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Performance of Teak (*Tectona grandis* Linn.) Seedlings Under Different Planting Media

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Abstract: Some trials were conducted in the Teaching and Research Farm of the Delta State University, Asaba Campus, Delta State, Nigeria in 2006 to determine the performance of teak seedlings under different planting media viz: top garden soil (TS), a mixture of top garden soil and sawdust in a ratio of 50:50 (TS/SD), sawdust (SD) and Sharp Sand (SS). The experiment was arranged in a Randomized Complete Block Design (RCBD) with four replications. The results indicated that the performance of the test plant as regards height, number of leaves, leaf area collar diameter and total leaf area was significantly ($p \leq 0.05$) higher in top garden soil when compared with seedlings grown in the other planting media. For example, while the height of the seedlings in TS at 6 Weeks After Transplanting (WAT) was 38.6 cm, the values of 29.4, 30.0 and 35.7 cm were recorded for seedlings planted in SS, SD and TS/SD at 6 WAT, respectively. This study has established that planting medium has a highly significant effect on the performance of teak seedlings. Top garden soil is therefore, recommended to teak growers in the tropical rainforest zone.

Key words: Growth, *Tectona grandis* seedlings, planting media

INTRODUCTION

The tropical rainforests of West Africa are endowed with abundant high valued tree species, which many households of the region depend on for economic uses including construction work (Nwoboshi, 1985; Nakata and Isoda, 2005). Many of the tree species such as teak are heavily traded on both locally and internationally thereby, contributing significantly to the economy of the countries involved (Bhat and Hwon, 2004). Furthermore, the clearance of forests for agriculture, increased urbanisation and industrialisation, over exploitation, rapid population growth, unsustainable forest harvest and other economic activities contribute to forest depletion (Salim and Ullsten, 1999; Agbogidi and Dolor, 2002).

Teak, through an exotic species, is widely cultivated throughout the world because of its durability and multipurpose benefits (Nwoboshi, 1985; Bhat and Hwon, 2004). The tree could reach a height of 30 ft or more with a fluted bole and sometimes with slight buttress and 3 m in girth (Nwoboshi, 1985). The tree flowers between April and August and starts fruiting around September. The wood is dark golden yellow heartwood, which darkens with age (Akinsami, 1985). Nakata and Isoda (2005) maintained that teak flowers are protandrous and pollen is shed within a few hours of flower opening. Teak has a high tolerance for drought and it is both insect and disease resistant (Bhat and Hwon, 2004).

Teak is easily worked and has natural oils that make it suitable for use in exposed location where it is durable and harder (Leakey and Newton, 1994). The timber according to Nwoboshi (1985) is used in the manufacture of out door furniture, boats, desks and other articles where weather resistance is

desired. Nwoboshi (1985) also stated that teak is useful for door floorings and as a veneer for indoor furnishing. The economic benefits derivable from the plant are quite numerous hence Bhat and Hwon (2004) stated that teak holds the place which diamond maintains among precious stones and gold among metals. In spite of these economic uses of teak, Oluwalana (1997) noted that existing teak plantations in Nigeria are quite small. If these benefits must continue especially for the future generations, there is a need to stimulate farmers' interest in teak cultivation thereby helping to reduce poverty not only among the rural populace, but also to boost the source of revenue for the federal government. To this end, it has become necessary to study the performance of teak seedlings under different planting media. The need to domesticate teak species not only for increased revenues but for ecological purpose cannot be overemphasized. This study was aimed at determining the performance of teak seedlings under different planting media with a view to recommending the best medium to teak growers. The study also has the advantage of bequeathing to posterity one of the exotic but widely cultivated species that is highly threatened by forces of extinction.

MATERIALS AND METHODS

The experiment was conducted at the Teaching and Research Farm of the Delta State University, Asaba Campus (latitude 6°14'N and longitude 6°49'E) (Anonymous, 2006).

Four growth media viz top garden soil, a mixture of top garden soil and sawdust in a ratio of 50:50 (TS/SD), sawdust and sharp sand. The plant used for the study was *Tectona grandis* Linn. The seedlings (12 weeks of age) were sourced from the Forestry Research Institute of Nigeria (FRIN), Ibadan, Oyo State. The plant was chosen because of its usefulness, its value in the timber industry and its abundant distribution in the rainforest zone. The seedlings were sown in soils in large bottom perforated poly-pots (20/15 cm) and irrigated with water every other day till the end of the trial following the procedure of Agbogidi and Eshegbeyi (2006). There were therefore, four treatments replicated four times. Each treatment including the control consisted of 10 poly-pots each. The set-up was left in the Departmental nursery for a week before they were transferred to the field for further examination. The experiment was arranged in a randomized complete block design with four replications. The trial was monitored for 9 weeks while parameters were measured every three week starting from the third week after transplanting (3 WAT). Parameters measured were plant height, number of leaves, leaf area, collar diameter and total leaf area. Plant height was measured with a meter rule at the distance from soil level to the top of the terminal bud, the number of leaves was determined by visual counting of the leaves, leaf area was determined by multiplying the length and breadth measurements of a leaf multiplied by the number of leaves in the plant and finally by a correction factor of 0.75 following the procedure of Agbogidi and Ofuoku (2005). Collar diameter at 3 cm above soil level was measured using veneer calipers. Data collected were subjected to analysis of variance while the significant means were separated with the Duncan's Multiple Range Test using SAS (1996).

RESULTS AND DISCUSSION

The seedlings grown in TS had the highest plant height values and were significantly ($p \leq 0.05$) different from the seedlings planted in the other planting media (Table 1). The medium containing mixture of TS and SD also had appreciable plant height values which were significantly ($p \leq 0.05$) different from the values of seedlings grown in SS and SD. For example, at 6 WAT, teak seedlings grown in top soil attained the height of 38.6 cm while 29.4 cm was recorded for those planted in sharp sand. Similarly, the number of leaves, leaf area, collar and total leaf area diameter of seedlings in the control soils (TS) were significantly ($p \leq 0.05$) greater when compared with those in the other growth media (Table 2-5) respectively.

Table 1: Height (cm) of teak seedlings as affected by different planting media

Planting media	WAT/height			Means
	3	6	9	
TS	34.2 ^a	38.6 ^a	46.7 ^b	39.8
TS/SD	32.0 ^b	35.7 ^b	43.1 ^b	36.9
SD	29.4 ^c	30.0 ^c	31.3 ^d	30.2
SS	28.7 ^c	29.4 ^c	31.7 ^c	29.9
Means	31.1	33.4	38.2	

Means with different superscripts in the same column are significantly different at ($p \leq 0.05$) using Duncan's Multiple Range Test (DMRT)

Table 2: No. of leaves of teak seedlings as influenced by different planting media

Planting media	WAT/No. of leaves			Means
	3	6	9	
TS	7.2 ^a	9.6 ^a	11.8 ^a	9.5
TS/SD	6.5 ^b	8.8 ^b	9.7 ^b	8.3
SD	4.5 ^c	5.7 ^c	6.8 ^c	5.7
SS	4.3 ^c	5.2 ^d	6.3 ^d	5.3
Means	5.6	7.3	8.7	

Means with different superscripts in the same column are significantly different at ($p \leq 0.05$) using Duncan's Multiple Range Test (DMRT)

Table 3: Leaf area (cm²) of teak seedlings as affected by different planting media

Planting media	WAT/Leaf area			Means
	3	6	9	
TS	100.4 ^a	115.7 ^a	126.4 ^a	114.2
TS/SD	90.6 ^b	98.4 ^b	107.6 ^b	97.9
SD	81.6 ^c	86.3 ^c	89.1 ^c	85.7
SS	80.4 ^d	84.8 ^d	88.3 ^c	84.6
Means	88.3	96.3	102.1	

Means with different superscripts in the same column are significantly different at ($p \leq 0.05$) using Duncan's Multiple Range Test (DMRT)

Table 4: Collar diameter of teak seedling as influenced by different planting media

Planting media	WAT/Collar diameter			Means
	3	6	9	
TS	2.5 ^a	2.8 ^a	3.1 ^a	2.8
TS/SD	2.3 ^b	2.5 ^b	2.6 ^b	2.5
SD	2.0 ^c	2.1 ^c	2.2 ^c	2.1
SS	2.0 ^c	2.2 ^c	2.3 ^c	2.2
Means	2.2	2.4	2.6	

Means with different superscripts in the same column are significantly different at ($p \leq 0.05$) using Duncan's Multiple Range Test (DMRT)

Table 5: Total leaf area (cm²) of teak seedlings as influenced by different planting media

Planting media	WAT/Total leaf area			Means
	3	6	9	
TS	502.0 ^a	786.8 ^a	1125.0 ^a	804.6
TS/SD	406.7 ^b	659.3 ^b	860.8 ^b	642.3
SD	367.2 ^c	517.8 ^c	695.0 ^c	526.7
SS	321.6 ^d	424.0 ^d	547.5 ^d	431.0
Means	399.4	597.0	807.1	

Means with different superscripts in the same column are significantly different at ($p \leq 0.05$) using Duncan's Multiple Range Test (DMRT)

The significant differences in the growth variables of the teak seedlings grown in the TS showed that top garden soil is best for seedling growth when such seedlings now depend heavily on available nutrients from the soil. Such soils according to Isirimah *et al.* (2003) contain both the macro and micro nutrients required by plants for their normal growth and developmental activities.

The observed growth reduction in the seedlings planted in the sharp sand and sawdust could be due to a greater porosity these media have relative to the other media thereby accommodating more spaces for air and water. The water supplied and the little nutrients available could have been washed away at a rate faster than the seedlings could cope with thereby leaving little or nothing for the plants for their normal growth and other metabolic processes. This observation agrees with prior reports of Obi (1990) who noted that coarse soil particles may reduce plant growth due to low water retention capacity and inadequate nutrients necessary for plant growth.

This study has established that the performance of teak seedlings is significantly affected by planting media. Top garden soil is therefore, recommended to teak growers in the tropical rainforest zone to raise teak seedlings.

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