ECOLOGICAL SUCCESSION OF PLANTS IN ADO – EKITI REGION, EKITI STATE, NIGERIA

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Abstract

This research paper describes the ecological succession of plants in Ado – Ekiti area of Ekiti State. Ecological succession of plants occurs almost everywhere in the world. This is initiated when a bare surface entirely devoid of plants due to natural processes or the action of man is colonized in primary succession. The data used in this research were collected between April 1st and July 15, 2015 using quadrat methods. A total of 11 species were identified in 14 observations.From the descriptive statistical analysis conducted and observations from all the plots, it was concluded that vegetation succession of plants in the study area depends on one hand on the ability of species to effectively colonize and spread over space and on the other hand on the propagation ability of the identified species.

Keywords: Abundance, Biodiversity, Ecology, Ecological Succession, Succession.

1.1. INTRODUCTION

Vegetation as one of the resources of nature provides not only for human building and construction and some other purposes, but it also serves as support for the top soil. It is one of the major medium through which erosion can be prevented. In addition, the dead and decomposed parts of the vegetation are useful for soil nutrients which serve as an impetus for high agricultural productivity of the land.Ecological succession of plants occurs almost everywhere in the world. It is initiated when plants start to colonise a bare surface which is entirely devoid of vegetal cover, which may be due to natural processes or the action of man.

Ecologist make a broad distinction between ecological succession; it is primary succession when the bare land surfaces has not been colonized by vegetation previously and secondary when succession on land surfaces is occurring on a land that has previously borne vegetation, but has been affected with serious fires, overgrazing, areas previously farmed or used in various ways that has led to the removal of vegetation.

Secondary succession occur at a faster rate than primary successions since the former are initiated on surfaces with a well-established chemically and biologically active soils substrate while the latter commence on relatively sterile substrates which may be devoid of organic matter (Adebayo and Owolabi, 2009).

Widespread deforestation and bush burning is creating a landscape in which mature tropical forests are islands in the sea of successional vegetation. This is the general picture of this area of the world. It is therefore on this note that this research is focusing its attention only on the secondary succession as it is as a result of man's action on the environment like when he clears the natural vegetation for farming purposes and later abandon it at the end of the cropping cycle.

1.2. THE STUDY AREA

The study area-Ado, Ekiti, is a famous and capital city of Ekiti State Nigeria. It is located within Latitudes $7^{o}31'$ and 7^{o} 49' north of the Equator and Longitudes $5^{o}7'$ and $5^{o}27'$ east of the Greenwich Meridian. It is situated about 344 Kilometres North-East of Lagos (Nigeria), and about 750km south west of Abuja, the Federal Capital Territory.

The area lies within the tropical climate with two distinct seasons of wet and dry. The wet season comes with the Tropical maritime (MT) air-mass originating from the Atlantic Ocean between the months of April and October which brings moisture laden winds from the coast. During the wet season, the relative humidity reaches values close to 80%. The total rainfall amount in the area is about 1400mm with the highest in September and October.

The dry season on the other hand is brought about by the Tropical continental (CT) airmass, blowing in from the Sahara desert between the months of November and March. The wind instills a cool-dry effect on weather conditions. Temperature in the region is however more uniform throughout the year with very little deviation from an annual mean of about $27^{o}C$ and a range of $37^{o}C$ between the month of highest temperature_ February and the month of lowest temperature –June.

The vegetation of the region was initially of the rain forest zone , but years of humans interference through agricultural practices and annual bush burning, have given it a new form, in which we now have the region under vegetation classified as the '' secondary forest''

1.3. LITERATURE REVIEW

Succession is a fundamental concept of ecology. It is the study of species change over time in an environment (McIntosh1999; Walker, and Del Moral, 2008). Succession addresses the dynamic of the ecosystem dynamics before, during and after the life span of living organisms. Ecological succession is not a modern concept as formal studies of plant succession have been conducted since 17th century. Also, much has been learned about how ecosystems respond to a dynamic physical environment (Pickett and White 1985), how species colonize and interact (Glenn-Lewin*et al.*1992), and how communities assemble and change(Tempertone*t al.* 2004).

Primary succession occurs on a new substrate which has not been colonized before. It occurs in an environment devoid of vegetation and other organisms are usually lacking as well (Walker and Del Moral, (2008). On the other hand, secondary succession is the sequence of changes which takes place on a previously colonized, but disturbed habitat. These changes usually occur in areas which have been cleared of existing vegetation or destructive events such as forest fires and floods. Secondary succession usually occurs faster than primary succession because there is already an existing seed bank of suitable plants which aid re-growth of plants.

In secondary succession, the root systems of plants which are left undisturbed in thesoil enhance remains of plant parts from previously existing generations to rapidly regenerate and grow. According to Maharning*et.al* (2009) who examined soil community changes during secondary succession in naturalized grassland, it was discovered that interactions between plant species and soil ecology affect each other in various successional stages.

According to Tanee*et al.* (2015) studies have shown that secondary succession has great impact on soil fertility status (Diekmann et al., 2007; Sarmiento and Bottner, 2002; Moran et.al 2000; and Bisong, 1994).However, Maharning et.al (2009) examined soil community changes during secondary succession to naturalized grassland, and discovered that in various successional stages approaching naturalized grasslands, interaction between plant species composition changes and soil ecology affect each other.

Also, Tanee*et al.* (2015) opined that several other biotic and abiotic factors have serve as agents of species ecological amplitude(Wilcox *et al*., 2005; Yuan*et al.,*2006; Duan*et al.,2008)*and together contribute to some degree the ecological succession and causes direct changes in plant species abundance in terms of frequency of occurrence and density. Other impacts of succesion involve changes inspecies diversity (in terms of richness and evenness),relative density, relative frequency, relative abundance,Importance Value Index (IVI), ratio of abundance tofrequency (A/F) and plant species regeneration and habit (Tanee*et al.*, 2015).

An obvious approach to conserve plant biodiversity is to map distributional patterns and look for concentrations of plant diversity (Gentry, 1992). Very often ecologists find it necessary to compare different vegetation structure of the same and/or different localities. This comparison has usually been done for conservation and management purposes.

Considering the role of the ecosystem on the livelihood and sustainability of the citizens whose source of income and revenue is dependent on agriculture, the importance of ecological studies cannot be overlooked at this point in time(Offiong*et al.,* 2015). Hence, as the ecosystem degradation is ongoing, due to various activities of man and advent of civilization, , there isthe need for the understanding of the ecological balance that could help in the improvement of the problems encountered by the citizens and further alleviate poverty among the community dwellers.

1.4. RESEARCH METHODS

The research was carried out in and around Ado- Ekiti region five different school field were selected based on topography and aerial differentiation of the school (fight) This is done to depict and represent the climatic conditions of the region.The research was carried out between April 1st and July 15th 2016. The observations were made weekly on the quadrat. A total of eleven species were identified in the whole of the 14 observations made (Table 1) A column was created to accommodate the unidentified species (US) which resemble each other at first sprout.

The data used in this research was purely primary data which means they were collected directly from the field using quadrat methods. A 3x3 metre quadrat was plotted in three different location in each school making fifteen quadrat in all making adequate representation of the whole study area. The choice of school field's was made due to the high human influence in form of agricultural practices and animal grazing which can create problem for the quadrat if not secured in a fenced area.

The measured quadrat was initially cleared of all weeds to make it look like a virgin land ready for colonization. This make for easy identification of sprouting plants.

1.5. DATA PRESENTATION AND ANALYSIS

Descriptive Statistics was employed in the presentation and analysis of the data collected which includes: The mean, the Standard deviation and the Coefficient of variation as they are one of the most significant among the measures of Central Tendency.

TABLE 1: TOTAL FREQUENCY, MEAN, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION

Frequency	CC	SA	TP	EI	DH	AS	DM	SN	US	CO	IC	AC
Total	423	198	93	166	179	165	173	35	19	3	148	54
Mean	84.6	39.6	18.6	32.2	35.8	33.0	34.6	7.0	3.8	0.6	29.6	10.8
S	32.2	29.9	26.0	24.9	51.7	41.0	12.4	10.6	8.5	1.3	66.2	20.0
CV	39.2	75.5	139.8	75.0	144.4	124.2	35.8	151.4	223.7	216.7	223.7	185

Source: Field Work (2016)

Where
Mean is the mean of the vegetation.
S is the standard deviation.
CV is the Coefficient of variation.

From Table 1, the coefficient of variation of vegetation ranges from 35.8 in *Desmodium* (DM) with standard deviation of 12.4 to 223.7 in unidentified species (US) and *Imperata Cylindrical* (IC), with standard deviation of 8.5 and 66.2 respectively. This shows that the vegetation succession on school lands is dynamic. The vegetation succession in the school lands is hence of high variability and the dominance depends on the sprout period and frequency of germination (Table 1)

There is variation in the frequency of grasses recorded in the gradual plots. For instance, *Cyprus coleochloe* (CC) recorded the lowest frequency of 44 in plot A5 (ASS) and the highest frequency of 122 in plot A1 (MIS) (Appendix 1).

Also, the frequency of *Desmodium* (DM) is the lowest in plot A2 (AUD) with 14 and the highest in plot A5 (ASS) with 44 (Appendix 1). This was due to the fact that the grasses with the lowest frequency did not sprout up on time. *Cyprus coleochloe*(CC) in quadrat plot A5, for instance, recorded its first sprout in the week 2, while *Desmodium* (DM) in plot A2, started sprouting in week 3.

In addition, there is variation in the mean of the vegetation species in the mean of the vegetation species in the plots. For instance, while *Cyprus coleochloe*recorded the highest mean of 84.6,*CochorusOlitorius*recorded the lowest mean of 0.6 (Table 1, Fig 1). This was the result of the variation in the frequency and appearance of the vegetation. However, *Sidaacuta*(SA) which has the mean of 39.6 and frequency of between 19 in plot A5 (ASS) and 75 in plot A1 (MIS) did not appear at all in plot A3 (ACS), *Eluisinindica*(EI) with the mean of 33.2 and frequency of between 19 and 58 in plot A5 (ASS) and plot A3 (ACS) respectively, did no sprout up in plot A4 (CHS). This was due to the fact that, on one hand, *Sidaacuta*(SA) was already in existence in the four plots before cutting and clearing was carried out. Thus, its stumps sprouted up in succession. While there was no *Sidaacuta*(SA) in plot A3 where there was no pre-clearing existence. *Eluisinindica*(EI), on the other hand did not appear due to the fact that the quadrat plot was maximally dominated by *Digitariahorizontalis*(DH) with broader foliage and basal coverage.

Moreso, it could be observed that unidentified species (US), *ImperataCylindrica*(IC), *CochorusOlitorius*(CC) recorded the highest coefficient of variation in the plots with low appearance while unidentified species (US) appeared in plot A1 (MGS), *ImperataCylindrica* (IC) colonized plot A5 (ASS)and *CochorusOlitorius*(CO) had its appearances in plot A3 (ACS) (Table 1) (Appendix 1).However, the sprouti9ng of t5hese vegetation species such as *CochorusOlitorius*and *ImperataCylindrica* (IC), in their confined areas was due to the fact that either the species had been in existence in that plot before it was cleared for this study; thereby having some of their stumps left or the species, such as unidentified species were able to spread quickly through propagation.

Furthermore, there are differences in the dominance of vegetation species between the plots. For instance, while *Imperata Cylindrica* dominated in plot A5 with frequency of 148, *Cyprus coleochloe* dominated both in plot A1 and A2 with frequency of 122 and 105 respectively and will, as time goes on, dominate in plot A3. However, in plot A4, *Digitaria horizontalis*(DH) which was the first colonizer dominated with frequency of 125 (Fig 2, Appendix 1) *Cyprus coleochloe*(CC) was able to dominate in almost three plots due to the fact that it was the first colonizer of the plot and had broad leaves with wider basal cover while *Imperata Cylindrica* and *Digitaria horizontalis* had been in existence in their confined plots before clearing the quadrat plot used for the research.

From the descriptive statistical analysis conducted and explanation of observations from all the plots, it could be concluded that vegetation succession on school lands depends on one hand, on the ability of species to colonize quickly and spread over space, and on the other hand, on the propagation ability of the grasses.

Conclusively, vegetation succession in Ado-Ekiti, like in any other settlement in the world is dynamic. This could be ascribed in one hand, to the conclusive climatic conditions, the soil type and fertility, and on the other hand, human influence, in form of man's activities on the land, such as agricultural practice, grazing etc. affects the type and pattern of vegetation succession.

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APPENDIX 1

Figure 1: Mean Frequency of Grasses in the Study Area

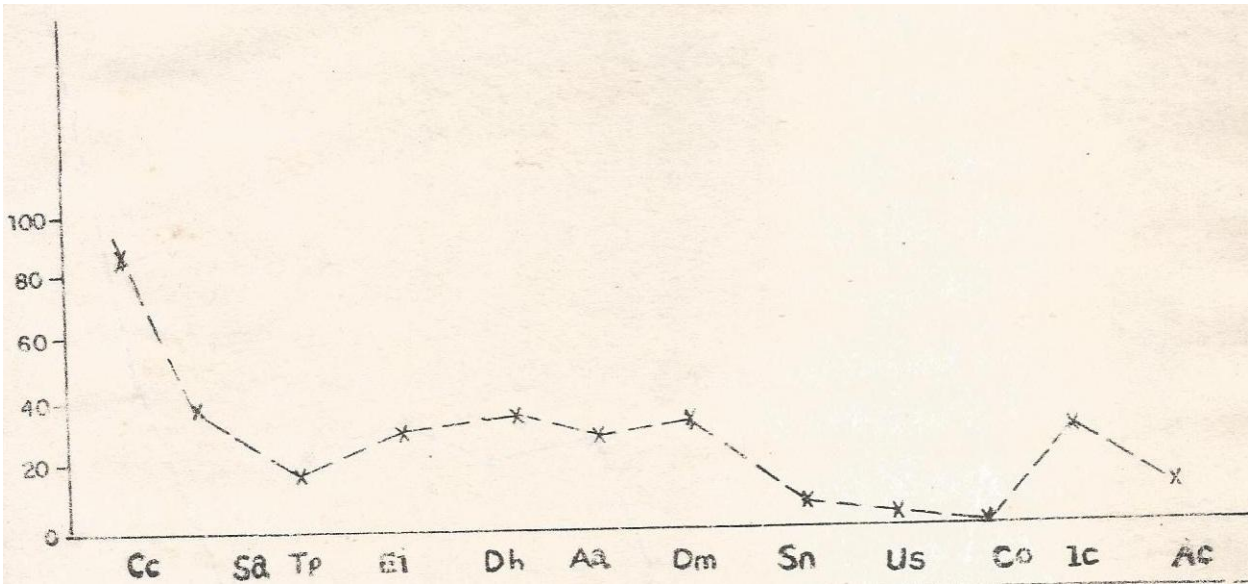

Figure 2: Frequency of Growth Distribution of Species

	Cc	Sa	Tp	Ei	Dh	Aa	Dm	Sn	Us	Co	Ic	Ac
MIS	122	75	61	57	23	34	42	24	19	-	-	-
AUD	105	56	26	32	31	24	14	-	-	-	-	8
ACS	56	-	-	58	-	5	21	-	-	3	-	-
CHS	96	48	-	-	125	-	32	11	-	-	-	-
ASS	44	19	6	19	-	102	44	-	-	-	148	46
TOTAL	423	198	93	166	179	165	173	35	19	3	148	54