

ASSESSMENT OF EARLY GROWTH PERFORMANCE OF *Treculia africana* UNDER DIFFERENT GROWTH MEDIA

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Abstract

A nursery experiment was conducted to evaluate the effect of different growth media and watering regimes on the early growth performance of *Treculia africana* seedlings. The experiment involved two factors which include three (3) growth media and three (3) watering regimes. Seven hundred and two (702) seeds were laid in a 3 x 3 factorial experiment with 9 replicates.. There were significant variations among the growth media and watering regimes. The top soil recorded the highest growth, followed by the sawdust while the river sand had lowest growth indices.. Similarly, the seedlings that were watered twice daily recorded the highest growth while the seedlings that were watered once daily and once in two days interval showed no clear distinction in their growth performance, that is, the seedlings had equal growth development. It was concluded that the topsoil medium was the best for the raising of healthy *Treculia africana* seedlings.

INTRODUCTION

Treculia africana is a multipurpose fruit tree species commonly known as African breadfruit. It belongs to the family of moraceae and it grows in the forest zone, particularly the coastal swamp zone (Agbogidi and Onomerebor, 2008). It enjoys a wide distribution in West Africa, Central Africa and Madagascar (Okafor, 2009). The species grows best in equatorial lowlands below 600-1550m above sea level (Nwajiaku *et al.*, 2013). It is widely grown in Southern Nigeria for its seeds. The most popular name in Igbo land is, "Ukwa". The species is a large tree, which grows up to 30m high; it flowers between October and February (Salami, 2002).

African breadfruit is a traditionally important edible fruit tree in Nigeria, its importance is due to the potential use of its seeds, leaves, timber, roots and bark (Okafor, 1989). It is increasingly becoming commercially important in Southern Nigeria hence, Baiyeri and Mbah (2006) described it as an important natural resource, which contributes significantly to the income and dietary intake of the poor. The seeds when cooked are highly nutritious containing most of the essential nutrients needed for the maintenance of good health, and it has variously described to contain 17.3% crude protein and 10.21% crude fat (Okafor and Okolo, 1974; Okafor and Caldecott, 1990). The proximate analysis shows that the seeds of *Treculia africana* contain protein, fat, iron, ash, calcium, phosphorus, carbon, hydrogen, magnesium, iron, sulphur, crude fibre, carbohydrate and other minerals including zinc, lead, copper, phytate, oxatate and tannin (Nwanna *et al.*, 2008). The seeds have an excellent polyvalent dietetic value, whose biological value exceeds even that of soybeans (WAC, 2004).

Idowu *et al.*, (2013) reported that in respect to the economic and domestic importance of *Treculia africana*, the tree has been over exploited and is unable to naturally regenerate therefore becoming endangered and gradually going into extinction. In spite of this, little

efforts have been made towards commercial propagation of this species. The production of high quality seedlings for orchard and plantation establishment involves several cultural inputs; the quality of potting media perhaps stands out as the most important (Baiyeri and Mbah, 2006). Nursery operations in Nigeria are in most cases, subsistence. However, there are few fairly organized nursery setups in colleges and agricultural establishments. A few existing peri-urban commercial nurseries are mostly manned by non-professional technicians or are operated with cultural practices that degrade the environment (Baiyeri and Mbah, 2006). Nursery potting media influence quality of seedlings produced thereof.

The quality of seedlings obtained from a nursery influences re-establishment in the field and the eventual productivity of an orchard. The traditional nursery potting medium in Nigeria is topsoil dug from the farmland and amended with poultry manure. Nevertheless, the suitability of this has not been tried on *Treculia africana*. The present study aims at determining the optimum growth media for the propagation of *Treculia africana* seedlings.

MATERIALS AND METHODS

This study was conducted in the nursery site of the Department of Forestry and Wildlife Technology, Federal University of Technology, Owerri. Nine hundred (900) seeds of *Treculia africana* were extracted from the fruit collected from a *Treculia africana* tree growing in the wild in the Ngor Okpala LGA of Imo State. The seeds were subjected to viability test by floatation method, then, the non-viable seeds were discarded. Three growth media (topsoil, river sand and sawdust) were filled into a germination tray. Seven hundred and two seeds were divided into three (3), each sown under the different media at about 2cm depth. Each treatment (growth medium) was replicated nine times with twenty six seeds sown in each replicate and three (once daily, twice daily and once in two days) watering regimes were applied. The experiment was laid out in a 3×3 factorial arrangement in a completely randomized design (CRD) or one-way ANOVA. Seedling emergence was monitored on daily basis, the number of seedlings that germinated was recorded. Data on seedling height, leaf number, and leaf area and collar diameter were collected. The number of the leaves was determined by counting, the seedling height was measured with a meter rule at the distance from the soil level to terminal bud while the leaf area was also determined by tracing the leaves on a graph paper and the total leaf area per seedlings obtained by counting the number of 1cm squares. Collar diameter was measured with veneer callipers. The data on germination was analyzed using descriptive statistics such as germination frequency and percentages. The data collected on growth parameters was subjected to statistical analysis using the ANOVA procedure.

RESULTS

Germination Successes of *Treculia africana* Under Different Growth Media

Table 1 present the germination percentages of *Treculia africana* under different growth media. Highest germination percentage of 91.45% was recorded under top soil. This was followed by the seeds sown in river sand with a percentage germination of 82.91%. The least germination percentage of 76.92% was recorded under sawdust.

Effects of Different Growing Media on Growth Performance of *Treculia africana*

Seedling Height

Seedlings in the Topsoil medium recorded the highest (29.83 cm) mean seedling height which significantly differed ($p < 0.05$) from the lowest (10.87 cm) mean seedling heights recorded from the river sand medium (Table 2). Watering regime did not show significant ($p < 0.05$) influence on the plant height of the seedlings.

Table 1: Percentage Germination under Different Growing Media

Growing media	Number of seeds sown	Number of seeds germinated	Percentage (%) germination
River sand	234	194	82.91
Top soil	234	214	91.45
Sawdust	234	180	76.92

Table 2: Growth Parameters under Different Growing Media and Watering Regimes

Factors	Mean values			
Growing media	Height (cm)	Leaf number	Leaf area (cm ²)	Collar diameter (cm)
River sand	10.87 ^c	3.46 ^b	14.15 ^c	0.80 ^a
Sawdust	11.62 ^b	3.50 ^b	17.69 ^b	0.76 ^b
Top soil	29.83 ^a	4.72 ^a	22.34 ^a	0.66 ^c
LSD value	0.73	0.10	0.90	0.04
Watering regimes				
Once daily	17.49 ^a	3.68 ^c	17.46 ^b	0.76 ^a
Twice daily	17.61 ^a	4.01 ^a	17.70 ^{ab}	0.75 ^a
Once in two days	17.22 ^a	3.98 ^b	19.02 ^a	0.70 ^a
LSD value	1.26	0.20	1.54	0.08

N.B.: Means with the same alphabet as superscripts are not significantly different from each other.

Number of Leaves per Seedlings

Watering regime significantly influenced the number of leaf per seedling. The seedlings that received twice daily watering recorded the highest (4.01) mean number of leaves which showed significant difference ($p < 0.05$) from the lowest (3.68) mean number of leaf recorded from the seedlings that received once daily water application. Similarly, seedlings in the topsoil growing medium had the highest (4.72) mean number of leaves which also was significantly different ($p < 0.05$) from the lowest (3.46) mean number of leaves recorded from the river sand medium (Table 2)

Leaf Area

The highest (22.34 cm²) mean leaf area per plant was recorded from the seedlings planted in the topsoil medium. This was significantly different ($p < 0.05$) from the lowest (14.15 cm²) recorded from the river sand medium. Also, seedlings that received twice daily water application recorded significantly ($p < 0.05$) the highest (19.02 cm²) mean leaf area per seedling while the lowest (17.46 cm²) mean leaf area per seedling was recorded from the seedlings that received once daily water application (Table 2).

Collar Diameter

The highest (0.80 cm) mean leaf area per plant was recorded from the seedlings planted in the topsoil medium. This was significantly different ($p < 0.05$) from the lowest (0.66 cm²) recorded from the river sand medium. However, seedlings that received once daily water application recorded the highest (0.76 cm) non-significantly different ($p < 0.05$) mean leaf area per seedling while the lowest (0.70 cm) mean leaf area per seedling was recorded from the seedlings that received once in two days water application (Table 2).

DISCUSSION

According to the results obtained from this study, it was observed that *Treculia africana* responded differently to different growth media treatments. The top soil recorded the highest growth, followed by the sawdust, then, the river sand. This is in line with the statement of Baiyeri and Mbah (2006), who stated that most of the seedlings growth parameters of *Treculia africana* (African Breadfruit) respond significantly to different growth media. This also conforms to the findings of Baiyeri (2005) who reported that nursery growth media influenced the quality of seedlings produced for establishment of a plantation or an orchard. In addition to this assertion, Baiyeri (2005) also obtained a higher germination percentage in top soil with *Persia americana* and *Dacryodes edulis* respectively. They argued about the availability of adequate soil nutrients for seedling germination, development and growth. However, in this present study the impressive performance of the seeds in terms of germination could be attributed to the quality of seeds used. This point is explained in the study of Cernac, et al., (2006) who stated that the germination rate and seedling emergence of plants are independent of the soil nutrient status, rather, it depends completely on the cotyledons that are attached to the seedlings which are rich in stored nutrient reserves till the seedlings become autotrophic or develop their root system and leaves for photosynthesis.

Subsequently, it was noted that African breadfruit also responded to several watering regimes. Among the three watering regimes studied, the general growth response and reaction to water stress suggested that the seedlings that were watered twice daily recorded the highest growth, while there was no clear distinction between the growth performance of the seedlings that were watered once, and a once in two days, that is, their growth rate were similar. Studies elsewhere had shown that there are influences of water stress under different watering regime of *Treculia africana* seedlings. Cernac, et al. (2006) recommended that adequate water supply is important for the effective growth and development of African breadfruit seedlings mostly daily in the nursery. Seedlings are tender; therefore, they are more responsive to water availability. It was observed that the seedlings grown in the river sand were the first to respond to water stress may be due to the poor soil structure of the growth media, thus, it suggests that for African breadfruit propagation, the growth media must be well aerated and has an optimum water holding capacity. Therefore, the relative balance of water and air within the soil pore spaces are very necessary for seedling growth and development.

CONCLUSION

From the results of this present study and the discussion that followed seedlings of *Treculia africana* are easy to raise and that they are at optimum performance in a topsoil medium. Therefore, for it can be said that topsoil medium is best for raising healthy *Treculia africana* seedlings. It is therefore recommended that plantations of this species be established to save the species from going extinct.

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