conditions, particularly relative to anthropogenic disturbance and natural hazards (Gilliam and Robert, 2003). In the past few decades, most quantitative studies in the tropical rainforests were focused on some selected life-forms such as lianas (Putz, 1984; Chittibabu and Parthesarathy, 2000;) or of a defined minimum diameter (Valencia et al. 1994; Parthasarathy. 1999;)

The understory plant species are often considered indicators of soil moisture and nutritional status and contribute the degree of biodiversity in forest ecosystem (Tremblay and Larocque, 2001). Compared to other components of forest ecosystems, relatively less attention has been given to the quantitative inventory of understory species in the tropical rainforests, probably because they represent very small proportion of the total biodiversity in the forest ecosystems. However, many understory species may affect the development of dominant tree species at seedling stage by regulating nutrient cycles, modifying microclimatic conditions, or competing for site resources (Gilliam and Robert, 2003; George and Bazzaz, 1999).

A good knowledge of the plant species, composition and structured ,diversity and understorey plant species in forest will help us to have an idea of the plants that survive under canopy cover. Therefore, there is need to list, quantify and assess the diversity of the wildlings, shrubs, herbs and grasses of the International Institute of Tropical Agriculture (I.I.T.A) forest, Ibadan. Hence the obejectives of this study includes identifying important understorey species, families and to provide a quantitative description of the structure and floristic composition of understorey species in International Institute of Tropical Agriculture (I.I.T.A) forest, Ibadan.

MATERIALS AND METHOD

STUDY AREA

The study area is located on the one thousand hectares land in the International Institute of Tropical Agriculture (I.I.T.A) campus at Idi-Ose, North of Ibadan. It is located on longitude 7^0 30^{1}N and latitude 3^0 55^{1}E and 243 m above sea level. The rolling topography is dominated by slopes that are 3-10 % (Ano. 1967, Moormann et al., 1975). The area is under-lain by metamorphic rocks of pre-cambrian basement complex, consisting largely of banded gneiss alternating with strata of quartzites and quartz schists. The soils are predominately Ferric Luvisols (Moormann et al., 1975).

The site falls within the humid tropical lowland region with two distinct seasons: the longer wet season and shorter dry season. The rainfall pattern has bimodal peak with an annual total ranges between 1,300-1,500 mm most of which falls between May and September. The average daily temperature ranges between 21^{0}C-23^{0}C while the maximum is between 28^{0}C and 34^{0}C . Mean relative humidity is in the range of 64-84% (Hall and Okali, 1979, Osunsina, 2004).

DATA COLLECTION

Data collection for this study was done within the twenty-four (25 m x25 m) Permanent sample plots established in 1979 by Hall and Okali, The plots were chosen to allow for monitoring and comparison of changes in forest regeneration after 35years. Within each plot ten (2 mx2 m) quadrants were further laid for easy assessment of the understory. Species present within each of the quadrants were counted and identified. Species that could not be identified on the field were collected and taken to the University herbarium for proper identification.

STATISTICAL ANALYSIS.

Standard procedure were followed to calculate density,frequency, abundance,relative density(R.D), relative abundance(R.A), and important value index(IVI) of the species. Relative density, relative frequency and important value index were to be calculated according to the formulae of Dumbois Muller and Ellenberg (Soerianegara and Indrawan 1998, Setiadi et al 2001). Diversity indices were computed by using the pooled data for all species; in the 24 sample plot using PAST - PAlaeontological Statistics, ver. 2.08. The diversity of understory. Simpson Diversity and Shannon Diversity index was also used to carried out similarities between the species in the plots. Detrended Correspondence Analysis (DCA) was also carried out on the data to elucidate the relationship that exists between plots and species

RESULT

FLORISTIC COMPOSITION AND STRUCTURE OF UNDERSTOREY SPECIES

A total of 3,833 individual representing 128 species and 44 families (57 trees, 33 herbs, 28 shrubs, 8 climbers and 2 grasses) were encountered during the study. Papilionaceae had the highest number of species (11) followed by Moraceae (10), Euphobiaceae (8), Agavaceae, Acanticiae, Anacardiaceae, Bombaceae, Caricaceae, Curcubitaceae, Ebenaceae had one species each (Table 1). Albizia zygia had the highest frequency of occurrence (24) with density of 116/ ha followed by Chassalia kolly (20), density of 169.33/ha. However Culcasia scandens had the highest density of 299.33/ha with frequency of 14, followed by Chromolaena odorata (244; 15), Alchornea cordifolia (230.67/ha; 18) (table 1). Species like Drypetes gilgiana, Solanum erianthum, Hildergardia barteri, had frequency of one. Important Value Index value of the understorey are presented in Table 1. Culcasia Scandens had the highest IVI of 13.82, followed by Chromolaena odorata (11.80) and the least IVI of 0.18 was recorded for Blepharis maderaspatensis, Carica papaya, Cissus piñata, Cleistopholuss pattens, Cola nitida and Combretum zenkeri. From the total of 3,833 individuals of understorey encountered, 1018 are trees from 57 species. Accounting for 27.1% of the total population.

SIMILARITY AND DIVERSITY INDICES OF UNDERSTOREY SPECIES

Table (2) present the Simpsons similarity between paired plots which varied from 0.16 to 0.75 for all the plots. Species diversity was generally high, this was reflected in 128 species, Simpsons diversity index 0.9529, and low dominance value (0.0471). The number of individual (density) species present in all the plots ranged from 90-226. Number of species present in each of the plot ranged from 6-39, the plot with the highest species composition included plots 84 (39), plots 37, 68 and 60 had 35 species each. Plot 6 and 69 had the least no of species (6) each. However dominance was generally high in plot 6 (0.384), plot 69 (0.291), plot 49 (0.21), plot 70 (0.166), plot 84 had the least dominance (0.052). Simpsons diversity was generally high in all the plots except in plot 6 and 69 (0.616) and (0.719) respectively. High diversity value was recorded in plot 84 (0.948) and high species composition

Table 1: Density (D), Frequency (F), Relative Density (RD), Relative Frequency (RF) and Relative Importance Value (RIV) of Understorey species in the Study Area.

Species	CODE	Form	Family	D/1.5	D/Ha	F	RF	RD	IVI
Abrus precatorius	ABPR	climber	papilionaceae	20	13.33	20.83	0.75	0.52	1.27
Adenia lobata	ADLO	herb	passifloraceae	6	4	12.5	0.45	0.16	0.61
Afzelia africana	AFAF	tree	Caesalpiniaceae	13	8.67	4.167	0.15	0.34	0.49
Agbaarin	AGBA			3	2	4.167	0.15	0.08	0.23
Albizia ferruginea	ALFE	tree	Mimosaceae	6	4	12.5	0.45	0.16	0.61
Albizia glaberima	ALGL	tree	Mimosaceae	2	1.33	4.17	0.15	0.05	0.20
Albizia zygia	ALZY	tree	Mimosaceae	174	116	100	3.60	4.54	8.14
Alchornea cordifolia	ALCO	shrub	Euphorbiaceae	346	230.67	75	2.70	9.03	11.73
Allophylus africanus	ALAF	herb	sapindaceae	2	1.33	4.17	0.15	0.05	0.20
Anchomanes difformis	ANDI	herb	araceae	27	18	20.83	0.75	0.70	1.45
Antiaris africana	ANAF	tree	Moraceae	2	1.33	8.33	0.30	0.05	0.35
Antiaris toxicaira	ANTO	tree	Moraceae	21	14	29.17	1.05	0.55	1.60
Aristolochia albida	ARAL	herb	aristolochiaceae	2	1.33	4.17	0.15	0.05	0.20
Aristolochia elgon	AREL	herb	Aristolochiaceae	2	1.33	4.17	0.15	0.05	0.20
Aristolochia ringens	ARRI	herb	Aristolochiaceae	10	6.67	12.5	0.45	0.26	0.71
Asplia africana	ASAF	herb	asteraceae	9	6	16.67	0.60	0.23	0.83
Baphia nitida	BANI	tree	Papilionaceae	24	16	41.67	1.50	0.63	2.13
Blepharis maderaspatensis	BLME	herb	Acanthaceae	1	0.67	4.17	0.15	0.03	0.18
Blighia sapida	BLSA	tree	Sapindaceae	12	8	25	0.90	0.31	1.21
Blighia unijugata	BLUN	tree	Sapindaceae	19	12.67	37.5	1.35	0.50	1.85
Bridelia micrantha	BRMI	tree	Euphorbiaceae	6	4	8.33	0.30	0.16	0.46
Bridelia micrantha	BRMI	tree	Euphorbiaceae	2	1.33	8.33	0.30	0.05	0.35
Brysocarpus coccineaus	BRCO	herb	Connaraceae	59	39.33	45.83	1.65	1.54	3.19
Caesalpinia bonduc	CEBO	shrub	Caesalpiniaceae	8	5.33	4.17	0.15	0.21	0.36
Capiscum fruitscens	CAFR	herb	Solanaceae	2	1.33	4.17	0.15	0.05	0.20
Carica papaya	CAPA	tree	Caricaceae	1	0.67	4.17	0.15	0.03	0.18
Carpolobia lutea	CALU	shrub	Polygalaceae	50	33.33	66.67	2.40	1.30	3.70
Ceiba paetandra	CEPA	tree	Bombacaceae	2	1.33	8.33	0.30	0.05	0.35
Celtis midberii	CEMI	tree	Ulmaceae	16	10.67	33.33	1.20	0.42	1.62
Celtis zenkeri	CEZN	tree	Ulmaceae	72	48	62.5	2.25	1.88	4.13
Centrocema pubscens	CEPU	climber	papilionaceae	6	4	12.5	0.45	0.16	0.61
Chassalia kolly	CHKO	herb	Rubiaceae	254	169.33	83.33	3.00	6.63	9.63
Chromolaena odorata	CHOD	herb	asteraceae	366	244	62.5	2.25	9.55	11.80
Chrysophyllum albidum	CHAL	tree	sapotaceae	6	4	12.5	0.45	0.16	0.61
Cissampelos oweriensis	CIOW	herb	Menispermaceae	27	18	37.5	1.35	0.70	2.05
Cissus adenopoda	CIAD	herb	Vitaceae	66	44	50	1.80	1.72	3.52
Cissus aralioides	CIAR	herb	Vitaceae	2	1.33	8.33	0.30	0.05	0.35
Cissus pinata	CIPI	herb	Vitaceae	1	0.67	4.17	0.15	0.03	0.18
Clausenia anisata	CLAN	herb	Rutaceae	23	15.33	37.5	1.35	0.60	1.95
Cleitophylis pattens	CLPA	herb	Annonaceae	1	0.67	4.17	0.15	0.03	0.18
Cnestis ferruginea	CNFE	shrub	Connaraceae	108	72	75	2.70	2.82	5.52
Coffea canephora	COCA	tree	Rubiaceae	3	2	4.17	0.15	0.08	0.23

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Clausenia anisata	CLAN	herb	Rutaceae	23	15.33	37.5	1.35	0.60	1.95
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Cnestis ferruginea	CNFE	shrub	Connaraceae	108	72	75	2.70	2.82	5.52
Coffea canephora	COCA	tree	Rubiaceae	3	2	4.17	0.15	0.08	0.23
Cola millenii	COMI	tree	Sterculiaceae	32	21.33	50	1.80	0.84	2.64

Cola nitida	CONI	tree	Sterculiaceae	1	0.67	4.17	0.15	0.03	0.18
Combretum hispidum	COHI	shrub	Combretaceae	63	42	37.5	1.35	1.64	2.99
Combretum racemosum	CORA	shrub	Combretaceae	19	12.67	16.67	0.60	0.50	1.10
Combretum spp	COHI	shrub	Combretaceae	29	19.33	33.33	1.20	0.76	1.96
Combretum zenkeri	COZE	tree	Combretaceae	1	0.67	4.17	0.15	0.03	0.18
Comelina bengalensis	COBE	herb	commelinaceae	5	3.33	12.5	0.45	0.13	0.58
Culcasia scandens	CUSC	herb	Araceae	449	299.33	58.33	2.10	11.71	13.81
Cyathula prostrata	CYPR	grass	amaranthaceae	28	18.67	12.5	0.45	0.73	1.18
Deinboilia pinnata	DEPI	tree	Sapindaceae	10	6.67	25	0.90	0.26	1.16
Dialum guinensis	DIGU	tree	Caesalpiniaceae	7	4.67	16.67	0.60	0.18	0.78
Dioscorea bulbifera	DIBU	climber	dioscoraceae	3	2	12.5	0.45	0.08	0.53
Dioscorea dumetorum	DIDU	climber	dioscoraceae	3	2	4.17	0.15	0.08	0.23
Diospyros mobuttensis	DIMO	tree	Ebenaceae	12	8	29.17	1.05	0.31	1.36
Draceana arborea	DRAR	shrub	Agavaceae	18	12	25	0.90	0.50	1.37
Drypetes floribunda	DRYP	shrub	Euphorbiaceae	7	4.67	4.17	0.15	0.18	0.33
Entradophagma angolensis	ENAN	tree	Meliaceae	4	2.67	8.33	0.30	0.10	0.40
Eudenia trifoliolata	EUTR	herb	Capparidaceae	7	4.67	12.5	0.45	0.18	0.63
Fagara santolinoides	FASA	shrub	Rutaceae	3	2	4.17	0.15	0.08	0.23
fern	FERN	herb		18	12	16.67	0.60	0.50	1.07
Ficus capensis	FICA	tree	Moraceae	2	1.33	4.17	0.15	0.05	0.20
Ficus exasperata	FIEX	tree	Moraceae	19	12.67	29.17	1.05	0.50	1.55
Ficus mucuso	FIMU	tree	Moraceae	3	2	8.33	0.30	0.08	0.38
Ficus sur	FISU	tree	Moraceae	1	0.67	4.17	0.15	0.03	0.18
Futumia elastica	FUEL	tree	Apocynaceae	11	7.33	25	0.90	0.29	1.19
Gliricidia sepium	GLSA	tree	Papilionaceae	28	18.67	12.5	0.45	0.73	1.18
Glypheea brevis	GLBR	tree	Tiliaceae	12	8	16.67	0.60	0.31	0.91
Grewia campanifolia	GRCA	tree	Tiliaceae	49	32.67	45.83	1.65	1.28	2.93
Haemanthus nultiflorus	HANU	herb	amaryllidaceae	5	3.33	4.17	0.15	0.13	0.28
Hildebergia	HILD	tree	Sterculiaceae	4	2.67	4.17	0.15	0.10	0.25
Holarrhena floribunda	HOFL	tree	Apocynaceae	4	2.67	8.33	0.30	0.10	0.40
Hoslundia opposita	HOOP	shrub	Lamiaceae	5	3.33	8.33	0.30	0.13	0.43
Icacina trichanta	ICTR	herb	Icacinaceae	135	90	66.67	2.40	3.52	5.92
Ipomea spp	IPSP	herb	Convolvulaceae	1	0.67	4.17	0.15	0.03	0.18
Ipomoea invoculata	IPIN	herb	Convolvulaceae	3	2	4.17	0.15	0.08	0.23
Isirigun	ISIRI			2	1.33	4.17	0.15	0.05	0.20
Lecaniodiscus cupanioides	LECU	tree	Sapindaceae	46	30.67	75	2.70	1.20	3.90
Lepsistema oweriensis	LEOW	shrub	Convolvulaceae	2	1.33	4.17	0.15	0.05	0.20
Leptoderis brachyptera	LEBR	shrub	Papilionaceae	28	18.67	50	1.80	0.73	2.53
Lonchocarpus cyanescens	LOCY	shrub	Papilionaceae	16	10.67	37.5	1.35	0.42	1.77
malacantha alnifolia	MAAL	tree	Sterculiaceae	68	45.33	37.5	1.35	1.77	3.12
Mallotus oppositifolius	MAOP	shrub	Euphorbiaceae	50	33.33	45.83	1.65	1.30	2.95
Mangifera indica	MAIN	tree	Anacardiaceae	1	0.67	4.17	0.15	0.03	0.18

Table 2: Similarity Indices of Plant Species

	plot14	plot8	plot68	plot90	plot49	plot37	plot57	plot48	plot95	plot76	plot89	plot41	plot64	plot26	plot84	plot97	plot86	plot70	plot28	plot60	plot17	plot30
plot14	1.00																					
plot8	0.60	1.00																				
plot68	0.67	0.60	1.00																			
plot90	0.50	0.40	0.62	1.00																		
plot49	0.75	0.63	0.67	0.50	1.00																	
plot37	0.57	0.68	0.57	0.62	0.75	1.00																
plot57	0.52	0.48	0.68	0.44	0.50	0.60	1.00															
plot48	0.47	0.36	0.41	0.54	0.46	0.50	0.28	1.00														
plot95	0.41	0.40	0.41	0.50	0.38	0.52	0.52	0.41	1.00													
plot76	0.33	0.24	0.33	0.35	0.21	0.37	0.24	0.37	0.41	1.00												
plot 89	0.53	0.44	0.41	0.54	0.42	0.53	0.36	0.47	0.59	0.37	1.00											
plot41	0.53	0.48	0.43	0.50	0.63	0.60	0.48	0.50	0.59	0.33	0.65	1.00										
plot64	0.52	0.39	0.43	0.39	0.48	0.61	0.43	0.48	0.70	0.30	0.70	0.83	1.00									
plot26	0.40	0.24	0.32	0.38	0.42	0.35	0.44	0.31	0.48	0.41	0.47	0.56	0.65	1.00								
plot84	0.50	0.48	0.43	0.54	0.50	0.51	0.56	0.47	0.59	0.33	0.56	0.61	0.74	0.53	1.00							
plot97	0.48	0.48	0.48	0.46	0.46	0.59	0.60	0.45	0.52	0.30	0.52	0.62	0.57	0.48	0.62	1.00						
plot86	0.27	0.16	0.19	0.31	0.25	0.31	0.24	0.38	0.46	0.31	0.50	0.58	0.52	0.65	0.54	0.46	1.00					
plot70	0.36	0.27	0.41	0.36	0.41	0.41	0.32	0.32	0.45	0.41	0.59	0.59	0.41	0.68	0.59	0.45	0.64	1.00				
plot28	0.40	0.44	0.41	0.50	0.46	0.50	0.56	0.38	0.52	0.26	0.53	0.66	0.65	0.59	0.66	0.55	0.54	0.50	1.00			
plot60	0.43	0.36	0.37	0.54	0.50	0.54	0.48	0.41	0.45	0.30	0.50	0.50	0.57	0.44	0.53	0.55	0.42	0.50	0.56	1.00		
plot17	0.56	0.40	0.52	0.44	0.42	0.52	0.40	0.48	0.48	0.36	0.68	0.56	0.52	0.40	0.60	0.48	0.24	0.41	0.48	0.64	1.00	
plot30	0.43	0.36	0.43	0.58	0.42	0.50	0.48	0.47	0.45	0.30	0.50	0.53	0.52	0.43	0.73	0.45	0.38	0.36	0.57	0.50	0.44	1.00

STAND ORDINATION

The result of stand ordination is presented in figure 1. The stand ordination defining the understorey vegetation of IITA, with respect to two-axis represent 73.9% of the variance accounted for by the first four-ordination axis. The first axis has 46.1% while the second axis has 26.8%. This presents the picture of the related plots and high heterogenous nature of the plots with the exceptions of plots 14 and 70 that are outliers. This means all the plots in this axis are linked together and the species of plant present in those plots are closely related together and can be said to be able to thrive under the same ecological and environmental conditions such as soil, rainfall, temperature and humidity. The ordination diagram presents three major groups. Group 1 comprises of plots 26, 28, 84, 41, 64. Group 2 comprises of plots 48, 17, 60, 89, 37, 30, 95, 90, 57, 49. Group 3 include plots 68 and 8. This grouping reflects the closeness in relation to the position of the plots to each other and the similarities in their floristic composition.

SPECIES ORDINATION

Species ordination by DCA of the understorey species of the 24 plots with respect to two-axis represent 72.9% of the variance accounted for by the first four-ordination axis. The first axis has 45.49% and axis 2 has 26.45%. The plant species in the two axis both positive and negative sides are closely related though there is a higher degree of association or relationship as indicated by the variance with the plant resources of the study area. Some of them exhibit stronger relationship with each other hence they are packed together in the same corner of the ordination space. Nearly all the species are located in quadrant 1. The length of the axis ranged from -1 to 5 on both axes. The first horizontal axis shows a gradient separating BLSA, EUTR, CHAL, ANTO, MOME, CEZN, TAPA, MITH, FERN, ENAN, on the negative side of the axis, SPJO, BIGU, MYAR, MAW,CLAN, BANI, FUEL, LECU, RICA, MOTE, BRMI, VEAM, MUPR, GLSA, CHOD, MIEX, ALZY, PAPI, DIMO, CORA, ALLO, ANDI, BANI, CYPR are at the positive end of the axis. This clearly is an indication of the impact of environmental factors on the species distribution.

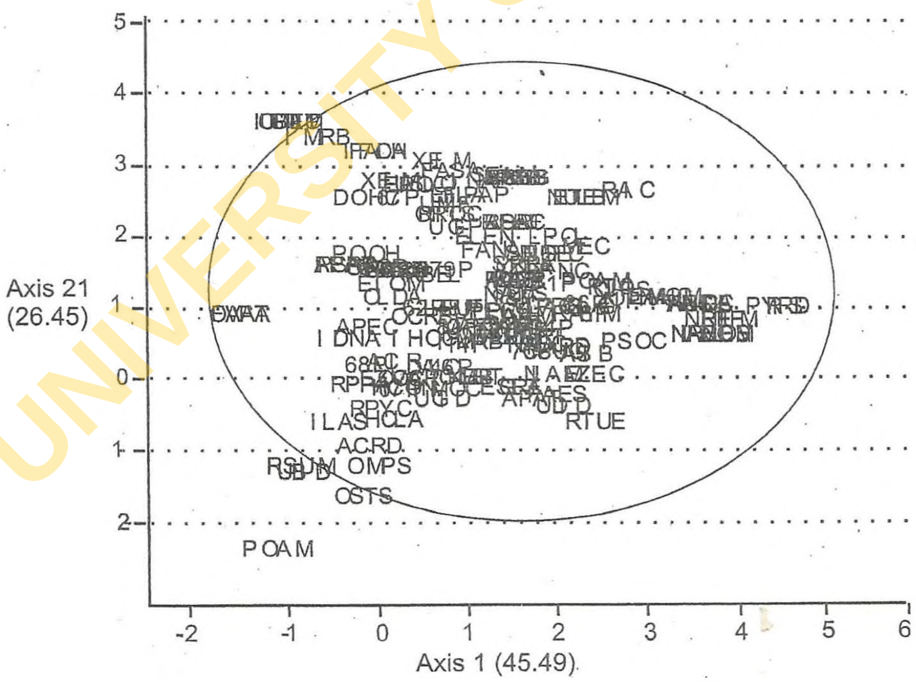

Figure 1. Species Ordination by Detrended correspondence Analysis (DCA) Defining the Understorey Species in the study area. (The circle represents the 95% ellipses)

DISCUSSION AND CONCLUSION

A total of 3,833 individuals from 128 species and 44 families (28 shrub, 33 herbs, 57 trees, 2 grass and 8 climbers) of under storey encountered during the study is an indication of high species richness of the site which is attributed to the presence of few common species which were either young or whose growth was arrested due to shade cast by overhead canopy as well as understorey species. High density and IVI of, CHKO, CUSC and CHOD may be a reflection of invasion as a result of dispersal agent. This reflects the ability of C. odorata to out-compete and suppress weeds. This has already been reported in previous studies on weed communities in mixed food crop fields in tropical Africa (Akobundu et al., 1992, de Rouw 1995, Roder et al., 1995, Akobundu et al., 1999, Ikuenobe and Anoliefo, 2003). Few species with high IVI was a reflection of high frequency of individuals and high number (density). The result showed that healthy forest patches are existent, indicated by important climber and Shrub species present.

Apocynaceae, Meliaceae Moraceae, Papilionaceae, Sapinideae and Sterculaceae are the dominant families in the sapling/tree in the forest floor; it is understandable, because a high proportion of the large trees exists as saplings in the understorey. In contrast, the family composition of herbs layer differed considerably with that of the tree layers, the dominant families are Vitaceae, Aristolochiaceae and Euphorbiaceae. This indicates that the seedlings/saplings of these families contributed greatly to the composition of the understorey in the forest.

The high species richness recorded in the study site reflects the heterogeneous distribution pattern in species composition and might be due to climatic factors which influenced the distribution of species, The result is similar to the findings of (Hussain et al., 2000; Abdullahi, 2001; Abdullahi, et al., 2009). The result also showed that IITA forest supports some of the most diverse and productive of all plant communities. This is primarily a result of the rich soils and abundant moisture. Readily available water and productive soils support a greater plant biomass than is usually found in upland areas, resulting in forests with a wide variety of species and complex vertical structures (LaRue et al., 1995).

Species diversity was generally high in the understorey and dominance was low. Simpson's similarity indices between paired plots ranged from 0.16 to 0.75 for the entire plot. High similarity value observed between some paired plots indicates how similar the plots are in floristic composition. Quite an appreciable number of paired plots have percentage similarity far above 50% which means that the level of difference or variation is low.

In summary, this study has demonstrated that the understorey could contribute a lot to the total species richness of IITA forest. The sapling layer and herb/seedling layer may hold as many species as the tree layer (DBH≥ 10cm). These results suggest that the understorey vegetation should be given full consideration for the assessment of biodiversity patterns in tropical forests.

The ordination diagram of the understorey species with respect to the first two-axis represent 72% of the variance accounted for the first four-ordination axis. This present the picture of the related plots and high heterogeneous nature of the plots with the exception of plots 14 and 70. This may also means that all the plots are clustered together and the species of plants present are closely related together and can be said to be able to thrive under the same ecological and environmental correlations such as soil, rainfall, temperature and humidity (Jayeola, 2004).
The first horizontal axis shows a gradient separation BLSA, CWTR, CHAL, ANTO, MOME, CEZE, TAPA, MITH, FIRN, ENAN, on the negative side of the axis while SPJO, DIGU, MYAR, MAIN, CLAN, BANI, FUEL, LECU, RICA, MOTE, BRMI, VEAM, MUPR, GLSA, CHOD,MIEX, AZZY, PAPI, DIMO, ALCO, ANDI, CYPR are at the positive end of

the axis. This clearly is an indication of the impact of environmental factors on species distribution.

Two groups of plots identified from the ordination diagram represent the closeness of the species to each other on the field and the similarities in their floristic composition.

Research conducted has shown IITA forest may act as a catalyst for successful natural forest succession of shrubs, herbs and grasses using the microclimatic conditions. This may be creating a more favorable environment for the establishment of native forest flora and habitat for fauna. Ultimately this may be leading to conserving biological diversity. The study eventually concludes that a continuous protection from human interferences and scientific management of undergrowth of the study area may lead to biodiversity rich site in the country.

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