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Autecological Studies of *Triplochiton Scleroxylon* K. Schum in Gambari Forest Reserve, Oyo State, Nigeria

Ojo, M.O
Department of Sustainable Forest Management,
Forestry Research Institute of Nigeria,
Headquarters, Ibadan, Nigeria

ABSTRACT: *Ten temporary plots were laid within Triplochiton scleroxylon woodland in Gambari Forest Reserve, one of the major rainforests in Nigeria (Latitude $7^0 25^I N$ and $7^0 55^I$ and Longitude $3^0 53^I$and $3^0 9^I E$) of attempts to assess tree species and their effects on surrounding soil in Triplochiton scleroxylon woodland. The tree species diversity was assessed using the sample plots laid in systematic line transects. In each sample plot, all trees with a diameter at breath height (DBH) above 10cm were identified by species and measured. The species diversity within 5 meter range of T. scleroxylon was shown to be high using Simpson diversity Index, 0.93 with low Dominance of 0.07 and Evenness of 0.85 indicating relative moderate range. The results showed that high diversity of tree species was enumerated in the study area with Triplochiton scleroxylon 36.00% followed by Funtumia elastica with 8.00%. Considering T. scleroxylon species, Plot 10 recorded the highest values for Basal Area and Volume, 3.386m^2 and 468.961m^3 respectively followed by Plot 2 with BA (2.759m^2) and Volume (293.006m^3) with lowest BA of 0.656m^2 for Plot 8, and least Volume of 24.22m^3 recorded against Plot 7. Plots 6 and 9 had no presence of T. scleroxylon with Plot 6 having 2.71% Organic Carbon greater than Plot 3 with highest frequency of T. scleroxylon of 2.52%. Sample 2 has the pH of 7.40 which is alkaline in nature as it can lead to the factor of high volume of Triplochiton scleroxylon, soil particles in the study area revealed that sand, silt and clay were in moderate for the growth of Triplochiton scleroxylon. The Nitrogen (%), Phosphorus (mg/kg) and Potassium (mg/kg) (NPK) were well utilized in interaction form by the high presence of T. scleroxylon (Plot 3), 0.21, 3.60 and 0.51 respectively while despite the presence of other tree species beside T. scleroxylon in Plot 2, NPK were not interactively utilized as in Plot 3 with the values of 0.3%, 4.94mg/kg and 0.65mg/kg respectively.*

KEYWORDS: basal area, volume,simpson rule, height, DBH, autecology

INTRODUCTION

Tropical rainforests, which worldwide make up one of Earth's largest biomes (major life zones), are dominated by broad-leaved trees that form a dense upper canopy (layer of foliage) and contain a diverse array of vegetation and other life (Jeremy, 2018). Michael, (2001) reported that the tropical rain forest is classified under the Köppen Classification system as **Af,** meaning tropical forest. The **A** is given to tropical climates that are moist for all months and which have average temperatures above 18 degrees Celsius. The **f** stands for sufficient precipitation for all months. The

latitude range for my climate is 15° to 25° North and South of the equator. The rainforest acts as main repository of the genetic diversity of both flora and fauna.

These studies were mostly non-respective over several years and little knowledge available about the behaviour of the individual tree species in the studied plot with the passage of time. The silvicultural treatment called Tropical Shelter wood System (TSS) given to the moist forest in Nigeria between 1950 and 1960, coupled with massive exploitation during this period had major effect on the structure of Nigeria rainforest (Oguntala, 2009).

Generally, competition is intense among the trees in the forest that only a small proportion of pole-size seedling under the shade grow into big trees. These are some of the problem which led to gradual change in Nigeria's forestry policy and the trend towards growing trees in commercial plantation. The dynamic nature of the forest canopies provides many different regeneration niches to which different species have become specialized. There are two contrasting ecological species groups. These are climate species and pioneer species. The key features are that climate species can germinate or establish seedling below a canopy whereas pioneer species required full light. In all tropical rainforest, there are fewer pioneers than climate species and they mostly belong to few families, for trees, Euphorbiaceae, Malvaceae and Urticeae (Whitmore, 2014).

In the forest, there is high diversity of tree species as well as clear distinction among soil types from one place to another. This shows that each organism in the forest affects other of the same population, and affected by organisms of other population including the abiotic environment. The study of this interaction between living and their environments is known as ecology. In ecology, everything is connected to everything else and there is a constant interaction among organisms, and between organisms and their immediate environments.

Autecology and synecology are two main branches of ecology. Autecology is the study of individual organism or individual species. Autecology helps us to understand the relationships between individual plant and environment (Walter 2014). Samanthi, (2018) defined autecology as the study of a single organism, a single type of species or a population of species in respect to their natural habitat. It is an experimental procedure that is simple and inductive. Here, only a single species of organism is taken into consideration.

In their own report, Stewart and New (2007) presented Autecology as an approach in ecology that seeks to explain the distribution and abundance of species by studying interactions of individual organism with its environment. An autecological approach differs from community ecology (synecology) ecology by greater recognition of the species-specific adaptations of individual animals, plants or other organisms, and of environmental over density-dependent influences on species distributions.

Triplochyton scleroxylon woodland in Gambari Forest Reserve is distinct and dense. *Triplochiton scleroxylon* is a characteristic species for semi-deciduous forest, where it often grows gregariously, but it can sometimes be found in clearings in dense evergreen forest and in dry forest. In Nigeria it is almost exclusively limited to moist forest areas at low and medium altitudes. It occurs up to

900m altitude in regions with an annual rainfall of up to 3000mm but is most abundant at 200–400m altitude and in areas with an annual rainfall of 1100–1800mm and 2 rainy seasons. It prefers more fertile, well-drained, ferruginous soils with light or medium texture and acid to neutral pH. It does not tolerate water logging, and in general avoids swamps. It is a light-demanding pioneer species. Seedlings may be very abundant in forest gaps of larger sizes, and the tree characterizes secondary forest.

MATERIALS AND METHODS

Experimental Site

The research work was carried-out at Gambari Forest Reserve, Ibadan. The Gambari Forest Reserve was declared from Ibadan Forest Reserve by a resolution of the Ibadan City Council passed in September 1899. A month later, the Mamu portion was added and to the government by deed of gift. Both sections were consolidated to form Gambari Forest Reserve in 1953 making a total area of 125.62 km^2. Gambari Forest Reserve is located between latitude 7° 26^I N and longitude 3°54^1 E. The *Triplochiton scleroxylon* woodland lies within Gambari Forest Reserve about 17 km South-east of Ibadan on the Idi-Ayunre-Ijebu-Ode road, Oyo state. It was laid about 2 km away from the nearest road well obscured by some forest fallows in the neighbourhood.

Table 1: MATERIALS AND THEIR USES

MATERIAL	USES
1. Soil auger:	To collect soil samples at within 5m, 10m and 15m of TS tree covering range.
2. Haga altimeter:	To measure the total height of each tree.
3. Diameter tape:	To measure the DBH of each tree species.
4. Meter tape:	To measure the distance away from the tree species to the point of observation.
5. 1.3m cut stick:	To measure the breast height point for DBH measurement
6. Cutlass:	To clear the way to the experiment site and cut experimental pegs
7. Pegs:	To demarcate the line round the plots
8. Line:	To make alignment of the points within the experimental plots
9. Collection bags:	To collect soil sample at the experiment plots
10. Rain boot:	To prevent been injured by stump on sharp object on the field.
11. Writing Materials:	Such as pen and jotter to note all the data collected.
13. Digital Camera:	To record for while the work is on-going.
14. GPS:	To get the geographical features of the working sites
15. Compass:	To find out the bearing of the traversing and included angles between them, waypoints (an endpoint) and direction.

Table 2: PARAMETERS AND METHODS OF ASSESSMENT

PARAMETERS	METHODS OF ASSESSMENT
1. Total Height:	The total vertical length of the trees from the soil level to the highest observable part of the tree.
2. Diameter at breast Height:	The diameter at 1.3m height of the tree
3. Basal area:	The TH multiply by DBH of the tree
4. Frequency:	The number of times a trees species occurs in a plot.
5. Canopy length:	It is the average width of canopy cover

Sampling Techniques and Method of Data Collection

A reconnaissance survey of the reserve was carried out to establish the baseline. Subsequently, Systematic line transect was used in the laying of the temporary sample plots of 100m in length (abbreviated as L1 and L2, in Figure 2) were established in east-west direction using a compass. Sample plots of 10m x 10m in size were established in alternate along each transect at 5m interval, using the edge effect of 5m away from the road side before laying of transects in the sampled plots. In totality, 10 sample plots were established in the study area. All trees were measured for diameter at breast height over bark (dbh-1.3 m above the ground) and trees species of 10cm girth and above DBH were identified by species, measured and enumerated in the sampled plots. The DBH was measured using a diameter tape accurate to 0.1cm.

The height of the tree species was taken using Haga altimeter. In cases where identification of the trees was not possible, the botanical specimens were taken to the herbarium section of the Forestry Research Institute of Nigeria (FRIN) for identification. The land mark of the natural forest is 10 hectares. Soil sample from Plots 1, 6 and 10 were purposively collected. In plot 1, the number of *T. scleroxylon* was very few, while in plot 6 no *T. scleroxylon* was found and in plot 10 the number of *T. scleroxylon* was much. So, the samples were taken to the laboratory and air-dried for 24hours then later sieved to get the particles for the Mineralogical routine analysis.

Laboratory Work

Certain amounts of each soil series were passed through a 2mm sieve, then small amounts were put into the mortar and grinded. The grinded part was put in a dry nylon(to be used for the Organic matter determination).

METHODS OF LABORATORY ANAYSES

Routine soil analyses were carried out and the following were determined in the laboratory.

Soil pH

The soil pH was determined with the pH meter using glass electrode in a 1:1 soil to water ratio (Udo and Ogunwale, 1986). Ten grammes (10g) of air-dried soil pass through 2 mm sieve and was weighed into sample bottles. Ten (10) ml of distilled water was added to the soil and placed on a mechanical shaker for 10minutes and then left to stand for 5-10 minutes. The glass electrode of pH meter was inserted into partly settled suspension one after the other and their respective pH readings were measured.

Organic Carbon

The organic carbon of the soil was determined using the Walkley Black wet oxidation method (Udo and Ogunwale, 1986). Half a gram (0.5g) of 0.5 mm sieved soil was weighed into a conical flask. Ten millimetres of ($K_2CR_2O_7$) solution was measured into each flask and swirled gently to disperse the soil. Two ml of concentrated sulfuric acid was added and the flask was swirled round gently until the soil and reagent mixed thoroughly. The sample was left to cool for 20 minutes before adding distilled water up to 100 ml mark of the conical flask. Three drops of phenoline indicator was added to the mixture and titrated with 0.5Nferrous ammonium sulphate solutions. As the end point was approached, the solution gave a greenish colour and then changed to dark green. At this point, the ferrous ammonium sulphate was added drop by drop until the colour changed to maroon red. A blank titration was carried out in the same manner but without soil to standardize the dichromate, Cr^2O^7.

Mathematically, %OC was calculated using the Equation 1.

Y= **Volume of K2Cr2O ×0.003 ×100×1.33**

Blank value × weight of sample----------Equation 1

%OC= (Blank – Sample litres) x Y

Organic matter of the soil was obtained from organic carbon by multiplying with the conventional Van Bemmelar factor of 1.724 (i.e. 100).

Total Nitrogen

Half gram (0.5g) of 0.5 mm sieved soil samples were weighed into a dry digestion tube. One tablet of selenium was added, followed by Ten millimetre of concentrated sulfuric acid and the samples was heated on the digestion stand for 5 hours until the digestion stand and left to cool. The digests were made up to 50ml and then transferred into samples cups. Distillation was carried out using 5ml of boric acid which was weighed into Erlenmeyer flasks and placed at the end of the condenser of the distillation flask by opening the funnel stopcock. The ammonium salt was converted to ammonia; by giving a green coloured solution (distilled). Fifty millimetre of distillate were collected for samples that were distilled. Fifty millimetre of distillate was titrated with 0.01M HCL. The ammonia reacted with the acid and the colour changed at the point from green to pink.

A blank sample was carried out using the same procedure but without soil sample and calculate based on equation 2.

$$\%N = \frac{(T-B) \times 14.01 \times 0.01N \times 100 \times 10}{\text{Weight of soil sample} \times 100} \quad \text{……...eq. 2}$$

Available Phosphorus

Available P was determined with spectrophotometer using Mehlich III extractant (Mehlich 1984) method. Two grams of 2 mm sieved soil was weighed into an extraction cup after which twenty millimetre of Mehlich One hundred and eleven solutions were added. The samples were stirred on the mechanical shaker for 10 minutes. The mixture was filtered using a filter paper. Five millimetres of the filtrate was measured into an extraction cup and 5ml of colour reagent was added to it. The samples were made up to 50ml by adding 40ml of distilled water. The samples were read with the spectrometer.

Exchangeable Bases (Ca, Na, K, Mg)
Half gram (0.5g) of 2mm sieved soil was weighed into an extraction cup. Twenty millimetres of Mehlich One hundred and eleven solution was added. The samples were stirred on the mechanical shaker for 10 minutes. The mixture was then filtered whatman 40 filter paper. Na was determined by flame photometer while Mg, K, and Ca were determined with atomc absorption spectrometer.

Exchangeable Acidity
Ten grammes (10g) of 2mm sieved soil were weighed into an extracting cup. Ten millimetre of KCL was added. The solutions were stirred for 10 minutes with mechanical shaker and filtered using filter paper. Ten millimetre of the filtrate was weighed into an extracting cup and 3 drops of phenolphthalein indicator was added. The solution was titrated with 0.01N NaOH. At the end point of the titration, the colour of the solution changed to light pink. The volume of base that was used (i.e NaOH) for titrating each sample was multiplied by 0.5 to get the total exchangeable acidity of the soil samples.

Extractable Micronutrient (Fe, Mn, Cu, and Zn)
Two grammes of 2mm sieved soil was weighed into an extraction cup, ten ml of Mehlich One hundred and eleven solutions were added. The samples were stirred on the mechanical shaker for 10 minutes, followed by the filtration of the solution. Fe, Mn, Cu and Zn were determined with atomic absorption spectrometer, according to Equation 3.
Calculation,
Fe, Mn, Cu, Zn (mg/kg)

$$= \frac{D^* R * Volume}{2g} \quad \text{…….. eq. 3}$$

Where;

D = Dilution factor, vol. = Volume of Solution,

R = reading 2g = Weight of soil sample

DATA ANALYSIS

The means of individual tree basal area, number of genera, number of species and number of stems per hectare were calculated for each transects line. One-way analysis of variance (ANOVA) was used to test the differences between the means of these parameters using Statistical Package for Social Sciences (SPSS) version 20. The relative dominance (abundance) of the species in each transect line was identified because of relative basal area.
The formula below was used to deduce the parameters:

Volume calculation
The volume of each tree was calculated using the Huber's formula (Hustch *et al*., 2003)
V=H. Ab---------- (1)
Where

V=Tree volume (m^3)
Ab=Basal Area respectively (m^3) and
H=Total Height (m)

Basal Area Calculation
Basal Area (BA) (m^2) = DBH $(cm)^2$ **divided by** 40,000

Tree Species Diversity
The following indices were employed following Magurran (2004) and Lu *et al*; (2010)
- Dominance
- Simpson
- Shannon
- Evenness
- Taxa
- Individuals

RESULT AND DISCUSSION

Tree species Composition
Table 3: Species composition of Trees within the study area

S/N	Family	Species	Frequency	Frequency %
1	Apocynaceae	*Funtumia elastic*	6	8.00
2	Bignoniaceae	*Newbouldia laevis*	2	2.67
3	Boraginaceae	*Cordia millenii*	1	1.33
4	Euphorbiaceae	*Ricinodendron heudeloti*	3	4.00
5	Irvingiaceae	*Irvingia gabonensis*	1	1.33
6	Leguminosae	*Piptadeniastrum africanum*	1	1.33
7	Malvaceae	*Ceiba petandra*	1	1.33
8	Meliaceae	*Cedrela odorata*	3	4.00
9	Moraceae	*Antiaris Africana*	2	2.67
		Ficus exasperate	2	2.67
10	Myristicaceae	*Pycnanthus angolensis*	5	6.67
11	Olacaceae	*Strombosia postulate*	5	6.67
12	Rutaceae	*Zanthoxylum zanthoxyloides*	2	2.67
13	Solanaceae	*Solanum aviculare*	1	1.33
14	Sterculiaceae	*Cola gigantean*	2	2.67
		Cola millenii	4	5.33
		Sterculia rheunopetala	3	4.00
		Triplochiton scleroxylon	27	36.00
15	Ulimaceae	*Celtis zenkeri*	4	5.33
TOTAL			**75**	**100**

Source: Field Survey, 2018

Table 3 indicates that there are 15 Families of tree among 19 species in the studied area. The family names are has shown in the above table. Sterculiaceae family had the highest percentage frequency of species composition of 36.00% followed by Apocynaceae of 8.00%, Myristicaceae and Olacaceae has the same percentage frequency of 6.67% respectively, Ulimaceae 5.33%, Meliacaceae, Euphorbiaceae family had the same frequency of 4.00%, Bignoniaceae, Moraceae and Rutaceae also had the same percentage of 2.67% while the families that have least percentage of 1.33% are Boraginaceae, Irvingiaceae, Leguminosae, Malvaceae and Solanaceae.

Table 4: Volume of the *Triplochiton scleroxylon* species

S/N	Plots	Total Number	DBH (cm)	HEIGHT (m)	BA (m^2)	Volume (m^3)
1	1	3	213	67.7	1.134	76.772
2	2	5	332.2	106.2	2.759	293.006
3	3	4	200.5	96	1.005	96.48
4	4	2	182	49	0.828	40.572
5	5	2	178.6	39.5	0.797	31.482
6	-	-	-	-	-	-
7	7	1	186	28	0.865	24.22
8	8	3	162	58	0.656	38.048
9	-	-	-	-	-	-
10	10	7	368	138.5	3.386	468.961
Total	**8**	**27**	**1822.3**	**582.9**	**83.020**	**48392.358**

Source: Field Survey, 2018

Table 4 above showed that *T. scleroxylon* in Plot 10 has the highest average total volume of 468.961m^3 followed by Plot 2 with 293.006m^3 while lowest volume was recorded in Plot 7 (24.22m^3). It should be noted that Plots 6 and 9 had no presence of *T. scleroxylon.*

Table 5: Species diversity of trees within 5meters range of *Triplochiton scleroxylon*

	Indices
Taxa	18
Individuals	48
Dominance	0.07
Simpson	0.93
Shannon	2.73
Evenness	0.85

Source: Field Survey, 2018

Table 5**,** Simpson diversity index revealed that the species diversity of the study are of high and low dominance. Shannon index also backed this up with a higher value of 2.73. Evenness is opposite of dominance such that when dominance is low then evenness is 0.85 which is relative moderate above. This is in support of "the Shannon index H and Simpson index D are both non-spatially explicit measures of relative species composition in a forest" (Shannon and Weaver, 1949; Simpson, 1949) and of high importance in relation to the work of Aguirre *et al*., (2003); Lexerod and Eid, (2006); Pommerening, (2002), (2006a); Sterba and Zingg, (2006) Tree diversity indices are also good quantitative descriptors of forest structures, which is a key pre-requisite for understanding the interactions between patterns and processes in forest ecosystems (Motz *et al*; 2010)

TABLE 6: Chemical Properties of selected soils under *Triplochiton scleroxylon* tree species

Parameters	**Sample1**	**Sample2**	**Sample3**
pH (H_20)	6.7	7.40	6.60
Sand%	93.60	91.40	93.40
Silt%	4.00	6.00	4.00
Clay%	2.40	2.60	2.60
Organic carbon%	5.32	2.71	2.52
Total Nitrogen%	0.47	0.30	0.21
A. Phosphorus (mg/kg)	4.01	4.94	3.60
Sodium (cmol/kg)	0.58	0.45	0.48
Potassium (cmol/kg)	0.77	0.65	0.51
Calcium (cmol/kg)	14.25	10.40	7.45
Magnesium (cmol/kg)	2.79	2.07	1.48
Manganese (mg/kg)	45.95	15.50	28.30
Iron (mg/kg)	6.70	4.50	5.55
Copper (mg/kg)	3.70	15.30	5.25
Zinc (mg/kg)	16.51	1.46	11.76

KEY
Sample 1……..Plot 1 (*T. scleroxylon*with Low frequency)
Sample 2……..Plot 6 (*T. scleroxylon*with Zero availability)
Sample 3……..Plot 10 (*T. scleroxylon*with High Frequency)

The soil analysis showed that the soil in T. scleroxylon woodland is basically sandy. This conforms to the work of Uniuyo Consult Ltd, (2003) that the sandy nature of the soils may be due to excessive rainfalls experienced in the region which cause erosion. This also explain while the soils have low K reserves of 0.77, 0.65 and 0.51 (cmol/kg) for Plots 1, 2 and 3 respectively as typical sandy soils (with small surface areas) have low ion exchange capacity, which determine the quantity of ions that a soil can retain against leaching (Edem, 2007). The soil reaction varied between pH6.60 and pH7.60, and is rated slightly acidic to alkaline. Sample 1(T, scleroxylon low frequency) has pH 6.70 slightly acidic while sample 2 (T. scleroxylon zero frequency) has pH 7.40 slightly alkaline and sample 3 (T. scleroxylon high frequency) has pH 6.60 slightly acidic. With this, it shows that there is interaction between the T. scleroxylon and the soil within the study area

which indicates that slightly acidic soil supports the growth and sustainability of the species. The organic carbon values for the range from 2.52%, 5.32%. Soil sample 1 has the highest organic content of 5.32% while the sample 3 has the lowest value of 2.52%. The organic carbon decreases down the plot area. The sharp decrease in OCC with depth from soil sample 1 to the sample 2 may be attributed to immobilization of organic matter by clay in sample 3 in form of organo-clay-complex (Mamyunda, 2015). The exchangeable bases comprise Sodium (Na), Potassium (K), Calcium (Ca) and Magnesium (Mg). Sodium (Na) of the soil sample varied between 0.45 – 0.58cmol/kg, with the soil Plot 2 which had the least value of 0.45cmol/kg and the highest value of 0.58cmol/kg in Plot 1. Exchangeable Na decreases down the plot while at the medium values in between the plot in the study area sample 2. Exchangeable Na of soils in all Plots was moderate. The Potassium (K) content in the sample was ranged between 0.51-0.77cmol/kg. The Plot 1 has the highest value 0.77cmol/kg followed by Plots 2 and 3, 0.65 and 0.51 respectively. Plot 3 had the least value of all (0.51cmol/kg). This might be due to high interaction due to the presence of high frequency of *T. scleroxylon* species. The Calcium (Ca) content varied between 7.45 and 14.25(cmol/kg). Plot 3 had the least value 7.45 cmol/kg, followed by sample 2 of 10.40cmol/kg. Plot 3 had the highest value 14.25 cmol/kg. The calcium content increased down the selected plot soil samples. The Magnesium (mg) content of the soil samples varied between 1.48-2.79 cmol/kg. Plot 3 had the least value 1.48cmol/kg while sample 1 had the highest value of 2.79cmol/kg. There are some moderate changes from sample 1 and sample 3 with the value of 2.79cmol/kg and 1.48cmol/kg. The copper was much at the zero availability of *T. scleroxylon* Plot 2 with 15.30mg/kg indicating that *T. scleroxylon* presence in Plot 1 and 3 interactively utilize Cu. In micro nutrient, the Zn content of the soil ranged between 1.46 – 16.51mg/kg. The Zn content of Plot 2 had the least value of 1.46mg/kg and Plot 1 had the highest value of 16.51 followed by Plot 3 with 11.76mg/kg. In the same manner, Plot 1 had the highest Iron (Fe) value of 6.70mg/kg followed by Plot 3 which had 5.55mg/kg and Plot 2 with the lowest content value of 4.50mg/kg. The Mn content of Plot 1 was the highest with 45.95mg/kg followed by Plot 3 with 28.30mg/kg and Plot 2 with 15.50mg/kg This shows that Plots with the presence of *T. scleroxylon* (Plots 1 and 3) contribute hugely to the production of Fe, Zn and Mn in the soil.

CONCLUSION

The research established that *T. scleroxylon* species had interaction with other tree species and the soil within the study area.

High diversity of tree species was enumerated in the study area with 5 meter range to *Triplochiton scleroxylon* with Simpson Diversity Index value of 0.93. Despite this, Dominance was 0.07 with Evenness 0.85 to make the plots moderately distributed. Numerically, 36.00% of species identified was accredited to *Triplochiton scleroxylon* followed by *Funtumia elastica* with 8.00%.

Triplochiton scleronxylon has the highest volume of 468.961m^3 with BA (m^2) of 3.386m^2. The soil chemical characteristics of the study area shows that Plot 2 has the pH of 7.40 which is slightly alkaline in nature as it can lead to the factor of high volume of *Triplochiton scleroxylon.* Soil particles in the study area revealed that sand, silt and clay were in moderate for the growth of *Triplochiton scleronxylon*. Plots with the presence of *T. scleroxylon* (Plots 1 and 3) contribute hugely to the production of Fe, Zn and Mn in the soil while Plot 2 of no *T. scleroxylon* had greater values in Nitrogen %, Phosphorus mg/kg and Potassium mg/kg (NPK) than Plot 3 with highest

frequency of *T. scleroxylon* but lower than Plot 1 with few *T.scleroxylon.* This concluded that the higher the stands of *T. scleroxylon* in an area, the higher the interaction between the species and the soil fertility that leads to nutrients exhaustion to the conversion of increase in size of the species.

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