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Research Article

Effect of different Growth Media on Foliage Production and Root Growth in *Gongronema latifolia* Benth Stem Cuttings

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ABSTRACT

This study investigated rate of foliage production and root growth of *Gongronema latifolia* stem cuttings in Sharp Sand, Topsoil, Sawdust, and a mixture of Sharp Sand/Topsoil/Sawdust, with a view to identifying the best medium for its propagation. Sharp Sand was the only growth medium that produced leaves during the first week. Leaf production in Topsoil and Mixture started in the second week, while cuttings in Sawdust did not produce leaves until the fourth week. The highest number of leaves was produced in Sharp Sand, followed by Topsoil, Mixture, and Sawdust respectively. Mean weekly number of leaves produced varied significantly between Sharp Sand and the other growth media. There was no significant difference in mean weekly number of leaves between Mixture and Topsoil while it varied significantly between each of the two growth media and Sawdust. Mean values for length of both tap- and lateral- roots were highest for Sharp Sand, followed by Topsoil and Mixture respectively, while no root growth was observed in Sawdust. The study showed that sharp sand is the most suitable medium for the propagation of *Gongronema latifolia* using stem cuttings. However, Topsoil or a mixture of Sharp Sand/Sawdust/Topsoil can be used as alternatives when Sharp Sand is not readily available.

INTRODUCTION

The utilization of leafy vegetable is part of Africa's cultural heritage and they play important role in the custom, tradition and food culture of the African household. Nigeria is endowed with a variety of traditional vegetables which are untilized by people from different ethnic groups in several ways and for different reasons. *Gongronema latifolia* is one of the highly valued vegetables in the southeastern part of Nigeria because of its nutritional and medicinal properties. *Gongronema latifolia* belongs to the family Asclepidiaceae. It is a woody liana and its common name is amaranth globe. In the southeastern part of Nigeria, it is called Utazi.

Gongronema latifoila is used for different purposes. Its leaf extract is used for boosting appetite, and the treatment of stomach problems, dysentery, worm, cough, high blood pressure, malaria, hypertension and typhoid fever (Agbo *et al*., 2005; Okafor, 2005). The leaves are used in the management of diabetes mellitus (Gamaniel and Akah, 1996). *Gongronema latifolia* is used as leafy vegetable for making soup and for preparing fresh fish pepper soup. It is also eaten as a dessert with other preparations like African salad in southeastern Nigeria (Ugochukwu and Babady, 2002; Ugochukwu *et al*., 2003). It is nutritionally high in minerals, vitamins, proteins and amino acids (Okafor, 2005). The proximate analysis of leaves of *Gongronema latifolia* revealed that the species is a valuable source of protein, fats/oil, and minerals such as Na, K, Mg and Fe (Okafor, 2005). Chemical analysis of its leaves showed that the species contains 62.66%, 10.94%, 18.77%, 58ppm, 336ppm, 20.75ppm, 56ppm, 8.17ppm, 0.90ppm and 0.12ppm of protein, ash, oil, Na, K, Ca, Mg, Fe, Zn, and Cu, respectively (Okafor, 2005). Traditionally, the leaves are used in controlling weight gain in lactating women and also to make a woman's system function effectively after child birth (Etim *et al*., 2008; Okeke *et al*., 2008; Okoye, undated). However, the species has become scarce, and in some places, threatened with extinction.

Considering the importance of *Gongronema latifolia*, there is the need to ensure its conservation. However, the successful conservation of the species will to a large extent depend on the identification of suitable growth medium for its propagation. There is need to identify the growth medium that enhances fast foliage production and rooting of stem cuttings of the species. Vegetative propagation has the advantage of rapid dissemination of selected clones or new varieties resulting from breeding programmes which are deemed desirable because of their quantitative and qualitative traits. This study therefore, evaluated early foliage production and root growth of *Gongronema latifolia* cuttings in four growth media with a view to identifying the best for its propagation.

MATERIALS AND METHODS

Location of the Study

This study was conducted at the research nursery of the Department of Forestry and Wildlife Management, located at the Choba Campus of the University of Port Harcourt, Nigeria. The University of Port Harcourt is located in Obi/Akpor Local Government Area of Rivers State. Figure 1 is the map of University of Port Harcourt showing the three campuses.

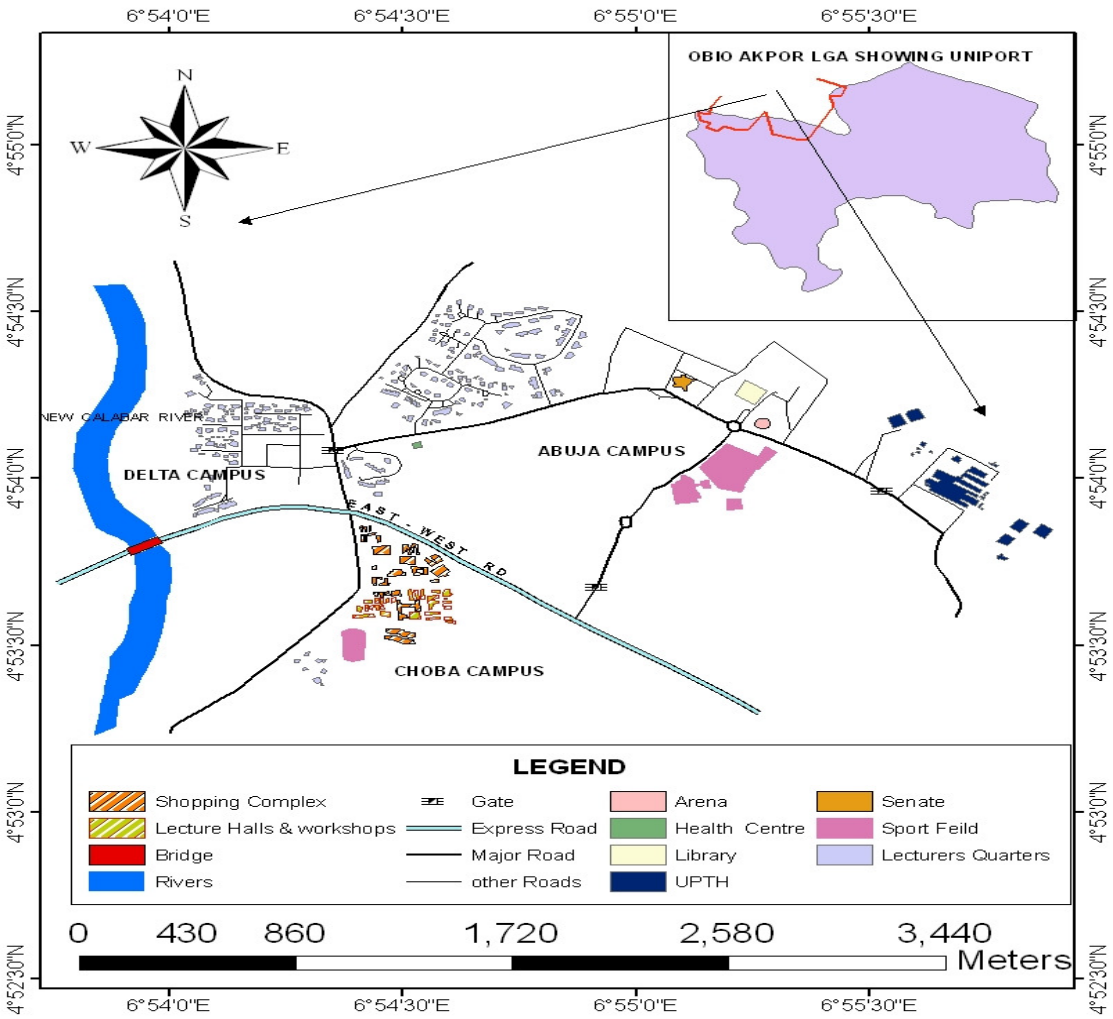

Figure 1: Map of University of Port Harcourt showing the campuses

Preparation of stem cuttings

Cuttings used for the study were about 30 – 35 cm in length, and gotten from a single parent stock to avoid the effect of genetic variation. During the preparation of the stem cuttings, it was ensured that each had four nodes, so that two of the nodes could be placed inside the growth media and the other two above for shoot production.

Planting of stem cuttings

Four growth media - Sharp sand, topsoil, sawdust, and a 1:1:1 mixture of topsoil, sharp sand and sawdust, were used for the experiment. Cuttings from the same parent stock were planted in all the growth media to ensure uniformity in the genetic make-up. During planting of cutting, two nodes were placed inside the growth media while the other two nodes were placed outside for shoot production. One cutting was planted per polybag and there were 15 cuttings per treatment laid out in completely randomized design. After planting, all growth media with cuttings were watered early in the morning and late in the evening until the experiment was terminated.

Data collection

Data collected included the time taken for the commencement of foliage production in each of the growth media, number of leaves produced per week, and the total number of leaves produced by cuttings in each growth medium for eight weeks. After eight weeks, the cuttings were uprooted and both the length of taproots and lateral roots measured using meter rule. The mean length for the lateral- and tap- roots were computed and presented for each growth medium.

Data analysis

Both descriptive and inferential statistics were used to analyze the data. The time taken before the commencement of foliage production, the rate and weekly trend in foliage production, total leaf production and mean lateral- and tap - root lengths, in different growth media are presented using line and bar charts. A one-way analysis of variance was used to test for

significant difference in the number of leaves produced in different growth media at 5% probability level using Statistical Package for Social Sciences (SPSS). Fisher's Least Significant Difference Test (LSD) was used for mean separation.

RESULTS

The time it took for the cuttings in the various growth media to start producing foliage after planting is shown in Figure 2. Sharp sand was the first growth medium to produce leaves, followed by topsoil/mixture, and sawdust respectively.

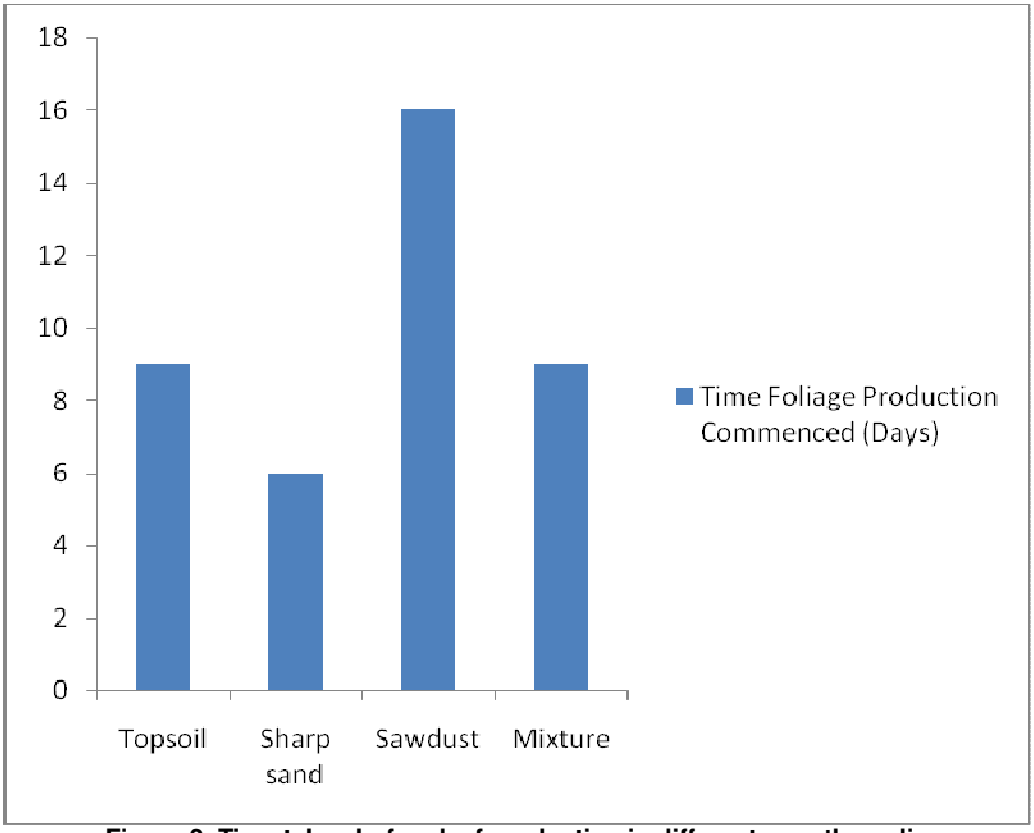

Figure 2: Time taken before leaf production in different growth media

The weekly trend in leaf production is shown in Figure 3. Sharp Sand was the only growth medium that produced leaves during the first week. Leaf production in Topsoil and Mixture started in the second week, while cuttings in Sawdust did not produce leaves until the fourth week. The highest number of leaves was produced in Sharp Sand, followed by Topsoil, Mixture, and Sawdust respectively (Figure 4).

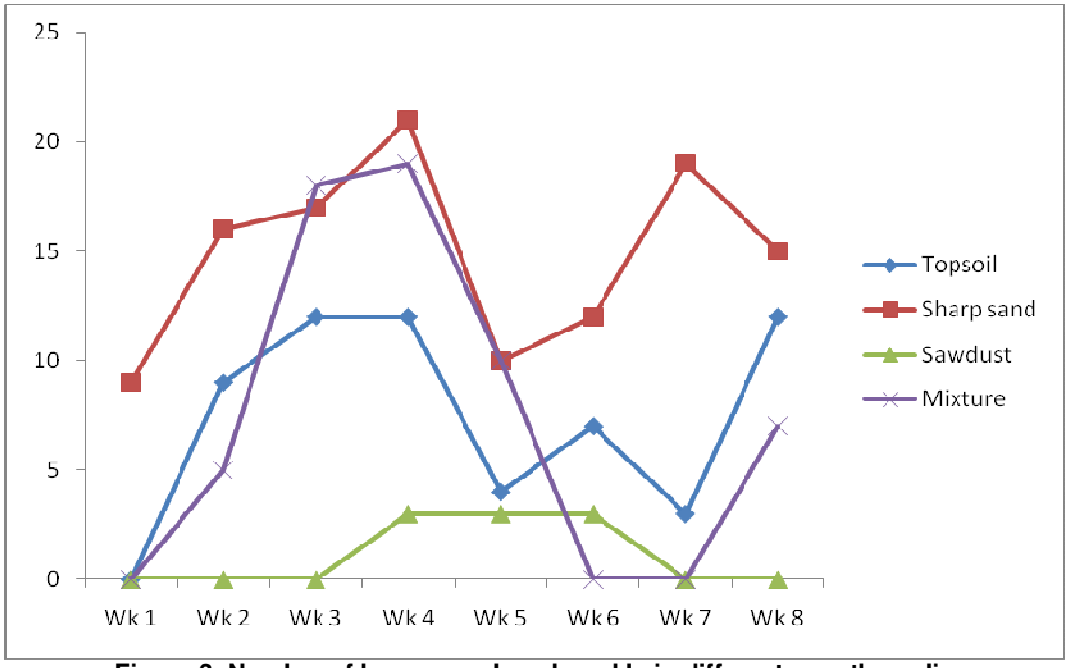

Figure 3: Number of leaves produced weekly in different growth media

Figure 4: Total number of leaves produced in different growth media after eight weeks

Analysis of variance (Table 1) shows a significant difference in the mean weekly number of leaves produced in different growth media. Mean weekly number of leaves varied significantly between Sharp Sand and the other growth media. There was no significant difference in mean weekly number of leaves between Mixture and Topsoil while it varied significantly between each of the two growth media and Sawdust (Table 2).

Table 1: One-Way Analysis of Variance Table for leaf production

ANOVA

Leaf production

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	759.375	3	253.125	9.851	.000
Within Groups	719.500	28	25.696		
Total	1478.875	31			

Table 2: Mean separation for weekly production of leaves in different growth media

Treatments	Mean
Sharp sand	14.8750 ± 1.51^{a}
Mixture	7.3750 ± 2.75^{b}
Topsoil	7.3750 ± 1.65^{b}
Sawdust	1.1250 ± 0.55^{d}

Means with the same superscript are not significantly different ($p > 0.05$)

The mean lengths of both the tap- and lateral- roots for the various growth media are shown in Figure 5. Mean values for both tap- and lateral- roots were highest for Sharp Sand, followed by Topsoil and Mixture respectively, while no root growth was observed in Sawdust.

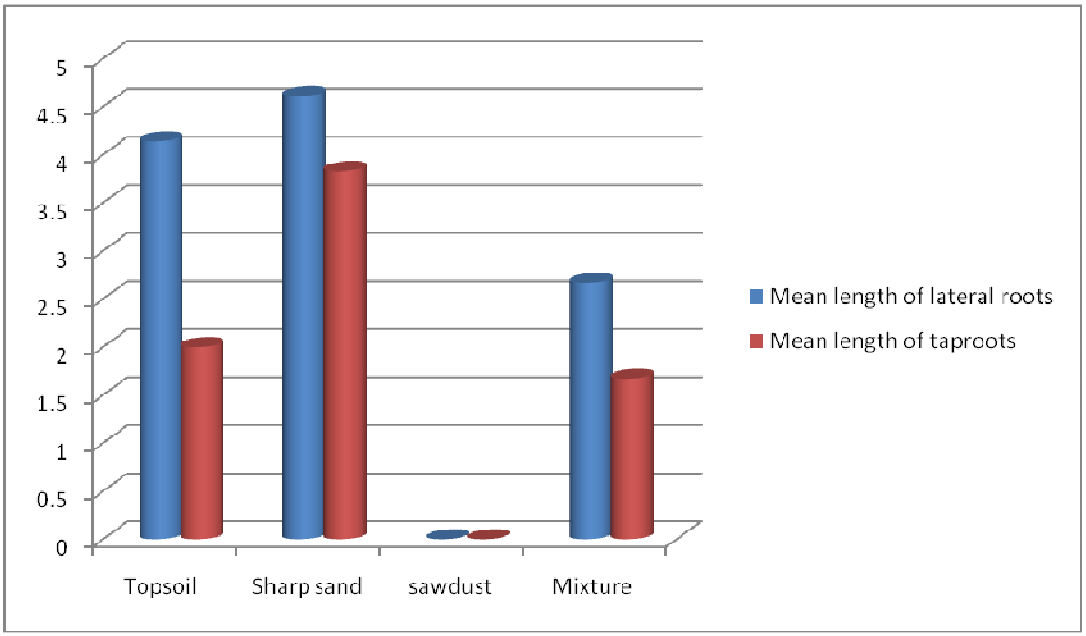

Figure 5: Mean length (cm) of lateral- and tap - roots for different growth media

DISCUSSION

The lowest number of days to the commencement of foliage production in sharp sand may be attributed to better aeration, water drainage and higher total porosity in sharp sand. Better sprouting of *Warburgia ugandensis* stem cuttings in sharp sand has been reported by Florence *et al*. (2011). The highest number of leaves produced in sharp sand than in the other growth media may be attributed to the longest length

of both lateral/tap roots which favours the absorption of nutrients.

Better root growth in sharp sand is attributable to better aeration potential and drainage capacity/porosity which enhance development and spreading of roots. Several authors (Hartmann and Kester, 1975; Olabunde and Fawusi, 2003; Puri and Thompson, 2003) have reported high drainage capacity and porosity in sharp sand. A study on rooting performance in *Vitellaria paradoxa* by Yeboah and Amoah (2009) showed that high aeration in rooting media is responsible for promoting metabolic activities and enhancing root initiation.Consequently, the type of rooting media used can have a major influence on the rooting capacity of cuttings.

Although, the porosity of the different growth media was not measured in this study, the poorest growth attributes in Sawdust may be most likely attributed to low porosity and aeration in sawdust. As observed by Amri *et al*. (2009), soils that do not have enough required aeration and porosity for sufficient gas exchange can lead to rotting of the cuttings. This was the case in this study. In weeks five and six, rotting of cuttings was observed especially in the sawdust. This probably explains why there was no leaf production in the Sawdust in weeks seven and eight.

CONCLUSION

The study has shown that sharp sand is the best medium for the propagation of *Gongronema latifolia* using stem cuttings. The shorter number of days to the commencement of foliage production, better root formation and growth, and the significant difference in mean number of leaves between sharp sand and the other growth media, lends credence to this conclusion. Therefore, sharp sand is recommended as the most suitable medium for the vegetative propagation of *Gongronema latifolia*. However, topsoil or a mixture of sharp sand, sawdust and topsoil can be used as alternatives when sharp sand is not readily available.

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