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Effect of Varying Depth and Soaking Time on the Germination of *Jatropha Curcas* in Sokoto

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ABSTRACT

This study investigated the effect of varying depth and soaking time on the germination of Jatropha curcas in Sudan savannah agro ecological zone of North Western Nigeria, with special reference to Sokoto. The field experiment was carried out in Sokoto research bio-energy farm. Seeds of Jatropha Caracas, were planted at the soil depth of 3, 6&9 centimeters respectively, and allowed to germinate for over a period of l8days. The experimental design was carried out in a completely randomized block design with three replicate. The percentage germination of 20 germinating plant at three varying depths were calculated and mean determined. Seed of Jatropha Curcas was also soaked and allowed to remain for a period of 30, 60&90 minutes respectively. The seeds were allowed to germinate for over a period of l8days and also the percentage germination of the seedlings was calculated. The result revealed the highest percentage germination occurred took place in 30cm depth, while 90cm depth has the least germination tendency. It is therefore recommended during planting for the use of 3cm depth and 90mins soaking time for, a better germination performance.

Key words: ***Jatropha curca, Socking time, Germination percentage, Varying depth***

INTRODUCTION

Jatropha curcas is a perennial, multi-purpose, monoecfius crops which grow in all forms of soils, (wasteland soils). Five species of Jatropha were found to be occurring in Nigeria. These include *J. cucas, J. gossyfolia and J. cheveleria* (Nana) *Podatrica and* Multipida. However, special interest is placed on the J. *curcas* because of the oil contained in its seeds that is chemically and functionally similar to petroleum diesel. The non-edible oil of *Jatropha* is found in Cape Verde and Nicaraguan varieties, but the Mexican variety is edible (Staubman, 1987: Rogo, 2008). The Cape Verde variety is the most widespread throughout the world. This variety was probably distributed by

Portuguese seafarers via Cape Verde Island to Africa and Asia. It is now cultivated in almost all tropical and subtropical countries. In Nigeria, it is cultivated as a protective hedge around homesteads, gardens and fields (Henning, 1997). The Cape Verde variety contains smaller but more numerous seeds per stand compared with the Nicaraguan variety (Kurawa 2007 and Henning, 2004; Gour, 2007; Rogo, 2008*).*

J. curcas can grow on soils with annual precipitation of 300 to 2000 mm with an optimum fruits yield at 1000 to 1500 mm. Where precipitation is below 600mm, supplementary irrigation will improve the yield, but rainfall higher than 1500mm will provoke fungal attack (Henning, 2004; Mohammed, 2006; Owens and Rogo, 2007). Well drained soil supports best growth; clay soil is unstable and subject to water logging (Mahaunta, 2006; Owens and Rudolf, 2007; Kurawa, 2008). Temperature well above 20°C is essential for crop yield (Henning, 2004).

There is the growing interest in the cultivation of *J. curcas* due to its potentials as feedstock for biodiesel, glycerol and organic fertilizer (Ormic, 2006). Its longevity of 30-50 years in productivity and potential for reclamation of degraded land makes it an increasingly important crop (Heller, 1996; Kurawa, 2008; Abubakar, 2008). The aim of this paper is to determine the suitable depth for germination of *Jatropha* also to find out whether or not soaking time has any significant effect on the germination of *Jatropha curcas.*

JUSTIFICATION

The role and importance of *Jatropha curcas* especially in semiarid and arid region can not be over emphasized.

For instance, it is used for reclamation of degraded lands and soils as a wind break leading to conservation of soils, repelling erosion, and so many other uses. The seeds of *Jatropha carcass* can be used in the production of biodiesel, the leaves when deducted as anti-malaria. The back of *Jatropha* produces petrol, the latex which is the white exudates is being used for landing, the glycerol for laboratory activities and finally the cake as feeds by animals, as fertilizer and as well for biogas generation (Young, 1986)

MATERIALS AND METHODS

Determination of germination of seeds at varying depth

Seeds of .*J. curcas* was planted at soil depths of 3, 6 and 9 cm respectively at

allowed to germinate for a period of 18 days. Thereafter, the percentage germination was determined.

Determination of germination of seeds after soaking

Seeds of *J. curcas* was soaked and allowed to remain for a period of 30, 60 and 90 minutes respectively. The soaked seeds were planted in the field and allowed germinate for a period of 18 days, thereafter the percentage germination was determined over the period of time. The two experiments were conducted separately and at 3 replicates each mean from where taken and calculated.

Soil physicochemical analysis

Soil samples from 0-15cm and 16-30cm depths were collected using a soil auger from the two experimental sites. Soil particle size analysis was carried out using the hydrometer method (Gee and Bauder, 1986). Percent hydrogen (pH) was determined by pH meter methods (Mclean, 1982). Electrical conductivity (EC) by the conductivity method (Rhoades and Crown, 1984) and exchangeable bases (Ca, Mg, Na, and K) and the CEC uses flame photometer method. Total nitrogen and organic carbon were determined using Walkley and Black (1934) method. Available phosphorus had been determined using the Bay No.1 method (Bray and Kurt, 1948).

RESULTS AND DISCUSSION

The effect of depth of planting on the germination of *J. curcas* is shown in Fig. 1. The highest percentage germination was recorded at a depth of 3 cm compared to the 6cm and 9 cm depth. At 3 cm depth, germination was recorded between day 5 and day 11. At 6 cm depth, germination took a longer time to commence (7 days) and lasted up to day 12. Germination was 15% at day 7 and increased to 40% at day 12, while at 9 cm depth, germination commenced ay day 9 and stopped at day 12. Total percentage of plant germination increased from 10% at day 9 to 25% at day l2.

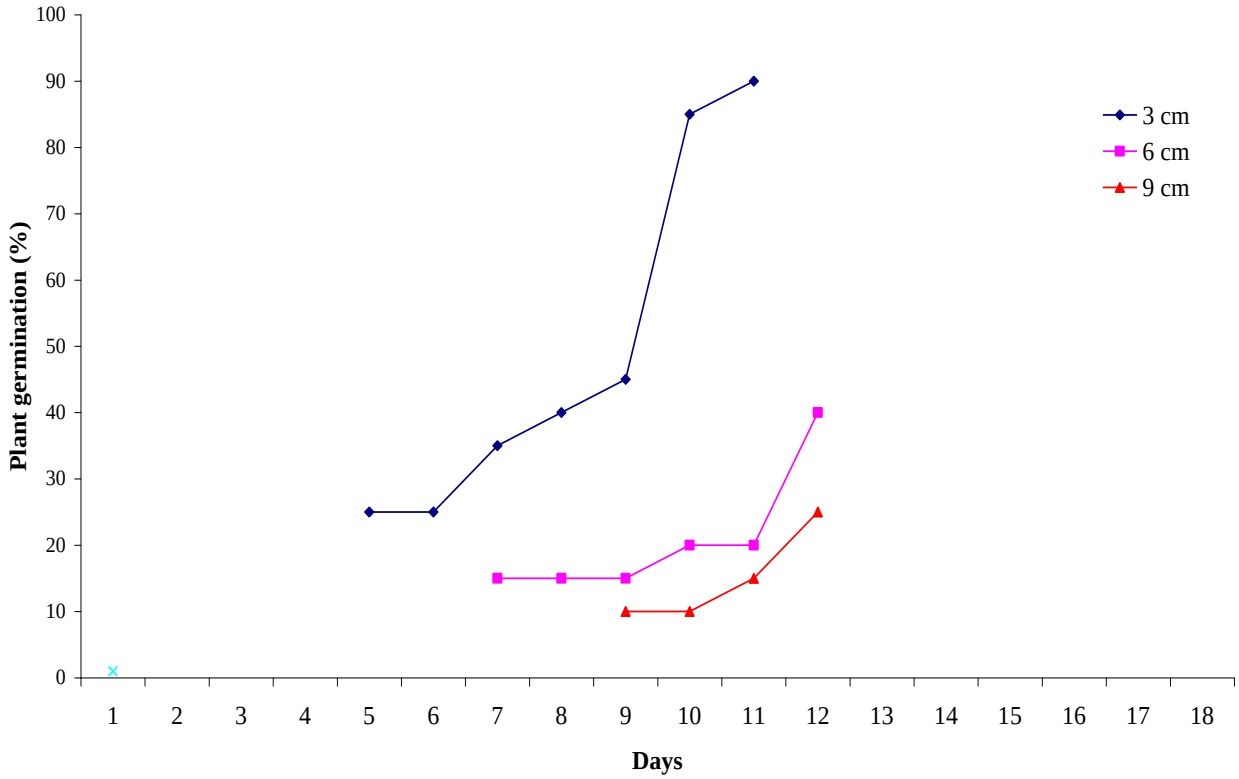

Fig. 27: Effect of depth on the germination of Jatropha curcas

Fig. 2 showed the effect of soaking and time on the germination of *J. curcas*. Soaking for 30 minutes produced percentage germination from day 6 to day 12 at 3cm depth. The germination increased with increase in time of soaking from 10% at day 6 to 25% at day 12. Soaking for 60 minutes produced germination between day 6 and day 12 with percentage germination increasing from 20% at day 6 to 65% at day 12, while soaking for 90 minutes produced germination between day 3 and day 7, with percentage germination increasing from 15% at day 3 to 85% at day 7. The control (seeds planted without soaking) produced germination ranging from 25% at day 5 to 90% at day 11.

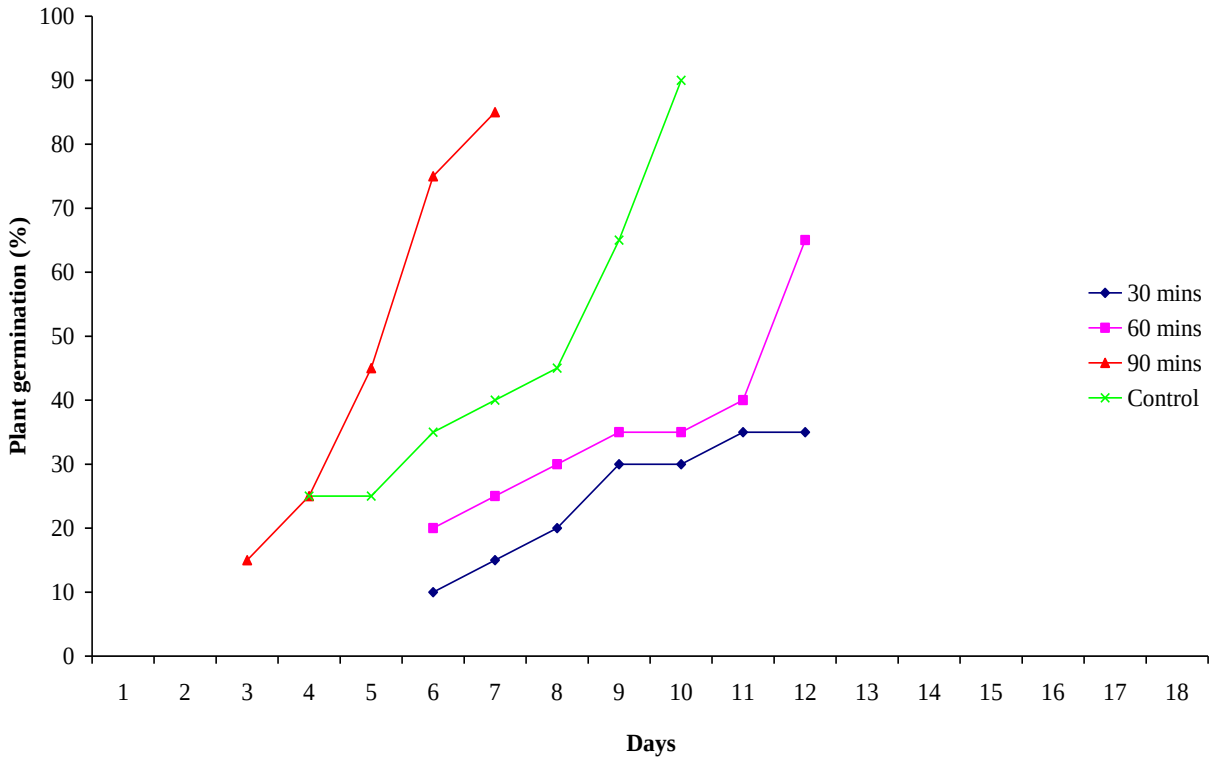

Fig. 28: Effect of soaking on the germination of Jatropha curcas

Physico-Chemical Properties of Lowland and Upland Soils of Sokoto

No significant difference (P>0.05) was observed in the pH of the lowland and upland soils with respect to soil depth. Table 1 shows the physico-chemical properties of soils of 0-15 cm and 15-30cm depths in lowland and upland areas of Sokoto. pH of lowland soil at 0-15 cm depth was 5.95, and 5.85 for 15-30 cm soil depth. Upland soils had higher pH values of 6.78 at 0-15 cm soil depth and 6.29 at 15-30 cm soil depths respectively. Thus, the lowland soils showed more acidity than upland soils. Soil acidity also increased with depth since the acidity of the 15-30 cm soils was higher than the 0- 15 cm soils in both lowland and upland areas.

Emulsion capacity (EC) of lowland soils at 0-15 cm soil depth was higher (0.34 ds/rn) although not significantly (P>0.05) than the soils at 15-30 cm depth (0.24 ds/m while upland soils had statistically the same (P>0.05) emulsion capacity at 0-15 cm soil depth (0.12 ds/m) and 15-30 cm soil depth (0.13 ds/m) respectively.

Furthermore, no significant difference (P>0.05) was observed in the organic carbon content of lowland soils at 0-15 cm depth (14.77 mg/kg) and 15-30 cm depth (14.30 mg/kg) respectively. However, for upland

soils, organic carbon at 15-30 cm soil depth was significantly (P<O.05) higher (10.37 mg/kg) than that of 0-15 cm depth (7.59 mg/kg). Thus organic carbon content of upland soils significantly increased with soil depth.

Total nitrogen of lowland soils at 0-15 cm and 15-30cm depths did not differ significantly (P>0.05) having the values of 0.77 glkg and 0.60 g/kg respectively. Similarly, for upland soils, total nitrogen did not differ significantly (P>0.05) at 0-15 cm (0.30 g/kg) and 15-30 cm depth (0.30 g/kg) respectively.

Available phosphorus was also statistically the same for lowland and upland soils at 0-15 and 15-30 cm soil depths. Soil depth significantly influenced the potassium (K) content of lowland soils. The K content of lowland soils at 15-30 cm was significantly (P<0.05) higher (38.60 mg/kg) than that of 0-15 cm depth (6.18 mg/kg); while in upland soils, soil depth did not significantly influence (P>0.05) the K content of the soil (Table 4 refer).

Content of sodium of lowland soils at 0-15 cm depth (19.23 cmol/kg) and 15-30 cm depth (16.59 cmol/kg) did not significantly differ (P>0.05), but differed significantly (P<0.05) for upland soils at 0-15 cm depth (1.32 cmol/kg) and 15-30 cm depth (1.20 cmol/kg) respectively. Upland soils had lower sodium content than the lowland soils. (Table 1 refer).

Calcium content of lowland soils was not significantly affected (P>0.05) by depth, with values of 1.29 cmol/kg at 0-15cm and 1.20 cmol/kg at 15-30cm soil depths. However, for upland soils, depth significantly influenced (P<0.05) the calcium content of the soil, with the 0-15 cm soil sample having higher calcium values (0.39 cmol/kg) than the 15-30cm sample (0.32 cmol/kg), thus indicating a decrease in calcium content with increase in soil depth.

Table 1: Soil physic-Chemical Properties of Lowland and Upland areas of Sokoto

	Lowland		Upland	
	Depth (cm)			
Chemical properties	0-15			
Ph	5.95 ± 0.61	5.85 ± 0.62	6.78 ± 0.55	6.29 ± 0.61
EC (ds/m)	0.34 ± 0.08	0.24 ± 0.04	0.12 ± 0.01	0.13 ± 0.00
Organic Carbon (mg/kg)	14.77 ± 2.48	14.30 ± 1.76	$7,59^{b}$ ± 0.10	10.37^{a} ± 0.09
Total N (g/kg)	0.77 ± 0.21	0.60 ± 0.16	0.30 ± 0.02	0.32 ± 0.02
Available P (mg/kg)	0.15 ± 0.03	0.14 ± 0.03	0.16 ± 0.01	0.16 ± 0.01
K	618^{b}±232	$0.38.60^{a}$± 16.73	0.32± 0.01	0.29± 0.01
Na(cmol/kg)	19.23 ± 8.25	16.59 ± 7.05	1.32^{a}± 0.01	1.20^{b}± 0.02
Ca (cmol/kg)	1.29 ± 0.09	1.20 ± 0.03	0.39^{a} ± 0.01	0.32^{b} ± 0.02
Mg (cmol/kg)	1.71 ± 0.42	1.60 ± 0.36	0.88^{b} ± 0.03	1.17^{a} ± 0.07
C.E.C	18.35 ± 6.75	16.16 ± 5.86	3.48^{a} ± 0.18	2.44^{b} ± 0.04

Values are mean ± standard error of six replications

a,b,c means in a row with the same superscripts are not significantly different (P>0.05)

CONCLUSION

It is concluded that, *Jatropha curcas* planted at the 3 cm depth support best germination as compared to 6 and 9cm depth. It was also realized that germination at 9cm depth took longer time to commence at day nine. This resulted to some stunted germination as a result of partial dormancy in some *Jatropha* seeds. It was also concluded that control seeds without soaking germinated better than the soaked ones. It is therefore recommended that, *Jatropha* large scale plantation should be planted at 3cm depth which proved to be more efficient in terms of germination. It is also recommended from this study that, *Jatropha* seeds should be planted with out soaking despite the hardy cover.

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