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GROWTH RESPONSE OF Adansonia digitata(Linn) SEEDS AND SEEDLINGS TO DIFFERENT LEVELS OF SPENT LUBRICATING OIL (SLO) CONTAMINTED SOILS

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ABSTRACT

The performance of Adansonia digitata (Linn) seeds and seedlings in spent lubricating oil contaminated soil was evaluated at Federal College of Forestry, Ibadan Oyo State, Nigeria with a view to determine the level of spent lubricating oil that the plant can tolerate. The experimental design used was Completely Randomized Design (CRD) with four replications. The spent lubricating oil levels were 0ml, 20ml, 40ml, 60ml, 80ml, 100ml 120ml, 140ml with 3kg of top soil. The parameters assessed were germination percentage (%), plant height (cm) stem diameter (mm) and leaf production and leaf area (cm2). Seedlings were watered once in a day. After fifteen weeks of observation and data collection, it was observed that the seedlings in oil contaminated soil gave different responses to the level of spent lubricating oil concentrations, However, T2 (20ml of SLO + 3kg of top soil) gave the best performance in seedling height (9.63cm), leaf production (5.15), while T5 (80ml of + 3kg of top soil) gave the best performance in leaf area (26.78cm2). Furthermore, there was no significant difference among treatments in seedling height (cm¬), leaf area (cm2) and leaf production at 5% level of probability but there was significant difference among treatments in stem diameter (cm2) at 5% level of probability. It was therefore recommended that Adansonia digitata should be adopted for reclamation of land where the use of Spent Lubricating Oil is prominent to an extent.

Keywords: Adansonia digitata, Spent Lubricating Oil, Germination, Growth.

1. INTRODUCTION

Adansonia digitata (Linn) is most wide spread of the specie on the African continent found in hot dry savannah to sub Saharan Africa; the common name is African baobab tree. The trees usually grows as solitary individuals and are large distinctive. Each leaf comprises of five leaflets. The African baobab fruit can grow up to 25cm long and it can contain 50% more calcium than spinach. (Claire. 2008) .*Adansonia digitata* is a fast growing plant. It takes the seed seven to twelve days to germinate and start growing if the soil is been prepared very well. It can thrive in difficult terrain, .harsh weather, stony area, depleted area of nutrient e.t.c., because it contains hard—fibre (FAO, 1988). Due to its ability to thrive in these conditions, *Adansonia digitata* will be adopted in this study to determine its growth response to different levels of spent lubricating oil contaminated soils, which can serve in reclaiming oil—contaminated area, eradicating encroachment and controlling environmental pollution. Further more the spent lubricating oil (waste engine oil) is usually obtained after servicing and subsequently draining

Vol. 4, No. 04; 2019

ISSN: 2456-8643

used oil from automobiles and generator engines. The disposal of spent lubricating oil into drainage systems. open vacant plots and farmlands in Nigeria is a common occurrence and is mostly done by auto mechanics and allied artisans with workshop on the road side and open places (Agbogidi. 2010). According to Wang *et al*., (2010), some of the spent lubricating oil may have foreign substances including synthetic polychlorinated biphenyls and higher concentrations of poly aromatic hydrocarbon (PAHS). and heavy metal which constitutes environmental risk to man other animals and plants. Spent lubricating oil according to Atuanya, (1987) affects soil physical, biological and chemical properties. However, used oil is a very serious waste management problem and is dangerous to the environment (Agbogidi, 2010). Also the presence of toxic oil constituents and heavy metals may not be ruled out as their influence on crop plant is quite enormous (Agbogidi *et al.,* 2007).

The spent lubricating oil contaminated soil has been used to raise tomato, red beans, pepper e.t.c. in the past to determine their growth response in such soils,(Annoliefo and Vwioka, 2000). but no research work has been done on *Adansonia digitata*. Therefore .this study was carried out to examine the germination and growth-response of *Adansonia digitata*. seeds and seedlings to different levels of spent lubricating oil contaminated soils.

2. MATERIALS AND METHOD

Experimental Site

The experiment was carried out at the nursery of Forestry Technology Department of Federal College of Forestry, Ibadan, Oyo state Nigeria. The nursery is located at Jericho area of Ibadan Northwest local government area of Oyo state, It is on latitude $7^0$26'E and longitude $3^0$5l'N of the Greenwich meridian. Its annual rainfall is about 1,300 - l,500mm while the annual temperature is 26^0C, the average relative humidity is about 65% (FRIN meteorological station. 2018)

Procurement Of Materials

The seeds of *digitata* were collected from a mother tree within the Federal College of Forestry. lbadan. Top soil was collected at Agricultural Technology Department AGT farm practical plot within the College premises. Spent lubrication oil was collected from the mechanic section of the College. The weighing balance was obtained from the Agricultural Technology Department; polythene pots, pen, vernier caliper, notebook, metre rule, paper cellotape were procured at Aleshinloye market. lbadan, OyoState.

Method

The seeds of *Adansonia digitata* were extracted by crushing the fruits. The extracted seeds were washed in running water. During this process seeds that were not viable were seen floating in the container were removed and discarded while the viable seeds settled at the base of the container were subjected to pretreatments. The seeds were pretreated by soaking in boiled water and then left for 24hours before sowing. They were sown in polythene pots of size 24.5cm x 14cm filled with the mixture of 3kg of topsoil and spent lubrication oil at varying levels.

The treatment combinations were:

Vol. 4, No. 04; 2019

ISSN: 2456-8643

- Treatment 1 —> 3kg of top soil (control)
- Treatment 2 —>3kg of top soil + 20ml ofS.L.O
- Treatment 3 —> 3kg of top soil + 40ml ofS.L.O
- Treatment 4 —+ 3kg of top soil + 60ml of S.L.O
- Treatment 5 —> 3kg of top soil + 80ml of S.L.O
- Treatment 6 ——> 3kg of top soil + 100ml of S.L.O
- Treatment 7 —> 3kg of top soil + 120ml of S.L.O
- Treatment 8 —> 3kg of top soil + 140ml of S.L.O

Experimental Design

The experiment was set up in a Completely Randomized Design (CRD). There were eight treatments .each treatment was replicated four times with four seeds per pot making a total of l28 seeds. The parameters assessed include; Germination Percentage (%), Stem Diameter (mm), Seedling Height (cm),Number of leaves and Leaf Area (cm^2). Data collected were subjected to Analysis of Variance (ANOVA)and means were separated using Duncan Multiple Range Test (DMRT).

3.RESULTS AND DISCUSSION

Table 1: Germination Percentage Of Adansonia Digitata Seedlings

Treatment	No of seeds sown	No of seeds germinated	Days of emergence	Germination %
T_1	16	5	11	31.25
T_2	16	4	18	25.00
T_3	16	2	20	12.25
T_4	16	3	31	18.75
T_5	16	3	31	18.75
T_6	16	4	33	25.00
T_7	16	2	32	12.50
T_8	16	3	39	18.75

Table1 above showed that germination was affected by the presence of spent lubricating oil. Significant reduction was observed in the germination percentage of *A. digitata* seeds sown in oil contaminated soils when compared with seeds sown in uncontaminated soil. Days of germination were also delayed as it took seeds in the contaminated soil longer time to germinate according to the level of concentration of spent lubricating oil that was applied. Similarly, all the seeds planted in various levels of contaminated soil germinated but the number significantly reduced ($p \geq 0.05$) with increasing oil level in the soil. T_8 managed and struggled to germinate but the plant showed evidence of shrinkness, unhealthy, yellowing of leaves, necrosis (die-back) and growth retardation. This supported the findings of De Jong,(1980) who noted that the embryo of seed tend to be injured or killed if it comes in contact with spent oil.

As a result the seedlings gave different response to different levels of concentration of the spent lubricating oil added to the soil.

Vol. 4, No. 04; 2019

ISSN: 2456-8643

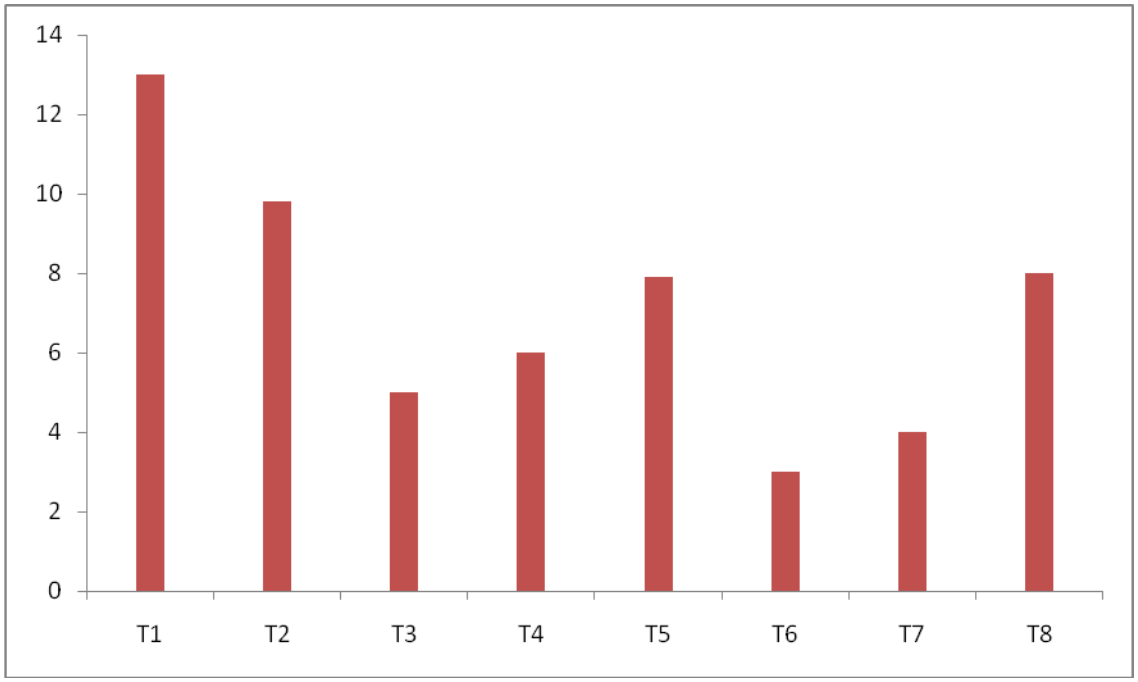

Figure I: Mean Height (Cm) For Adansonia Digitata Seedlings .

Figure 1 above showed that T_1 (control) had the highest performance in height with a mean value of

l2.77cm. followed by T_2 (20ml of SLO + top soil) with a mean value of 9.63cm, while the least performance was observed in T6 (l00ml of SLO+ top soil) with a mean value of3.l lcm. Furthermore, the various reduction in growth characteristics measured were spent lubricating oil concentration dependent, this was brought about by the effect of the SL0 in the soil which inhibited the growth of the plants; although T_2 (20ml of SLO + top soil) performed best when compared to other seedlings in contaminated soils. This result supported the findings of Agbogidi (2010) who reported that since uptake of water and salt (iron) is carried out by root undisturbed, seedlings could have absorbed enough nutrients compared to the seedlings exposed to soil treatment with diverse levels of spent lubricating oil. However, table 2showed that there was no significant difference among the treatments at 5% level of probability.

Table 2 : Analysis Of Variance For Seedling Height

SV	DF	SS	MS	F	P-VALUE
TRT	7	318.62	45.51	1.15NS	0.37
ERROR	24	949.14	39.54		
TOTAL	31	1267.77			

Note: Ns- not significance (p >=0.5)

Vol. 4, No. 04; 2019

ISSN: 2456-8643

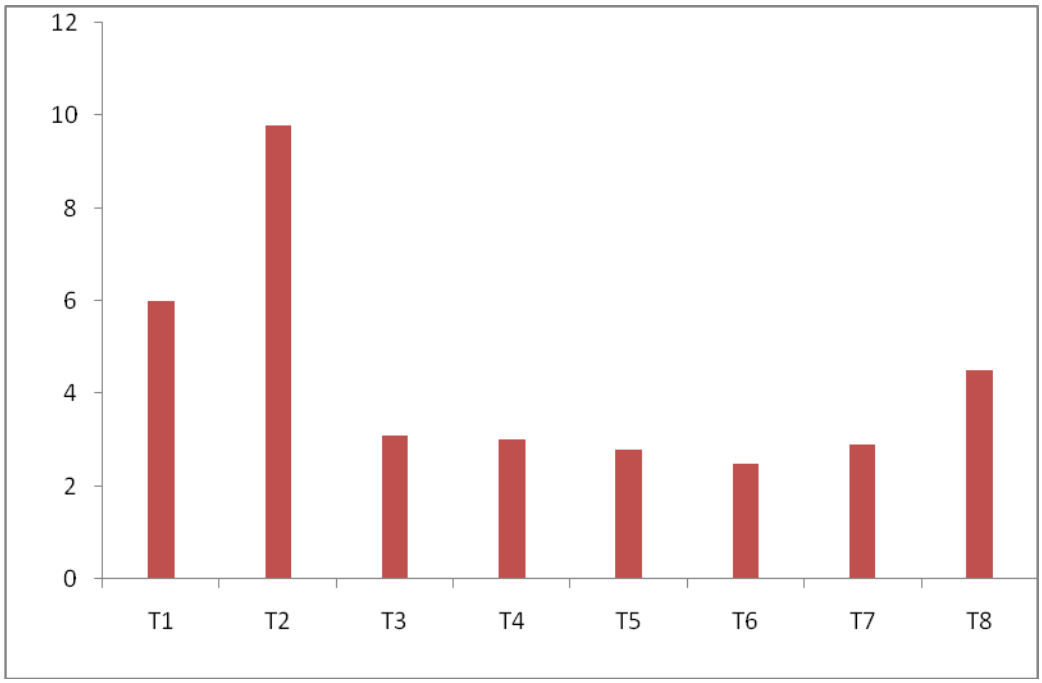

Figure 2 : Mean Leaf Production For Adansonia Digitata Seedlings .

Figure 2 revealed that seedlings in T_1 (control) gave the highest mean leaf production of 5.40. followed by T_2(20ml of SLO + top soil) with a mean value of 5.15, while T_6 had the least performance with mean value of 2.43. Furthermore, the result showed that SLO can affect the leaf production in plants but at lower concentrations the seedlings can still adapt. Consequently, seedlings in higher concentrations showed evidence of shrinkness, yellowing of leaves as well as stunted growth. This result therefore supported the findings of Atuanya (1987) who pointed out that as hydro carbon from oil contaminated soils accumulate, translocation is affected due to obstruction of the xylem and phloem vessels, hence reduction in photosynthesis tend to reduce the matter content components of the plants. Table 3 showed that there was no significant difference among the treatments applied at 5% level of probability.

Table 3 : Analysis Of Variance For Seedling Height

SV	DF	SS	MS	F	P-VALUE
TRT	7	32.62	4.63	0.63ns	>0.05
ERROR	24	226.14	9.42		
TOTAL	31	258.			

Note : ns – not significant (p>=0.05)

Vol. 4, No. 04; 2019

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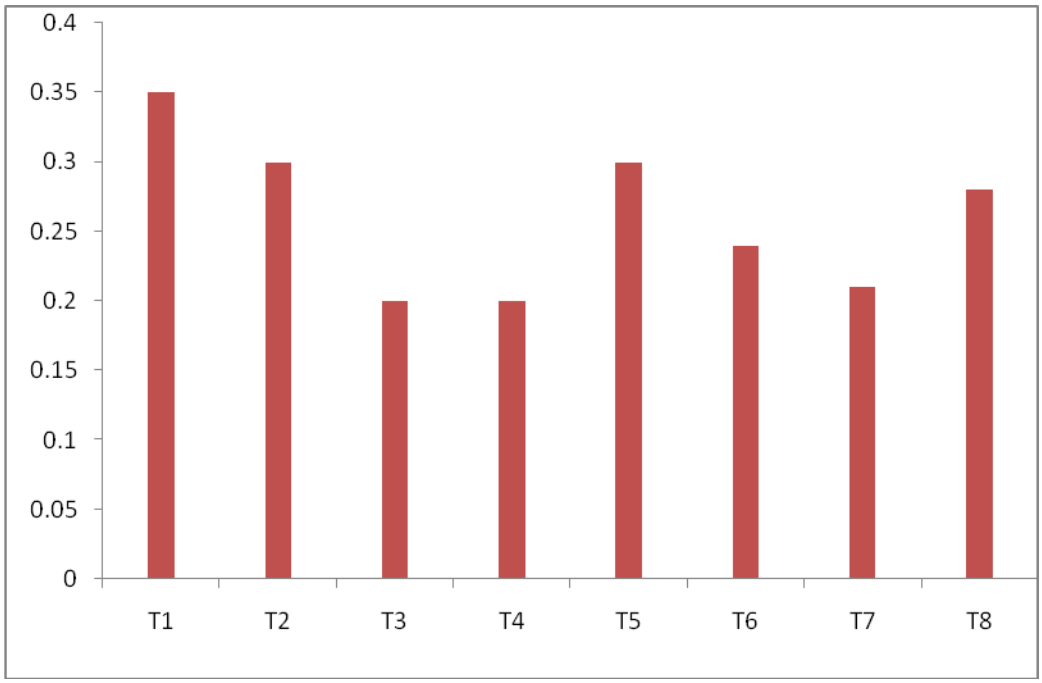

Figure 3 : Mean Stem Diameter (Mm) For Adansoni Adigitata Seedlings .

Figure 3 above indicated that T_1 (control) had the highest performance in stem diameter with mean valueof 0.35mm ,followed by T_5 with a mean value of 0.32mm, while T_3 and T_4 showed the least performancewith the mean value of 0.2lmm respectively. Here, the treatments gave different response to differentlevels of concentration of SLO applied to the soil. This report was in consonance with the findings of Agbogidi and Ejemete (2005) who noted that the level of oil in soil seemed to exert significant influenceon plant species and agricultural lands due to the presence of heavy metals which is responsible for the reduction in plant growth characters mobilization as well as the metabolic activities ofthe plants. Table 4indicated that there was significance difference among the treatment used at 5% level of probability.

Table 4 : Analysis Of Variance For Seedling Height

SV	DF	SS	MS	F	P-VALUE
TRT	7	0.06	0.01	0.18*	0.03
ERROR	24	1.18	0.05		
TOTAL	31	1.24			

Note : Significant at 5% level of profitability (p>=0.05)

Vol. 4, No. 04; 2019

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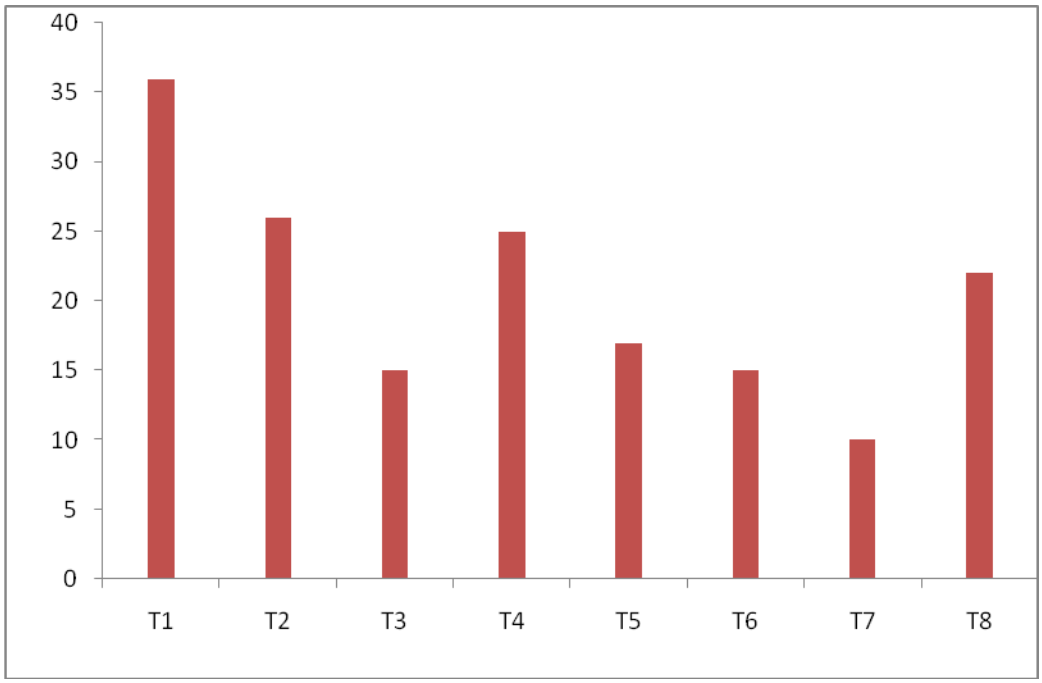

Figure 4 : Mean Leaf Area (Cmz) For Adansoniadigitala Seedlings .

Figure 4 above showed that T1 (control) had the highest performance in leaf area (38.60cm2), followed byT_3 (20ml of SLO + top soil) (26.68cm2), while T_7 produced the least performance with mean value ofl0.65cm2. Furthermore, the growth reduction in leaf area could be interpreted as being due to the effect of SLO which could have shown up thereby distorting and reducing the number of stomata per unit area of the leaf thus affecting photosynthetic process and consequently, the amount of photosynthates produced. This result was in support of the findings of Agbogidier *et al.*, (2007) who noted that the presence oftoxicoil constituents and heavy metals may not be ruled out as their influences on crop plant are quiteenormous.

Table 5 indicated that there was no significant difference among the treatments applied at 5%level of probability.

SV	DF	SS	MS	F	P-VALUE
TRT	7	2320.94	331.56	1.17ns	0.36
ERROR	24	6804.06	283.50		
TOTAL	31	9125.00			

Note: ns - not significant (p>=0.5)

4.CONCLUSION

It is commonly known that spent lubricating oil is a soil contaminant, but no one has been able to quantify it and assign a number to the value of damage. SLO contaminates the soil and hereby does notgive way for soil aeration. All treatments applied at different rates consequently affected

Vol. 4, No. 04; 2019

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the growth of *Adansonia digitata* at different levels. Also the study revealed that although seedlings of *Adansonia digitata* can thrive in spent lubricating oil, there is a level that it can tolerate. this can be seen in seedlings planted in 40mls, 60mls, 80mls, 120mls and l40mls of SLO contaminated soil as seedlings showed evidence of shrinkness, unhealthiness, yellowing of leaves, necrosis and growth retardation. It is therefore recommended that *Adansonia digitata* should be adopted for reclamation of land where the use of SLO is prominent to an extent.

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