Journal of Forestry Research and Management. Vol. 14 (1), 103-109; 2017, ISSN 0189-8418

www.frin.gov.ng/frin1/journals.html

Effects of Media Composition on Shoot Initiation of *Mansonia altissima* A. Chev. Using Nodal Culture Technique

Osunlaja, O.A., *Olomola,D.B, Nwogwugwu, J.O., Afolabi, J.O. and Oloyede, E.O

Forestry Research Institute of Nigeria, P.M.B. 5054, Jericho Hill, Ibadan, Oyo State.

***Corresponding author:** topeolomola@gmail.com/+2348023261243

Abstract

Manson*ia altissima* A. Chev. is a tropical tree species with desirable properties. Over the years it has been over-exploited because of its economic importance. Seed dormancy and bush burning have the part of the factors affecting its successful domestication and plantation establishment. Researchers over the years have exploited various means of determining the best factors that will support its early growth and eventual plantation establishment. This study was carried out to determine the effect of different media composition in-vitro on the shoot initiation of M. altissima. The plant growth regulators used for the experiment were Indole-3-butyric acid (IBA) and Benzyl amino purine (BAP)in concentrations of 0.5mg/L and 1mg/L respectively all through for each media composition. The strengths of each treatment were varied from full strength (W_{full}) to half of a quarter ($W_{1/8}$). Treatment $W_{1/4}$ produced greatest shoot length followed by treatment $W_{1/2}$ and then treatment W_{full}. The experiment also showed that while the treatments had no significant effect on the average number of leaves produced, they had significant effect on the shoot length.

Keywords: media, composition, shoot initiation, nodes.

Introduction

Mansonia altissima belongs to the family *Sterculiaceae* (Irvine, 1961, Maku *et al.*, 2014) and is mostly found in West Tropical Africa in countries like Benin, Cameroon, Cote d'Ivoire, Ghana and Nigeria.

It is a semi – deciduous forest species that grows up to 37m high with trunk of about 2.5m girth.(Maku *et al*., 2014). *Mansonia* is classified as a non – pioneer light demander (Gyimah *et al.*, 2003).

However, this tree of high economic importance is faced with divers challenges which include annual bush burning, over exploitation and seed dormancy (Beet, 1989). It is also faced with the dangers of extinction from human induced deforestation (Myers, 2000). *M. altissima* has been described as vulnerable according to the IUCN Red list of threatened species (IUCN, 2008); it therefore requires urgent conservation attention.
Many of the candidate species for domestication have seed problems. These range from short periods of seed viability, damage from pests and pathogens to irregular flowering (Bonner, 1990).

This in turn results in the unavailability of materials for both commercial forestry and provenance testing. Also, the growing demand for seed banks for reforestation programs underlines the need for an alternative means of propagation other than through seed hence the need to explore other means of propagation. Most tropical tree species have been documented to peculiar growth habits (Foli *et al*., 2003).

Lack of dependable supply of planting material can be overcome through micro- propagation.

Tissue culture will ensure the mass production of genetically identical trees which makes identification of promising genotypes possible. Therefore, this study aims at developing protocol for the in vitro propagation of *M.altissima* using nodal culture in order to enhance its mass propagation.

MATERIALS AND METHODS

Media Preparation

Different strengths of Woody Plant Medium (WPM) were prepared and supplemented with 0.5mg/L IBA and 1mg/L BAP as listed in Table 1. The pH was adjusted to 5.7 using 0.1 N NaOH and 0.1 M HCl before autoclaving at 121^0C with the pressure of 1.05 Kg/cm^2 for 15 minutes (Okere and Adegeye, 2011).

Table 1: Different strengths of woody plants Media used

Treatments	% Strength
$W_{1/8}$	12.5
$W_{1/4}$	25.0
$W_{3/8}$	37.5
$W_{1/2}$	50.0
$W_{5/8}$	62.5
$W_{3/4}$	75.0
$W_{7/8}$	87.5
W_{full}	100

Explants Source and Preparation

Six weeks old seedlings were used as source of explants. Nodal segments (1.5cm) were excised from the seedlings. The segments were disinfected using 70% alcohol, 10% sodium hypochlorite and a mixture of ascorbic acid, broad spectrum antibiotic and antifungal. This was followed by rinsing thrice with sterile distilled water in laminar airflow cabinet (Okere and Adegeye, 2011).

These sterilized segments were inoculated on the already prepared growth media of different strengths with each treatment having ten replicates.

The cultures were incubated in 16h/8h photoperiod under light intensity of 50µE/ m^2/s provided by cool, white fluorescent light at 22^0C with 55% relative humidity (Okere and Adegeye, 2011).

Data collected during the course of the investigation were shoot height and number of leaves. A completely randomized design was used for this experiment and the data were subjected to analysis of variance and presented in the results below.

RESULTS AND DISCUSSION

Leaf emergence was observed after 10days of inoculation, just like seeds that germinate between 10-14days.

Table 2: ANOVA table for the effect of media composition on number of leaves

Source	df	SS	MS	F-ratio	F-Prob
Treatment	7	1.1496	0.16423	1.899^{ns}	0.095
Error	40	3.45885	0.08647		
Total	47	4.60845			

ns = not significantly different at 5% probability levelThe treatments had no significant effect on leaf production in the young plant specimen i.e. treatment means are not significantly different *(P*>0.05), this is in line with the work carried out by Maku *et al.*,2014, which showed that different hormonal concentrations has effect on the number of leaves per seedling. Since the growth regulators' concentration are same, hence the result.

Table 3: ANOVA table for the effect of media composition on Shoot length

Source	df	SS	MS	F-ratio	F-Prob
Treatment	7	0.348289	0.049756	6.59*	<0.001
Error	40	0.301970	0.007549		
Total	47	0.650259			

*Significantly different at 5% probability

The treatments had highly significant effect on the shoot length of the young plant specimen i.e. treatment means are significantly different *(P*<0.05). This result demonstrated that different hormonal concentrations may not have any significant on the shoot length rather the nutritional contents of the various media compositions.

Table 4: Follow up test on effect of media composition on shoot height

Media composition	mean shoot height (cm)
$W_{1/8}$	1.0006^{bc}
$W_{1/4}$	7.112^{a}
$W_{3/8}$	1.0006^{bc}
$W_{1/2}$	1.1583^{b}
$W_{5/8}$	1.0006^{bc}
$W_{3/4}$	1.0006^{bc}
$W_{7/8}$	1.0006^{bc}
W_{full}	1.0775^{bc}

Treatment $W_{1/4}$ produced greatest shoot length followed by treatment $W_{1/2}$ and then treatment W_{full}. Treatment mean W_{full} is not significantly greater than treatment mean $W_{1/8}$, $W_{3/8}$, $W_{5/8}$, $W_{3/4}$ & $W_{7/8}$.

Plant growth regulators are known to stimulate germination; this has been documented by various authors (Fletcher, 2000; Rademacher, 2000).

Media $W_{1/4}$ produced greatest shoot length growth followed by $W_{1/2}$. This is in line with the findings of Hamdy *et.al. (*2006) that nodal explants proliferation and somatic embryogenesis do better on media with reduced concentration. The treatments produced significant difference in the height of shoots while there was no significant difference on the number of leaves produced.

CONCLUSION

Considering the results obtained from this study and the effects of the treatments on the germination of *M. altissima*, it could be concluded that shoot initiation of *Mansonia altissima* using nodal culture can be easily achieved when the strength of the medium is reduced by a factor of four. This will in turn enhance the mass propagation and germplasm conservation of the species for plantation establishment and domestication purposes.

REFERENCES

Beet W.C. (1989). The potential role of agro forestry in ACP countries. Technical centre of Agric and Rural Cooperation (ACP-SEC IOME CONVENTION) Netherland.

Bonner, F.T. (1990). Storage of seeds: potential and limitations for germplasm conservation. *Forest Ecology and Management* 35:35-43.

Fletcher, A., A. Gilley, N. Sankhla, and T. Davies. (2000). Triazoles as plant growth regulators and stress protectants. Hort. Rev. 24: 55-138.

Foli, E.G., Alder,D., Miller, H.G., and Swaire, M.D.(2003). Modeling growing space requirements for some tropical forest tree species. *Forest Ecology and Management* 173:75-88.

Gyimah, R., T.Nakao and Min (2003). *Effect of light intensity and nutrient on growth and electron transport of tropical tree found in Ghana*, Faculty of Agriculture, Miyazaki University, Japan. 40pp.

Hamdy O, Porramatikul S and Al-Ozairi E (2006) Metabolic obesity: the paradox between visceral and subcutaneous fat. Current Diabetes Review 2(4) 367-373.

Irvine, F.A.R. (1961). Woody plants of Ghana with special reference to their uses. OxfordUniversity Press London p 146.

IUCN (2008). 2008 International Union for Conservation of Nature and Natural Resources Red list of threatened species.

Maku J. O. , Gbadamosi A. E., Fadoju O. A. (2014). Germination and Seedling Growth of *Mansonia altissima* (A. Chev) in Response to Hormonal Treatment International Journal of Agriculture and Forestry 2014, 4(4): 269-274 DOI: 10.5923/j.ijaf.20140404.02

Myers, N. (2000). *Deforestation Rates in Tropical Forests and their Climatic implications.* Friends of the Earth, London U.K., 116 pp. 4. WF Climate Change Campaign. 2000

Okere, A. U. and Adegeye, A.(2011). In vitro propagation of an endangered medicinal timber species Khaya grandifoliola C. Dc. *African Journal of Biotechnology Vol. 10(17), pp. 3335-3339*, 25 April, 2011 Available online at http://www.academicjournals.org/AJB DOI: 10.5897/AJB10.236 ISSN 1684–5315

Pill, W. G. and J. A. Gunter. (2001), Emergence and shoot growth of cosmos and marigold from paclobutrazol-treated seed. *J. Environ. Hort*. 19: 11-14.

Rademacher, W. (2000). Growth retardants: effects on gibberellin biosynthesis and other metabolic pathways. Ann. Rev. Plant Physiol. Plant Molec. Biol. 51: 501-531.