Effect of Soil Types on the Preliminary Growth of *Jatropha curcas* in River State, Nigeria

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Abstract: A preliminary study on the effect of soil types on the growth of *Jatropha curcas* in River State was carried out at the teaching and research farm, Ignatius Ajuru University of Education, Ndele campus, Port-Harcourt. A randomized complete block design (RCBD) with three treatments – sandy, loamy and clay soils were used. In all a total of seventy-five pots were used with each pots planted five seeds. Each treatment was replicated five times. Data were collected on germination percentage, plant height, root length and number, leaf number and stem width development. Data was analyzed by use of analysis of variance and subjected to least significant difference. Results showed that *Jatropha curcas* perform better in loamy and sandy soil in most parameters tested compared to other soil.

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Introduction:

Soil is a mixture of minerals, organic matter, gasses, liquids and myriads of micro and macro – organism that can support plant life (Mahamood, 2003). The body (soil) exists as part of the pedosphere and performs four distinct functions

- It serves as a medium of plant growth
- It is a means of water storage, supply and purification
- It serves as a habitat for organism that takes part in decomposition and creation of habitat for other organism (Kathira Vene *et al*., 2003).
- It also serves as a modifier of the atmosphere.

It consist of soil phase (minerals and orgasmic matter) as well as a porous phase that hold gases and water, being the end of the influence of climate, relief, biotic activities and materials interacting together. (Guyton and Hull, 2000). The structure of soil undergoes development by way of numerous, physical, chemical and biological processes which include weathering with associated erosion (El-Sallami 2003) giving rise to three different types - loamy, sandy and clay soil, each with it's own distinct characteristics.

Loamy soil composed mostly of sand and silt and a smaller amount of clay (40 – 40 – 20), with this proportion varying to a degree resulting to another classification (different types of loamy soil). However, this soil is assumed to contain more nutrients, moisture and humus than sandy soil. Sandy soil composition is highly variable depending on the local rock sources and conditions but the most constituent is silica, Clay soil itself, being a fine grained soil combines one on more clay minerals with traces of metal oxides and organic matter. They consist mainly of geological clay deposits composed of phyllosilicate minerals containing variable amount of trapped nutrients in the mineral structure (Scarre, 2005).

From the origin, there seems to be variations in the structure, composition and mineral constituent of the various soil which determine the accessibility of mineral up take that will enhance/hinder plant's growth in the soil hence this study. Report from literature, Azza *et al.* (2010) has shown that successful green house and nursery production of container – grown plants are largely dependent on the chemical and physical properties of the growing media. An ideal medium should then be free of weeds and heavy enough to avoid frequent tipping over and light to enhance its handling coupled with ability to retain sufficient water. These qualities ensure that variations will exit in growth of plants to soil types.

Jatropha carcus, from the family of Euphorbiaceas is a drought resistant perennial crop that can easily be established as it grows, producing seeds for over 50 years. The plant is recognized recently as a wonder crop, producing seed with an oil content of 37%. The oil can be used as field without refining. The by product are press cake, a good organic fertilizer. The oil also contains insecticide. It is also used in most areas of the would in treatment of diseases such as cancer, piles, snakebite paralysis, deprosy etc. it's usefulness and cultivation in the Niger – Delta especially in Rivers – State has not been explored. In view of this, the study tends to investigate the influence of the various soil types existing in Rivers State in relation to the adaptation and growth of this wonder – crop.

Materials and methods

This study was carried out at the teaching and research farm of Ignatius Ajuru University of

Education, Ndele campus Port-Harcourt. The main objective was to investigate the effect of soil types on germination and preliminary growth of *Jatropha curcas*. *Jatropha curcas* seedlings were procured from a mini farm in Ogoni (Gokana) River –state. The experimental design used was a randomised complete block design (RCBD) with three treatments sand, loamy and clay replicated five times. The experiment was carried out for eight weeks. Each replicate consist of five pots and five seeds were sown in each pot.

Germination percentage was taken at four and eight days intervals. Plant height, number of leaves, roof number and stem width development was carried out two weeks after planting. The number of leaves was recorded by counting the number from each of the plant in each soil sample, same with root number.

Shoot length and stem with development were taken with the aid of vernire calipers. Data generated from the experiment were subjected to statistical analysis (analysis of variance) while treatment mean were compared using the least significant difference (LSO) option at 0.05% probability level.

Results

The results obtained in Table I below showed that germination of *Jatropha curcas* was high in sandy and loam soil compared to clay soil.

Table I: Effect of soil types on the germination percentage of *Jatropha curcas*

	FOUR DAYS (4 DAP)%	Eight DAYS (8 DAP)%
Sandy soil	20	30
Clay soil	0	10
Loamy soil	0	40
Total	**20**	**80**

Data in Table II shows that root development of Jatropha curcas was more in sandy soil in all the weeks followed by loamy soil. There was no significant difference in root development of the plant in sandy and loamy soil at p < 0. 05 in week 8.

Table II: Effect of soil types on root development of *Jatropha curcas*

	Ti (sand)	T2(clay)	T3 (loam)
Week 2	8^a	4^c	6^b
Week 4	12^a	7^c	10^b
Week 6	14^a	9^b	14^c
Week 8	16^a	11^c	18^a

abc –means with different superscripts along the same row are significantly different at p< 0. 05.

The results obtained in Table III indicate that number of leaves of *Jatropha curcas* was significant in loam soil than other treatments. This was followed by sandy soil. However no significant difference in week 2 on the number of leaves of *J. curcas* in sandy and loamy soil at p< 0.05.

Table III: Effect of soil types on numbers of leaves of jatropha curcas

	Ti (Sand)	T2(Clay)	T3 (Loam)
Week 2	4^a	2^b	4^a
Week 4	8^b	4^c	9^a
Week 6	10^b	6^c	12^a
Week 8	12^b	8^c	14^a

Means with different superscript along the same row are significantly different at p<0 .05.

In Table IV, shoot length development of *Jatropha curcas* was highly significant in clay in all the weeks compared to other treatments.

Table IV: Shoot length development of *Jatropha curcas* as affected by soil types.

	Ti (sand)	T2(clay)	T3 (loam)
Week 2	$0.\ 12^c$	$0\ .26^9$	0.14^b
Week 4	0.12^c	4^c	0.18^b
Week 6	0.16^c	6^c	0.22^b
Week 8	0.18^c	8^c	0.22^b

Abc means with different superscripts are significantly different at p<0.05.

The result presented in Table V shows that loamy soil favored stem width development of *Jatropha curcas* in all the weeks at p<0.05 than sandy and clay soils.

Table V: Effects of soil types on stem width development *of Jatropha curcas*.

	T1 sand	T2clay	T3 loam
Week 2	$1.\ 14^b$	$1\ .10^c$	1.18^a
Week 4	1.15^b	1.11^c	1.70^a
Week 6	1.50^b	1.22^c	1.80^a
Week 8	1.70^b	1.40^c	1.90^a

Abc means with different superscripts along the same row are significantly different a p<0.05.

From the results, it can be deduced that the performance of *Jatropha curcas* in loamy and sandy soil were more significant than clay. This shows that the ability of loamy and sandy to drain water easily must have accounted for its enhancement in growth promotion as evident in the works of Jarnick and Jules (2008). The relative improvement in leaf number of *J. curcas* in loamy soil and sandy soil at p < 0.05 when compared to clay is a further indication of their potentials in crop growth. Qualities such as water/nutrient retention ability are major consideration

/conditions for growth enhancement as confirmed by Jannick etal (2008) and these are in built qualities in sandy and loamy soil. For example sandy soil is porous, the ions absorbtion is more easier while some ions adhere on the clay soil particles. Mesiry and Assa (2001) gave further attestation to this result.

However, the result in Table IV took an opposite trend as shoot length of *Jatropha curcas* was significant ($p < 0.05$) in clay soil than sandy and loamy soil, it has been noted that excess water discourages absorbtion of nutrients and encourage longitivity which has directs link to logging in plants. Shoot development in *Jatropha curcas* is then expected in clay soil as confirmed by Achten, *et. al* (2007) which noted that clay soil has the ability to retain water in soil limiting the growth and development of other parts except shoot elongation. This must also have accounted to significant increase in other parameters in loamy and sandy soil.

In conclusion, it a then postulated that for better development of *Jatropha curcas* in Rivers State, soil with relative ability to drain water and encourage degradation organic materials should be recommended.

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