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POPULATION STRUCTURE AND DENSITY OF TREE SPECIES OF *Meliaceae* FAMILY (MAHOGANY) IN A TROPICAL RAINFOREST OF SOUTHWESTERN NIGERIA

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ABSTRACT

The Permanent Sample Plot in Akure Rainforest Reserve, Southwestern Nigeria was enumerated for tree species of mahogany family.A total of six species were encountered. These species include *Entandrophragma cylindricum*, *Guarea cedrata*, *Khaya grandifoliola*, *Lovoa trichilioides*, *Trichilia heudelotii* and *Trichilia preuriana*. *Guarea cedrata* had the highest population of 25 individuals per hectare, while *Khaya grandifoliola* had the list of 1 per hectare. All the tree species had their populations distributed in the lower diameter-classes of 4.8 – 15cm (class 1) and 15-25cm (class 2). The highest basal area value of 19.71m^2/ha was calculated for *Guarea cedrata*, while the least of 1.07m^2/ha was calculated for *Lovoa trichilioides*.

KEY WORDS: Rainforest, Mahogany, Population, Basal Area, Regeneration

INTRODUCTION

The Nigerian rainforest is an integral part of the world tropical rainforest which has been adjudged as the most biologically diverse of all terrestrial ecosystems (Turner, 2001).The rainforest occupies about 10% of Nigeria landmass (Ajakaiye, 2001). It is greatly rich in diverse timber species. The rainforest has, over the years, been the principal source of the country's domestic wood need and wood export. According to Akinsanmi and Akindele (2002), although large areas of plantations exist, yet the rainforest is of greater attraction to timber contractors due to their wide variety of species and sizes.

However, one of the major trees' families that produce commercially valuable timbers both for domestic needs and export in Nigeria is *Meliaceae* (Bada, 1986). This family is commonly called Mahogany. Among the species belonging to this family that have been exported to Europe are *Guarea* spp; *Khaya* spp; *Entandrophragma* spp. and *Lovoa trichilioides* (Bada 1986). As a result of human population increase, great increase in housing development, furniture need and quest for foreign exchange earning, demand for wood, and rainforest land for other forms of landuse have increased drastically. The foregoing demands have resulted in over exploitation of timbers leading to serious degradation of rainforest in many locations.

The need to sustainably manage the remaining areas of rainforest cannot be overstressed. The majority of the highly valuable rainforest trees that are even threatened by extinction cannot yet be grown in plantation because of some ecological and silvicultural problems that are yet to be surmounted. The problems include high vulnerability to disease attacks and devastating pest infestation when planted as monoculture stand, and general dearth of viable planting materials. It has been observed that nature greatly assuages these problems while the trees grow in their natural environment (Lusk, 1995; Richards, 1996; Turner, 2001; Dalling and Hubbell, 2002; Christie and Armesto, 2003). It, therefore, implies that the continuous existence of many indigenous timber tree species depend on sustainable management of the remaining areas of our rainforest.

Okojie *et al* (1988) avers that to ensure sustainable management of a forest, particularly a tract of natural forest, quantitative information which include the abundance of each species, stem diameter distribution, basal area, volume and yield tables are indispensable. This paper, therefore, is a report of an investigation on population structure and density of tree species of *Meliaceae* (Mahogany) family in permanent sample plot, Akure Forest Reserve in Southwestern Nigeria.

MATERIALS AND METHODS

Study Area

The study was carried out in the Akure Forest Reserve's Permanent Sample Plot 29 (PSP 29). Akure Forest Reserve is a dry lowland rainforest located in Ondo State, Southwestern Nigeria. The PSP 29 was originally established in 1935, but reconstituted in 1951. It covers a total area of 23.5 hectares. The plot was divided into ten (10) strips each 50 X 450m in size. At the inception of the establishment of the plot, all the trees with diameter at breast height (1.3m) $\leq$ 4.8cm were identified, measured and numbered with aluminum tags. However, many of the trees have lost the number tags now.

The forest reserve lies between latitude 7^0 and 7^020^1N and longitude 5^0 and 5^030^1E. The mean annual rainfall of the area is about 1329.4mm, while the mean annual relative humidity is 80% at 7.00 Hr. The mean monthly maximum temperature is about 33.5^0C and the mean minimum temperature is about 21.4^0C. The soil is derived from metamorphic and igneous rocks and classified as an utisol (Ojo, 1991).

Data Collection

Four out of the ten strips into which the plot was divided were randomly selected for data collection. Each of the four strips was divided into nine quadrats 50 X 50m each. Four 50 X 50m quadrats were randomly selected from each of the four strips (totalling 4ha) for tree diameters' enumeration. All the trees belonging to *Meliaceae* family with diameter at breast height (1.3m) $\geq$ 4.8cm were identified and enumerated. The data were collected between November and December 2003.

DATA ANALYSIS

The trees were analyzed for population structure by classifying their diameters into seven classes as follows: 4.8 – 15cm(Class 1), 15-25cm (class 2), 25 – 35cm (class 3), 35 – 45cm (class 4), 45 – 55cm (class 5), 55-65cm (class 6), and 65cm + (class 7). Density of each species was determined by computing its basal area using the universal formula

$$B.A = \frac{\prod D^2}{4}$$

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where,

B.A = Basal Area
D = Diameter
Π = 3 142

RESULTS AND DISCUSSION

Six species were encountered These species are *Guarea cedrata*, *Trichilia heudelotii*, *Trichilia preuriana*, *Entandrophragma cylindricum*, *Lovoa trichilioides* and *Khaya grandifoliola*. *Guarea cedrata* had the highest average population of 25 per hectare, while *Khaya grandifoliola* had the least of 1 per hectare (Table 1) All the tree species were represented only in the lower diameter classes of 1 and 2 (Table 1)

Table 1: Stem diameter distribution of tree species of *Meliaceae* family in PSP 29 Akure Forest Reserve, Southwestern Nigeria.

Species	Diameter- Class (Per/ha)							
	1	2	3	4	5	6	7	Total
Entandrophragma cylindricum	2	1	-	-	-		-	3
Guarea cedrata	22	3	-	-	-	-	-	25
Khaya grandifolila	1	-	-	-	-	-	-	1
Lovoa trichilioides	2	-	-	-	-	-	-	2
Trichilia heudelotii	13	-	-	-	-	-	-	13
Trichilia preuriana	5	3	-	-	-	-	-	8

The highest basal area of 19.7m^2/ha was calculated for Guarea *cedrata*, while the least of 1 07m^2/ha was calculated for *Lovoa trichiloides* (Table 2)

Table 2: Basal area of tree species of *Meliaceae* family in PSP29, Akure Forest Reserve, Southwestern Nigeria.

Species	Basal Area (m^2/ha)
Entandrophragma cylindricum	9.29
Guarea cedrata	19 71
Khaya grandifoliola	1 27
Lovoa trichilioides	1.07
Trichilia heudelotii	8.92
Trichilia preuriana	7 85

The existence of a tree species in a natural forest is a function of availability of viable seeds or propagules of the species in the forest. Moreover, the microclimate in the rainforest greatly influences regeneration and growth of the constituent's trees. Thus, variability in the populations and basal area growth of the tree species was expected because of the differences in the growth rates and ability to tolerate the local environment in the forest Even though, all the species were represented in the lower diameter-classes of 1and 2, the tree species ages were variable. Their growth might have been retarded by unfavourable growth milieu in the forest According to Bada (1984), under poor environmental factors such as shading, suppression or acute competition for water or nutrients, a tree species that is normally a fast- growing light- demander can exhibit a slow growth rate Christie and Armesto (2003) observed that distribution, survival and growth of tree regeneration are influenced by the microclimate in a rainforest in Chile South America

The variation in the populations of the tree species can be attributed to the different rates of production of viable seeds by the mother trees and falling of the seeds into unfavourable germinative sites The generally poor population densities of the species can probably be ascribed to the mortality of many old mother trees (Olajide 2004) On the basis of population density, a species with less than ten individuals per hectare is considered as a rare species (Parthasarathy and Karthikeyan, 1997) Accordingly, four of the species viz, *Entandrophragma cylindricum*, *Khaya grandifoliola*, *Lovoa trichilioides* and *Trichilia preuriana* can be deemed as endangered species The four species might not be really endangered if they have high populations of regeneration per unit area of the forest This study did not assess regeneration densities of the tree species

CONCLUSION

Following the findings of this study, there is a need to intensifying the conservation of *Meliaceae* in the forest reserve by banning their exploitation for a long time. Silvicultural treatments, like canopy-opening through felling of a number of big old trees, would allow more irradiance into the forest floor to induce germination of some dormant trees' seeds in the soil It would also create favourable environment for relatively rapid growth of the regeneration as competition for moisture and mineral nutrients would be greatly reduced.

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