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Full Length Research Paper

Growth Response of *Afzelia africana* (SM. EX PERS.) Seedlings to Different Potting Mixtures

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A study was carried out at the nursery site of the Department of Forestry and Wildlife Delta State University (DELSU), Asaba Campus, Nigeria in 2008 to investigate the growth response of Afzelia africana seedlings to different potting mixtures. Top garden soil (100%), top garden soil (50%) + pig manure (50%) (TS+PM), sharp sand (50%) + cow dung (50%) (SS+CD) and sawdust (50%) + poultry droppings (50%) (SD+PD) sourced from DELSU, Asaba campus served as the treatments. Seedlings from Forestry Research Institute of Nigeria, Ibadan. Oyo State were transplanted into bottom perforated polypots. The set up comprised four treatments arranged in a randomized complete block design and replicated four times. The experiment was monitored for 12 weeks after transplanting (WAT) while growth characteristics were measured forth nightly. The results showed that A. africana seedlings sown in a mixture of SS+CD had the highest plant height, number of leaves, leaf area and collar diameter and were significantly (P≤0.05) different from those planted in the other mixtures TS alone and TS+PM). A. africana seedlings exposed to SD+PD died as from the 3rd week after transplanting (WAT). No trace of life was noticed as from the 4 WAT. Conclusively, Afzelia africana seedling responds differently to potting mixtures with the mixture of SS+CD producing the highest growth characteristics hence SS+CD could be recommended to A. africana growers. Alternatively, 100% TS and a mixture of TS+PM could also be used by Afzelia africana growers.

Keywords: *Afzelia a fricana,* potting mixtures, growth responses.

INTRODUCTION

Afzelia africana is a leguminous tree found in the humid and dry forest savannah borders or semi-deciduous forest (Keay, 1989). It is used for soil conservation and improvement (Agbogidi and Onomeregbor, 2007). Agbogidi and Eshegbeyi (2008) established that forests perform numerous environmental functions outsides aesthetics, provision of shelter to wildlife, serving as camouflage during war, food, medicine and hygienic purpose. As population density increases and land for food production expands due to agricultural activities and urbanization, natural forests became degraded (Salim and Ullsten, 1999). The degradation has led to the to the disappearance of most species including agro forest trees and causing difficulty in growing some seedlings including *Afzelia africana (*Nwoboshi, 1985; Keay, 1989; Gupta, 2000; Etukudo, 2000; Ezenwata *et al*., 2004). Besides, in spite of the numerous economic uses of *Afzelia africana* (Okeke, 1996; Burkill, 1999; Etukudo, 2000; Agbogidi *et al.*, 2008), documented reports on the cultivation and seedling growth of this multipurpose tree known commonly as African mahogany are scarce. If the benefits derivable from *A. africana* must continue especially for the future generations, there is the need to stimulate farmers' interest in the cultivation of *A.africana* thereby helping to reduce poverty, helping in conservation role as well as to boast the source of revenue for the federal government. In addition, the high demand for *A. africana* leaves, seeds, roots and barks for various uses has resulted in corresponding increase in the exploitation at such a rate that sustainability of this

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Table 1. Plant height of *Afzelia africana* seedlings as affected by different potting mixture

Potting mixture	Plant height/ Weeks after Transplanting (WAT)						
	2	4	6	8	10	12	Means
TS (control)	27.5	28.2	28.9	29.5	30.2	30.9	29.2[c]
SS+CD	27.2	28.1	29.2	31.8	34.4	36.7	31.2[a]
TS+PM	28.1	29.2	30.3	31.4	32.6	33.4	30.8 [b]
SD+PD	29.0	0.0	00.0	0.00	0.00	0.00	4.8 [d]

Means with different letters are significantly different (P≤0.5) using the Duncan's multiple range tests.

Table 2. Number of leaves of *A. africana* seedlings as affected by four potting mixture

	Number of leaves/WAT						
Potting mixture	2	4	6	8	10	12	Means
TS	14.4	15.6	16.6	16.0	15.8	16.0	15.7[c]
SS+CD	14.3	15.8	18.9	19.6	24.2	25.1	19.7[a]
TS+PM	15.6	16.7	17.8	19.1	20.7	22.0	18.6 [b]
SD+PD	15.3	00.0	0.00	0.00	0.00	0.00	2.5 [d]

Means with different letters are significantly different (P≤0.5) using the Duncan's multiple range tests.

Table 3. Leaf area of *A. africana* seedlings as affected by four potting mixture

	Leaf area/WAT						
Potting mixture	2	4	6	8	10	12	Means
TS	212.2	232.9	251.1	243.0	238.1	245.3	237.1[c]
SS+CD	234.2	265.2	300.8	348.2	280.5	429.0	326.6[a]
TS+PM	250.3	279.4	310.0	321.7	350.8	378.2	314.9 [b]
SD+PD	245.0	0.0	0.0	0.0	0.0	0.0	40.8 [d]

Means with different letters are significantly different (P≤0.5) using the Duncan's multiple range tests.

natural resource cannot be guaranteed. In the same vein, information on the domestication of the plant seeds and seedlings are in piece meal due mainly to the poor nature of the soil caused by human influences. Consequently, the need to acquaint farmers with the most successful soil or potting mixtures that could enhance the growth of *A. africana* seedlings cannot be overemphasized. It is against this background that a study as this has emerged. This study was aimed at investigating the growth response of *Afzelia africana* seedlings to different potting mixtures with a view to recommending the best potting mixture (s) to *A. africana* growers especially at the nursery stage and to perpetuate this multi-purpose species that nature has bequeathed to mankind.

MATERIALS AND METHODS

Study site: The experiment was carried out in 2008 at nursery site of the Department of Forestry and Wildlife, Delta State University (DELSU), Asaba Campus (Latitude $6^0 14^1$N and longitude $6^0 49^1$E) in Delta State, Nigeria (Asaba Meteorological Station, 2008).

Source of seedlings: The seedlings of *A. Africana* (10 weeks of age) were procured from the Forest Research Institute of Nigeria (FRIN), Ibadan, Oyo State. Top garden soil (100%) control, top garden soil (50%) + pig manure (50%) (TS+PM), sharp sand (50%) + cow dung (50%) (SS+CD) and sawdust (50%) + poultry droppings (50%) (SD+PD) sourced from DELSU, Asaba campus served as the treatments. A seedling each was transplanted into bottom perforated polypots (50/38cm in dimension) at 12 weeks old and watered to field capacity immediately and afterwards, every other day till the end of the experiment following the procedure of Agbogidi *et al.* (2007a). The experimental set up therefore comprised four treatments arranged in a randomized complete block design and replicated four times. The set up was monitored for 12 weeks after transplanting (WAT) while growth characteristics were measured forth nightly. Parameters measured were plant height (cm), number of leaves, leaf area (cm^2) and collar diameter (cm). Plant height was measured with a meter rule at the distance from soil level to terminal bud. The number of leavers was determined by counting while the leaf area was determined by tracing the leaves on a graph paper and the total leaf area per seedling was obtained by counting the number of 1cm squares. Collar girth at 2.5cm above the soil level was measured with venire calipers. Data collected were subjected to analysis of variance while significant means were separated with the Duncan's multiple range test (DMRT) using SAS (2005).

RESULTS AND DISCUSSION

Afzelia africana seedlings sown in a mixture of sharp sand and cow dung recorded the highest plant height values were significantly (p≤0.05) different from those in the other potting mixtures (Table 1). Seedlings grown in mixture of top garden soil and manure, also recorded significant (p≤0.5) plant height values when compared with those planted in 100% top garden soil. *Afzelia africana* seedlings exposed to sawdust and poultry droppings died as from the 3rd week after transplanting.

Table 4. Collar diameter of *A. africana* seedlings as influenced by four potting mixture

	Collar diameter / WAT						
Potting mixture	2	4	6	8	10	12	Means
TS	0.8	0.8	0.9	0.9	1.0	1.1	0.9[a]
SS+CD	0.8	0.8	0.8	1.1	1.4	1.6	1.1[a]
TS+PM	0.7	0.8	0.8	0.9	1.2	1.4	1.0[a]
SD+PD	0.9	0.0	0.0	0.0	0.0	0.0	0.2[b]

Means with different letters are significantly different (P≤0.5) using the Duncan's multiple range tests.

No trace of life was noticed as from the 4th WAT. All the leaves of the seedlings dried up and they started falling off. The number of leaves, leaf area and collar diameter of *A. africana* seedlings planted in the mixture of (SS + CD) were also significantly (p≤0.05) greater compared to seedlings grown in the other potting mixtures (Tables 2, 3 and 4) respectively. Again, death was typical to the seedlings grown in the mixture of sawdust and poultry droppings hence growth variables could not be measured.

The significant differences observed in the growth indices (plant height, number of leaves, leaf area) of *A. africana* seedlings planted in all potting mixtures except sawdust and pig dropping could be attributed to the fact that top garden soil, TS + PM and SD + PD are best suited for seedling growth as plants depend heavily on available nutrients (both macro and micro) required for normal plant growth and development. This finding agrees with prior reports of Agbogidi *et al.* (2007a) and Agbogidi *et al.* (2007b) for *Tectona grandis and Dacryodes edulis* respectively. Jun *et al.* (2003) stated that pig manure contains nitrogen, phosphorus, potassium, magnesium, iron copper, zinc. Cow dung has also been reported to be rich in phosphorus, potassium, iron and copper while sharp sand has appreciable amount of silicon and magnesium (Satyanarayana *et al.,* 2002; Baya *et al.*, 2006).

The death recorded in the seedlings grown in the mixture of sawdust and poultry droppings could be attributed to one or a combination of the following: greater porosity when compared with the other mixtures consequent upon the spaces for air and water. The water supplied during watering and the available "nutrients" could have been washed away at a rate faster than the seedlings could cope with thereby leaving little or nothing for the seedlings for their normal growth and other metabolic activities. This observation corroborates the reports of Obi (1990) and Isirimal *et al.* (2003) who noted that coarse soil particles/potting mixture could inhibit plant growth due to low water retention capacity and inadequate nutrients required for plant growth. The sawdust may contain some poisonous components which had not undergone natural decomposition process. Sawdust according to Abou El Magd *et al.* (2005) has nitrogen, phosphate and potash. Poultry dropping have ammonium nitrates (NH_3) as well as phosphorus and potassium (Adeniyan and Ojeniyi, 2005).

Conclusively, *Afzelia africana* seedlings responded differently to potting mixtures with the mixture of SS + CD producing the highest growth characteristics hence SS + CD could be recommended to *A.* Africana growers. Alternatively, 100% TS and a mixture of TS + PM could also be used by *Afzelia africana* growers.

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