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INFLUENCE OF SOWING DEPTH ON SEED GERMINATION AND EARLY GROWTH OF *Plukenetia conophora* Mull. Arg.

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ABSTRACT

The effect of sowing depth on germination and early growth variables of *Plukenetia conophora*was was investigated in this study. The study was conducted in the indigenous fruit tree nursery of Forestry Research Institute of Nigeria, Ibadan. The treatments consisted of four sowing depths of 4cm, 8cm, 12cm and 16cm and these were tagged T_1, T_2, T_3 and T_4 respectively. These treatments were arranged in Randomized Complete Design (RCD) with five replicate each. The data were subjected to ANOVA in CRD at 5% probability level. It was revealed that seed germination and other early growth variables studied increased with decrease in sowing depth. Treatment T_3 (12cm) gave the highest germination percentage (93.33%), followed by T_2 (73.33%) while T_1 and T_4 had 60.00% germination percentage. The first seed emerged 20 days after planting in T_1. Peak germination of 6 seeds/day was recorded at 30th day after sowing and 10th day after germination commenced. Although the result of ANOVA indicated that there was no significant effect for all the growth variables assessed except for collar diameter, it was concluded that the depth of sowing greatly influence the seed germination of *P. conophora*. Thus, the study suggested that the seeds of *P. conophora* should be sown at 12cm depth of soil to obtain maximum seedlings emergence for optimum establishment of *P. conophora* plantation.

Key words: *Plukenetia conophora*, seed germination, sowing depth and seedlings

INTRODUCTION

The Euphorbaiceae is one of the most interesting and economically important plant families. The family is of much importance from the point of view of producing a number of useful products, for example, natural rubber is produced from *Hevea* spp; biodiesel from *Jatropha*; starch from *Manihot* and castor oil from *Ricinus*. Some of the families are also used as ornamentals (Ayodele, 2003). *Plukenetia conophora* Mull. Arg. (African walnut) is also a member of the Euphorbiaceae family. It is a woody climber of about 6–18 m long on attainment of reproductive phase with a stem found in the wet parts of Eastern and Western Nigeria, and Western Africa in general (Udedi *et al*., 2013). Conophora plants are cultivated principally for the nuts which are usually cooked and consumed as snacks (Ayodele, 2003). The fruits are four winged ridged between wings and up to 3 inches in diameter with four round seeds (usually brown) in each fruit (Nuhu *et al*., 2000)

The plant is known in Africa especially in the Eastern and Western parts of Nigeria for its antibacterial efficacy (Okerulu and Ani, 2001). Decoction of leaves and seeds serve as beverage which relieves abdominal pains and fever. Dried walnuts can be ground and turned into flour which can be used as composite flour during baking or in-place of milk in tea preparation (Malu *et al*., 2009). Phytochemical analysis of the nuts, leaves and roots indicates that it contains bioactive compounds such as oxalates, phytates, tannins, saponins, alkaloids, flavonoids and terpenoids (Ayodele, 2003; Ojobor *et al*., 2015). It possesses wound healing, antibacterial, antioxidant and immune stimulating activities (Animashun *et al*., 1994). It is a healthy food for cardiological patients due to its ability to reduce cholesterol and triglyceride in rats compared with the control group fed with standard diets (Kanu *et al*., 2015). Despite the huge importance of this plant, its silvicultural handling is still in its infancy, hence the aim of this study

The germination of the seeds of many tree species is affected by several climate and edaphic factors like temperature, light, soil moisture, sowing depth etc. The depth of sowing is one of the most important factors which influence the seed germination of many plant species. Too shallow sowing results in poor germination due to inadequate soil moisture at the top soil layer (Desbiolles, 2002). On the other hand, deep sowing can also significantly reduce crop emergence and yield (Aikins *et al*., 2006). Therefore the main aim of this study is to examine

the influence of sowing depth on the seed germination and early growth of *Plukenetia conophora.*

MATERIALS AND METHODS

Mature *P. conophora* fruits were collected from Oyo, Oyo State. Seeds were extracted and three seeds were sown in perforated big size polythene pots filled with 2kg top with different depths of soil as follows:

4cm– T_1

8cm – T_2

12cm – T_3

16cm – T_4

After sowing, they were covered with the soil of same composition to the level of required thickness for each treatment. These were arranged in a Completely Randomized Design (CRD). Regular watering was done to maintain the proper moisture content and replicated 5 times making a total of sixty seeds, and observed for seedling emergence until no more germination was observed. Twenty seedlings were randomly picked after emergence for growth variables measurement (Number of Leaves, Leaf Area, Seedlings Height and Collar Diameter). Data collected were subjected to descriptive (Percentages and Averages) and ANOVA.

During the experiments number of days taken for the emergence of first seedling and completion of germination were recorded in all the treatments, and the germination percentage in each case was calculated.

Plate 1: *Plukenetia conophora* seeds before sowing

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Results

Table 1: Germination percentages according to Sowing Depth of *Plukenetia conophora*

Treatment	Number Planted	Number Germinated	Germination Percentage (%)	Overall Germination Percentage (%)
T_1	15	9	60.00	20.93
T_2	15	11	73.33	25.58
T_3	15	14	93.33	32.56
T_4	15	9	60.00	20.93
Total	60	43	71.67	

The first emergence was observed in seeds sown in 4cm depth at 20th day of sowing. Peak germination of 6seeds/day was recorded at 30th day after sowing and 10th day after germination commenced. The highest germination percentage (93.33%) was recorded in 12cm depth, followed by 8cm depth (73.33%). Ironically, there seem not to be any difference when sown in 4cm and 16cm deep.

Table 2: Analysis of Variance for the Collar Diameter (mm) of *Plukenetia conophora*

Source of Variation	df	Sum of Square	Mean Sum of Square	F-calculated	F-tabulated
Treatment	3	115.72	38.57	38.57*	5.28
Error	16	16.03	1.00		
Total	19	131.75			

*significant at 5% probability level

Table 3: Analysis of Variance of the Number of Leaves of *Plukenetia conophora*

Source of Variation	df	Sum of Square	Mean Sum of Square	F-calculated	F-tabulated
Treatment	3	36.75	12.25	1.04^{ns}	3.24
Error	16	188.90	11.81		
Total	19	225.65			

ns = Not significant at 5% probability level

Table 4: Analysis of Variance of the Seedling Heights (cm) of *Plukenetia conophora*

Source of Variation	df	Sum of Square	Mean Sum of Square	F-calculated	F-tabulated
Treatment	3	1025.15	341.72	0.74 ^{ns}	3.24
Error	16	7435.85	464.74		
Total	19	8461.00			

ns = Not significant at 5% probability level

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Table 5: Analysis of Variance of the Leaf Area (cm^2) of *Plukenetia conophora*

Source of Variation	Df	Sum of Square	Mean Sum of Square	F-calculated	F-tabulated
Treatment	3	3755.80	1251.93	3.07*	3.24
Error	16	6514.66	407.17		
Total	19	10270.46			

*significant at 5% probability level

Plate 2: *Plukenetia conophora* seeds germinating under shed

DISCUSSION

The germination percentage increased as the depth of sowing increased from T_1 to T_3 whereas, a sharp decrease in it was found with an increase in depth of sowing to T_4. The minimum days required for emergence of first seedling was 20 for T_1 and this period follows the trend of increase with increase in depth of soil, similarly the number of days for completion of germination was found to increase with increase in depth of sowing. This is in line with Ahirwar, (2015) who worked on the effect of sowing depth on seed germination of *Bute afrondosa* and found that the sowing depth has influence on percentage germination of the species. The similar results are found in *Acacia catechu* and *Cassia fistula* at 2cm depth of soil (Agrawal *et al.*, 1996). The earlier seed germination was found in *Sterculia urens* at

2cm depth of soil (Pande and Khatoon, 1999). But the germination percentage significantly decreased in *Alangium lamarckii* with the increase in depth of soil (Ahirwar, 2011).

The negative effect of deep sowing depth was reported by Nabi *et al*., (2011) who found that seedling emergence was decreased with increased sowing depth in cotton. The deeper the seed is sown the more strength it needs to push its shoots above the soil surface. It is suggested that with similar seeds, shallow sowing depth are best.

The study on the growth variables corroborates Siddig and Abdellatif, (2015) who also found no significant difference among the sowing depth on growth parameters of Faba Bean (*Vicia faba*). This is because they were exposed to same conditions once they emerged out of the soil.

CONCLUSION AND RECOMMENDATION

From the experiment, it can be concluded that the depth of sowing greatly influence the seed germination of *P. conophora* since the seeds sown at 12cm depth of soil gave better seed germination than other sowing depths of soil. Thus, from the study, it can be recommended that the seeds of *P.conophora* should be sown at 12cm depth of soil to obtain maximum seedlings establishment and for subsequent plantation establishment by farmers.

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