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Nursery techniques for the propagation of *Pterocarpus mildbraedii* Harms (Oha ojii) in Owerri West, Southeastern Nigeria.

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Abstract
Wild and semi-wild crops are faced with the problem of extinction caused mainly by deforestation and urbanization. This study was carried out to determine ways to enhance nursery establishment and subsequent domestication of *Pterocarpus mildbraedii*. Treatments consist three nursery media; (Standard nursery media with topsoil + poultry manure + river sand in 3:2:1 v/v/v combination, top soil and sawdust) and four stem cutting lengths; (5, 10, 15 and 20 cm). The experiment was a 3 x 4 factorial arrangement laid out in Completely Randomized Design. Results showed that nursery media did not significantly ($P \leq 0.05$) affect sprouting and growth of Pterocarpus seedlings. However, stem cutting length significantly affected sprouting and growth of the seedlings. Cuttings of 15 and 20 cm length sprouted earliest and had vigorous growth than cuttings of 5 and 10 cm length. Therefore, for domestication of *Pterocarpus mildbraedii* seedlings, stem cuttings of 15 and 20 cm length should be raised in standard nursery medium.

Keywords: Nursery techniques, *Pterocarpus mildbraedii*, stem cutting length, nursery media

1.0 Introduction

Pterocarpus mildbraedii Harms is locally known as Oha ojii and belongs to the family Papilinaceae. In Nigeria, two more different species of Pterocarpus are known and their leaves are used as food; they include *soyauxii* Taub (oha) and *santalinoides* L' Herit (Uturukpa). *Pterocarpus mildbraedii* is a semi-wild tree vegetable, existing mostly in the wild, rarely cultivated by farmers and seen sparingly in households. It is facing the threat of extinction caused by high rate of deforestation and urbanization (Adelaja and Faidi, 2008). Fresh leaves of *Pterocarpus mildbraedii* are used as vegetables, livestock feed for goats and also recommended for consistent use by diabetics (Durugbo, 2013). Agriculturally, it is used as shade tree in the nursery.

Field establishment of *Pterocarpus mildbraedii* firstly involves nursery sprouting, growth and subsequent transplanting to the field. Good production of *Pterocarpus mildbraedii* seedlings in the nursery is highly influenced by nursery medium and length of cutting. Nursery potting media influence quality of seedlings produced thereof (Agbo and Omaliko, 2006). Use of good materials as parts of the planting medium ensures greater aeration and drainage of the medium which will enhance germination, sprouting and seedling emergence (Ndubuaku and Oyekanmi, 2000). Also, the length of stem cutting is an important agronomic practice for enhanced seedling sprouting and growth in vegetatively propagated crops as number of buds are higher in longer stem cuttings. Longer cuttings with higher number of buds gave better stands and higher yields than shorter ones (Ekandem, 1962; Gurnah, 1974).

This work was carried out to determine the effect of nursery media and stem cutting length on the sprouting and growth of *Pterocarpus mildbraedii*.

2.0 Materials and Methods

The field experiment was carried out at the Teaching and Research Farm, Federal University of Technology, Owerri, Imo State (latitude 5^0 27' N and 7^0 02' E) during the early cropping season of 2015.

2.1 Nursery establishment

The nursery site was cleared using machete and 13 litre perforated plastic buckets filled with different nursery media were lined up in an unshaded nursery site. The nursery media consist of sawdust (100%), topsoil (100%) and standard nursery mixture of Top soil + poultry manure + river sand in the ratio of 3:2:1. Cured poultry manure were procured from commercial broiler production unit of the University

Teaching and Research Farm. Saw dust were procured from saw mill at Owerri market. Topsoil was excavated from the fallow land at the Teaching and Research Farm of Federal University of Technology, Owerri and mixed together. River sand was collected from the Otamiri river in the university. *Pterocarpus mildbraedii* stems were collected from Mbaise in Imo state. Six stem cuttings were planted in each bucket.

2.2 Experimental Design

Treatments consist of two factors; nursery media (topsoil, sawdust and standard nursery mixture) and stem cutting length (5, 10, 15 and 20 cm length). The experiment was a 3 x 4 factorial laid out in Completely Randomized Design with three replications.

2.3 Chemical analysis of nursery media

Samples of the cured poultry manure, topsoil and sawdust were collected randomly from the bulk, air dried in the laboratory under room temperature for 14 days. Soil pH was analyzed by the use of pH meter (Hendershot *et al*., 1993), organic matter values were obtained by multiplying total carbon with 1.724 (Van Bemmelen's correlation factor) (Nelson and Sommers, 1982), available phosphorus according to the procedure of Olsen and Sommers (1990), total nitrogen was by microkjeldahl digestion technique (Bremner and Mulvaney, 1982), calcium and magnesium by Versnate titration method and potassium by flame photometer method.

2.4 Data collection and analysis

The following data were collected on five samples of *Pterocarpus mildbraedii*; days to first sprouting, days to 50% sprouting, plant height, number of leaves and leaf area. Data collected were analyzed using Genstat, 2007 software and means were separated using Least Significant Difference at 5% level of probability.

3.0 Results and Discussion

Standard nursery mixture had highest water holding capacity (35.19%) while sawdust had the least water holding capacity (28.33%) (Table 1). Organic matter was highest (34.74%) in sawdust and least in topsoil (2.30).

Table 1: Physical and chemical properties of media used for raising Pterocarpus mildbraedii in the nursery

Properties	Sawdust	Topsoil	Standard nursery mixture
Physical			
Water holding capacity (%)	28.33	30.79	47.17
Chemical			
Organic matter (%)	34.74	2.30	3.71
Organic carbon (%)	20.15	1.26	2.14
Total nitrogen (%)	0.14	0.02	0.07
Potassium (%)	0.24	0.04	0.09
Phosphorus (%)	0.09	0.01	0.02
pH (H_2O)	6.70	5.60	6.50

Days to first sprouting was not significantly ($P \leq 0.05$) affected by stem cutting length, nursery media and stem cutting length x nursery media interaction (Table 2).

Days to 50% sprouting was not significantly affected by nursery media and stem cutting length x nursery media interaction (Table 3). Number of days to 50% sprouting was significantly affected by stem cutting length. 50% of stem cuttings of 10, 15 and 20 cm lengths sprouted within 10 days of planting while 50% of stems of 5cm length sprouted in 16 days.

Table 2: Effect of nursery media and stem cutting length on days to first sprouting

	Days to first sprouting				
	Stem cutting length (cm)				
Nursery media	5	10	15	20	Mean
TS	10.33	8.33	7.00	7.00	8.17
SD	7.33	8.33	10.00	7.67	8.33
SNM	8.33	8.67	8.33	8.00	8.33
Mean	8.67	8.44	8.44	7.56	

$LSD_{(0.05)}$ for nursery media = ns
$LSD_{(0.05)}$ for cutting length = ns
$LSD_{(0.05)}$ for nursery media x cutting length interaction = ns
TS = Topsoil, SD = sawdust, SNM = standard nursery mixture

Plant height was not significantly affected by nursery media and stem cutting length x nursery media interaction (Table 4). Stem cutting length significantly affected plant height. Stem cuttings of 20 cm length produced tallest *Pterocarpus mildbraedii* plant (5.26 cm) while stem cuttings of 5 cm length produced shortest *Pterocarpus mildbraedi*i plant (2.69 cm).
Number of leaves was not significantly affected by nursery media and cutting length x nursery media interaction (Table 5). Cutting length significantly affected the number of leaves. Highest number of leaves (16.00) was produced by cuttings of 20 cm length while cuttings of 5 cm length produced lowest number of leaves (4.10). Number of leaves produced by cuttings of 20 cm length was not significantly different from number of leaves produced by cuttings of 15 cm length.

Table 3: Effect of nursery media and stem cutting length on days to 50% sprouting

	Days to 50% sprouting				
	Stem cutting length (cm)				
Nursery media	5	10	15	20	Mean
TS	14.67	11.00	9.67	9.00	11.08
SD	18.33	9.33	10.67	10.33	12.17
SNM	16.33	9.00	9.33	11.67	11.58
Mean	16.44	9.78	9.89	10.33	

$LSD_{(0.05)}$ for nursery media = ns
$LSD_{(0.05)}$ for cutting length = 4.33
$LSD_{(0.05)}$ for nursery media x cutting length interaction = ns
TS = Topsoil, SD = sawdust, SNM = standard nursery mixture

Table 4: Effect of nursery media and stem cutting length on *Pterocarpus* mildbraedii height (cm)

	Plant height (cm) Stem cutting length (cm)				
Nursery media	5	10	15	20	Mean
TS	4.22	4.67	5.32	4.92	4.78
SD	1.50	3.92	3.15	6.13	3.67
SNM	2.33	4.83	3.94	4.72	3.96
Mean	2.69	4.47	4.14	5.26	

$LSD_{(0.05)}$ for nursery media = ns
$LSD_{(0.05)}$ for cutting length = 1.38
$LSD_{(0.05)}$ for nursery media x cutting length interaction = ns
TS = Topsoil, SD = sawdust, SNM = standard nursery mixture

Table 5: Effect of nursery media and stem cutting length on number of leaves

	Number of leaves Stem cutting length (cm)				
Nursery media	5	10	15	20	Mean
TS	4.50	11.50	13.30	15.40	11.20
SD	2.00	7.60	14.60	21.10	11.30
SNM	5.70	12.50	17.20	11.50	11.70
Mean	4.10	10.50	15.10	16.00	

$LSD_{(0.05)}$ for nursery media = ns
$LSD_{(0.05)}$ for cutting length = 1.38
$LSD_{(0.05)}$ for nursery media x cutting length interaction = ns
TS = Topsoil, SD = sawdust, SNM = standard nursery mixture

Nursery media did not significantly affect days to first sprouting, days to 50% sprouting and growth parameters such as sprout height and number of leaves. This could be attributed to dependence of stem cuttings on stored food within the cuttings for sprouting and growth from sprouting to one month after planting. Endosperm (seed food storage) supplies sprout with the energy and nutrients needed until it has developed a root system to absorb nutrients from the growing medium (Yan et al., 2014).

Stem cutting length significantly affected growth and development of *Pterocarpus midbraedii* sprouts. Stem cuttings of 15 cm and 20 cm length achieved 50% sprouting within ten days and had better growth than cuttings of 5 cm and 10 cm length. This could be attributed to higher number of buds in stem cuttings of 15 and 20 cm length. Longer stem cuttings with higher number of buds gave better stands and higher yields than shorter ones (Ekandem, 1962; Gurnah, 1974).

4.0 Conclusion

Stem cutting length of 15 and 20 cm were found to promote sprouting and morphological growth of the seedlings in the nursery and therefore is recommended for effective and efficient propagation and domestication of *Pterocarpus mildbraedii.*

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