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EFFECT OF POTTING MEDIA ON EARLY SEEDLING GROWTH OF *Azanza garckeana*(F. HOFFM)

[*1]David, B., [2]Peter, M. K., [1]Emmanuel, B. A., [1]Abdulrahman, I. M., [1]Blessing, O. and [1]Selzing, M.

[1]Montane Forest Research Station, Jos, Plateau State, Nigeria
[2]Federal College of Forestry, Jos,P.M.B. 2019 Jos, Plateau State, Nigeria
Corresponding Author:estyb2009@yahoo.com*

ABSTRACT

This study investigated the effects of potting media on early seedling growth of Azanza garckeana (F. Hoffm) at the Forestry Nursery in Montane Forest Research Station Jos, Nigeria. Using Completely Randomized Design (CRD) with five treatments [sharp sand (control), top soil, rotted cow dung, cow dung + top soil (50:50) and sharp sand + top soil + cow dung (1:1:1)], four seeds of A. garckeana replicated five times were planted on each of the potting media (treatment) at a depth of 2 cm. From each polythene pot, one seedling was later thinned to one stand per pot in various combinations to assess the growth parameters (plant height and leaf count) for 10 weeks. Descriptive and inferential statistics were employed to analyze collected data. Analysis of variance (ANOVA) of collected data on combined soil aggregate on growth parameters indicated a non-significant ($p \geq 0.05$) difference in plant height and at 1st, 6th to 8th weeks after germination for leaf count and significant ($p \leq 0.05$) difference in leaf count at 2nd to 5th, 9th, 10th weeks after germination. Potting with cow dung gave the best potting media growth results when compared to other treatments that enhanced seedling growth of A. garckeana. This observation of cow dung incorporated potting mixtures over other potting media provides an outstanding potential to enhance A. garckeana plantation establishment. Consequently, it wasrecommended for raising seedlings in the nursery as well as ensuring sustainable management.

Keywords - *Azanza garckeana,* Seedling Growth and Potting Media

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INTRODUCTION

Azanza garckeana is a tree in the family of Malvaceae, found throughout the warmer parts of Southern Africa in wooded grasslands, open woodland and thickets. It also grows in semi-arid areas, receiving lowest annual rain fall of 250mm and highest rain fall of 1270mm (Orwa *et al*., 2009). *A. garckeana* grows in a variety of soils and is found near termite mounds and deserted areas, while in Nigeria it grows in open woodlands in the North-East part of the country. It is also seen as one of the indigenous fruit tree species found in Nigeria (Ochokwu *et al*., 2014). The plant is semi domesticated in Kaltungo and Michika Local Government Area of Gombe and Adamawa States, Nigeria.

A. garckeana wood is used as construction material, poles, fencing posts, farm implements, tool handles, domestic utensils and knife sheaths (Orwa *et al*., 2009; Ochokwu *et al*., 2014), while the leaves are eaten by livestock and are a source of fodder during the dry season. The leaves also provide bees with forage. The roots are medicinal and are taken orally for painful menstruation and to treat coughs and chest pains. An infusion made from the roots and leaves is dropped into the ear to treat ear ache or taken orally as an antiemetic, (Orwa *et al*., 2009).

According to Akinnifesi *et al*., (2008) lack of information on propagation techniques for the woody species inhibits farmers from successfully growing this multipurpose forest fruit tree species. Due to inadequate research on planting and regeneration of economic woody species in Africa; and most of the work to date has been skewed towards these tree species. Consequently, there is an urgent need to study and improve both new and existing methods for propagation and regeneration of the tree species (Nyamukuru *et al*., 2014).

Thus, the aim for this study was to evaluate various potting media in order to ascertain the most suitable medium for early seedling growth of *A. garckeana* to

enhance its success in propagation and cultivation in the study area.**MATERIALS AND METHODS**

Study Area

The study was conducted within forestry nursery of Montane Forest Research Station, Jos, Plateau State. The study area lies in the Northern Guinea Savannah situated between 9°88'N to 9°93'N, longitude 8°83'E to 8°88'E with an elevation of about 118m above sea level. The mean annual rainfall for the location is between 1200 mm and 1250 mm and mean temperature ranges between 23°C and 25 °C. The soil is sandy-loam, light to dark in colour. The climate of the State is cool due to its high altitude and rainy season is usually between April and September while the dry season is from October to March (UJMS, 2000).

Seed Collection and Viability Test

The seeds of *A. garckeana* were sourced from the mother tree in Montane Forest Research Station, Jos Plateau State, Nigeria. The seeds were subjected to a viability test using the Floatation Test Method. Seeds were put in a basin of water and left undisturbed for an hour. All suspended seeds were discarded and the sunken ones collected. Seeds which sunk were perceived to have had higher specific gravity due to more stored food reserves.

Research Design

A total number of 25 perforated polythene bags (20×5 cm) containing 3 kg of soil were laid out in a completely randomized design (CRD) with 5 treatments (sharp sand, top soil, rotted cow dung, cow dung and top soil [50:50] and mixture of sharp sand, top soil and cow dung at a ratio of 1:1:1) at the Forestry Nursery, Montane Forest Research Station Jos, Nigeria. According to the report of Ufere *et al.,* (2013) cow dung was applied at the rate of 2 kg per 3 kg of soil before sowing. The treatments were replicated five times.

Table 1: Randomized Layout of Experimental Plots

$_{A}R_1$	$_{B}R_2$	$_{C}R_2$	$_{C}R_4$	$_{D}R_4$
$_{B}R_1$	$_{1}R_4$	$_{2}R_3$	$_{A}R_4$	$_{2}R_4$
$_{2}R_5$	$_{A}R_2$	$_{B}R_3$	$_{1}R_3$	$_{2}R_5$
$_{1}R_1$	$_{2}R_2$	$_{A}R_3$	$_{2}R_3$	$_{B}R_4$
$_{2}R_1$	$_{2}R_1$	$_{1}R_2$	$_{3}R_5$	$_{A}R_5$

Seed Planting and Assessment of Growth

According to Kyei, (2016); Ufere *et al.,* (2013), four seeds of *A. garckeana* obtained from the mother tree were planted on each of the potting media at a depth of 2cm. From each polythene pot, one seedling was later thinned to one stand per pot two weeks after germination. Data on seedling height (cm) was taken weekly from the soil level (base) to the tip using a graduated meter rule, the leaves of every seedling in the replicates were counted and the mean per replicate was determined.

Statistical Analysis

The data obtained was subjected to descriptive and inferential statistical analysis of variance to determine their significance at 5% level using Statistical Package for Social Sciences (SPSS©) version 23. Means separated using Duncan Multiple Range Test ($P \leq 0.05$).

RESULTS

Effect of Potting Media on Seedling Growth of *Azanza garckeana*

Table 2 shows mean effect of treatment on height of *A. garckeana* seedlings. The result also reveals trends in height growth following treatment (sharp sand, top soil, rotted cow dung, cow dung + top soil [50:50] and mixture of sharp sand + top soil + cow dung at a ratio of 1:1:1) on the early growth of *A. garckeana*. Seedling height (cm) values recorded for each treatment were not significantly ($p \geq 0.05$) different at 1st to 10th weeks of data collection. Results of the study thus revealed that the values recorded for each treatment increased as the age of seedlings progressed after germination from 1st to 10th weeks. Despite the differences observed from height of seedlings at the different treatment for weeks after germination, treatment combination of sharp sand + top soil + cow dung (1:1:1) exhibited highest overall value (98.32). This was followed by potting media of cow dung + top soil (94.54) >control(90.44) >rotted cow dung(76.60) >top soil (72.42).

The effect of treatment (potting media) on mean leaf count of *Azanza garckeana* were significantly ($p \leq 0.05$) different at 2nd to 5th, 9th, 10th and non-significantly ($p \geq 0.05$) different at 1st, 6th to 8th weeks after germination (Table 3). Results of the study equally shows trends in leaf count as the weeks increases and the highest value (72.20) for each stage was obtained from potting media of sharp sand + top soil + cow dung (1:1:1), this was followed in order of performance as top soil (65.80)>rotted cow dung (64.80)>cow dung + top soil (63.20) >control (53.60).

Table 2: Effect of Treatment on Mean Height (cm) of *Azanza garckeana* Seedlings

Treatments	Seedling Height (cm)									
	1WAG	**2WAG**	**3WAG**	**4WAG**	**5WAG**	**6WAG**	**7WAG**	**8WAG**	**9WAG**	**10WAG**
CTRL	8.14 [a]	8.36 [a]	8.64 [a]	8.80 [a]	9.08 [a]	9.20 [a]	9.30 [a]	9.40 [a]	9.54 [a]	9.98 [a]
TS	6.30 [a]	6.58 [a]	6.58 [a]	6.92 [a]	7.22 [a]	7.52 [a]	7.64 [a]	7.64 [a]	7.82 [a]	8.20 [a]
RCD	6.04 [a]	6.16 [a]	6.28 [a]	7.56 [a]	7.98 [a]	8.14 [a]	8.50 [a]	8.54 [a]	8.60 [a]	8.80 [a]
CD + TS (50:50)	6.92 [a]	7.14 [a]	7.24 [a]	9.80 [a]	10.08 [a]	10.50 [a]	10.62 [a]	10.62 [a]	10.74 [a]	10.88 [a]
SS + TS + CD *(1:1:1)*	8.74 [a]	9.00 [a]	9.16 [a]	9.70 [a]	9.90 [a]	10.14 [a]	10.22 [a]	10.28 [a]	10.46 [a]	10.72 [a]
SE	**0.96**	**0.97**	**0.98**	**1.12**	**1.10**	**1.10**	**1.12**	**1.12**	**1.12**	**1.14**
p-value	***0.240***	***0.236***	***0.194***	***0.299***	***0.322***	***0.294***	***0.342***	***0.342***	***0.341***	***0.399***

Values (in the same column) with the same subscript letters do not differ significantly from each other according to the Duncan multiple range test.
KEY: *WAG = Weeks after Germination;CTRL = Control (Sharp Sand); TS = Top Soil; RCD = Rotted Cow Dung; CD + TS = Cow Dung + Top Soil (50:50); SS + TS + CD = Sharp Sand + Top Soil + Cow Dung (1:1:1)*

Table 3: Effect of Treatment on Mean Leaf Count of *Azanza garckeana*Seedlings

Treatments	Leaf Count									
	1WAG	**2WAG**	**3WAG**	**4WAG**	**5WAG**	**6WAG**	**7WAG**	**8WAG**	**9WAG**	**10WAG**
CTRL	2.80 [a]	3.20 [b]	3.60 [b]	3.80 [b]	4.40 [b]	6.40 [a]	6.80 [a]	7.00 [a]	7.40 [b]	8.20 [b]
TS	4.20 [a]	5.20 [a]	5.60 [a]	6.00 [a]	7.00 [a]	7.20 [a]	7.40 [a]	7.40 [a]	7.80 [ab]	8.00 [b]
RCD	3.80 [a]	5.00 [a]	5.40 [a]	6.00 [a]	7.20 [a]	7.20 [a]	7.20 [a]	7.20 [a]	7.40 [b]	8.40 [b]
CD + TS (50:50)	3.60 [a]	5.20 [a]	5.80 [a]	6.20 [a]	6.80 [a]	6.80 [a]	7.00 [a]	7.00 [a]	7.20 [b]	7.60 [b]
SS + TS + CD *(1:1:1)*	4.20 [a]	4.80 [a]	6.00 [a]	6.40 [a]	7.00 [a]	7.40 [a]	8.00 [a]	8.40 [a]	9.00 [a]	11.00 [a]
SE	**0.53**	**0.46**	**0.43**	**0.52**	**0.46**	**0.56**	**0.48**	**0.48**	**0.42**	**0.59**
p-value	***0.354***	***0.029***	***0.006***	***0.012***	***0.001***	***0.722***	***0.467***	***0.250***	***0.046***	***0.005***

Values (in the same column) with the same subscript letters do not differ significantly from each other according to the Duncan multiple range test.
KEY: *WAG = Weeks after Germination; CTRL = Control (Sharp Sand); TS = Top Soil; RCD = Rotted Cow Dung; CD + TS = Cow Dung + Top Soil (50:50); SS + TS + CD = Sharp Sand + Top Soil + Cow Dung (1:1:1)*

DISCUSSION

The results of this study reveal that there was no significance difference in the performance of *A. garckeana*height seedlings treated with the combination of Sharp Sand + Top Soil + Cow and other treatment combinations, this is an indication that all treatments can considerably improve the growth of the species.

Result on plant height of *A. garckeana* recorded highest in cow dung potting media. Cow dung manure were reported to be richer in nitrogen and other nutrient content. Buochuama and Akhabue (2020) stated that cow dung manure enhances the growth of *Streculia setigera* seedlings. Thus, cow dung could be utilized to make nutrient available for optimal growth of *Tamarindus indica* seedlings (Sodimu *et al.,* 2020). This is also in-line with the study of Rotowa *et al.*(2020) in a study they carried out to evaluate the germination and growth response of *Eucalyptus torelliana* F. Muell. to organic manure and potting media treatment where cow dung manure recorded the highest yield of growth parameter assessed.

Haouvang, *et al.,* (2017) stated that organic amendments in general and cow dung compost in particular could constitute the best fertilizer to improve growth of *Moringa oleifera* in pots. The highest leaf count of *A. garckeana* seedlings recorded under cow dung potting media revealed a better performance of these seedlings when compared with other treatments combinations. This finding agrees with the studies carried out by Imobighe (2004) and Okunomo *et al*.,(2006) on the performance recorded with the use of cow dung on the number of leaves of tree seedlings. The result thus agrees with Imoro, *et al*., (2012) who indicated that cow dung are valuable sources of fertilizers for the growth of tree seedlings because they have greatly improved growth performance of vegetative parts of treated plants.

CONCLUSION

The finding of this study showed that the early seedling growth of *Azanza garckeana* was best recorded in cow dung treated medium (sharp sand + top soil + cow dung). This is may be consequent upon mineralization and nutrient uptake causing significant increase in growth of *A. garckeana*, serving as good source of soil amendment which in turn resulted in improved growth.

RECOMMENDATIONS

The use of organic manure (cow dung) in seedling production is desirable as it had variable impacts on growth of *A. garckeana* seedlings.

Tree farmers or nursery owners, who are interested in the production of *A. garckeana* seedlings*,* should be advised to use cow dung treatment to ensure normal growth of the seedlings.

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