EFFECT OF MEDIA ON EARLY GROWTH OF *Morinda lucida* (BENTH)

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Abstract
This paper reports findings of a twelve weeks growth investigation of *Morinda lucida* (Benth) on six different media. The experiment was laid in Completely Randomized Design (CRD). Data collected were plant height (cm), stem diameter (mm), leaf production and leaf area (cm^2). The collected data were subjected to one-way Analysis of Variance. Early growth of *M. lucida* on the different media evaluated was significant in terms of height, leaf production and leaf area. Seedlings on loamy soil exhibited best performance in height (7.62 cm), stem diameter (4.00 mm), leaf production (10.80 cm) and leaf area (8.4 cm^2). The least performances in height and leaf production were however recorded for seedlings raised on river sand with 6.06 cm and 7.60 respectively. Loamy soil significantly improved the growth of *M. lucida* at nursery stage because of its composition in meeting the growth requirement of young seedlings especially at nursery stage. It is therefore recommended that loamy soil is preferable for healthy seedlings at nursery stage.

Keywords: *Morinda lucida*, growth media, leaf area, loamy soil
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Introduction

Forests play critical roles in maintaining and providing ecosystems service and functions (Nadrowski *et al.,* 2005). However, those roles are threatened as a result of combined effects of deforestation, forest fragmentation and degradation (Lamb *et al.,* 2005*).* Hard wood species have traditionally depended on natural forest management techniques for regeneration, these dependence coupled with poor control of logging activities in the forest reserve has led to over exploitation of the forest in humid West Africa. With high rate of deforestation and forest degradation, it became clear that there is a great need for deliberate interventions to restock the moist forests and initiate intensive plantation forest (Ladipo *et al.,* 1994*).* The focus on non-timber forest products are on rural incomes, rural households need and the key components are on sustainable forest management and conservation strategies. There has been a sustainable global awareness of the importance of the superfluity of bio-diversity and natural resources from tropical forest for several purposes. This stem not only from the derivable forest products but also from the potent of ethno-botanical and ethno-medicinal uses of the plants in the forests. The world tropical rainforests are especially rich in bio-diversity but there is a rapid depletion of the natural resources in Nigeria (Aumeeruddy, 1994; Eyzaguiire, 1995).

Morinda lucida is a genus of flowering plant in the family, Rubiaceae. It is commonly known as Brimstones trees. It is a tropical rain forest tree commonly called 'Oruwo'(Yoruba) and 'Huka', 'Ezeogi' (Igbo tribes of Nigeria), 'Amake' (Ghana), 'Atakakake' (Togo) and 'Sangogo' (Cote d'Ivoire) (Hepper *et al.,* 1963).

Morinda lucida is widely utilized by people. The bitter tasting roots are used as flavouring for food and alcoholic beverages and in Nigeria they are popularly used as chewing sticks. The root is also added to indigo vats in Cote d'Ivoire to contribute to fermentation and reduction process necessary for dyeing with indigo in order to get darker blues (Irvines *et al.,* 1961). The wood is excellent in making charcoal, and also used for construction, mining props, furniture, canoes, poles and fuel wood. The leaves are used in cleaning and scouring of calabashes.

Different parts of the plants are used medicinally for treating different ailments. These include fever, dysentery, abdominal colic and intestinal worm (Adeneye *et al.,* 2008*)*. It is also used to prevent infection of the breast after weaning of infants (Adewumi *et al.,* 1984) as well as in the treatment of diabetes, hypertension, cerebral congestion, dysentery, stomach-ache, ulcers, leprosy and gonorrhea (Adesida *et al.,* 1972). In Cote d'Ivoire a bark or leaf decoction is applied against jaundice and in Congo, the decoction of the stem bark and leaf is combined with a dressing o powdered root bark against itch and ringworm (Abbiw, 1990).

Considering the usefulness of this plant, there is a need to investigate and intensify efforts in ensuring mass production of healthy seedlings that can be used to reclaim degraded or deforested lands. This study is therefore aimed at investigating the effects of selected media on the growth performance of *Morinda lucida* seedlings.

Materials and Methods

Experimental site

The study was carried out at within the premises of Federal College of Forestry, Ibadan, Oyo State located on latitude 07^{o}22'N and longitude 03^{0}58'E. The total annual rainfall, mean annual maximum temperature, mean annual minimum temperature and mean annual relative humidity are 1148.1 mm, 31.5^{o}C, 24.4^{o}C and 71.9% respectively (FRIN, 2014).

Experimental procedure, treatments and design

The seeds of *Morinda lucida* were collected from the seed store of the Forestry Research Institute of Nigeria, Ibadan while sterilized river sand was collected from the stream between FRIN and Federal College of Forestry, Ibadan.

One hundred and twenty (120) seeds of *Morinda lucida* were broadcasted into the 24 cm x 24 cm x 6 cm germination boxes. The germination boxes were filled with river sand and watering was done once daily. Sprouting of the seedlings was monitored until when no sprout was observed again in seven days.

The treatments for the experiment are as follows:

T1 – loamy soil
T2 – sandy soil
T3 – river sand
T4 – mixed loamy and sandy soil (1:1)
T5 – mixed loamy and river sand (1:1)
T6 – mixed sandy and river sand (1:1)

The experiment was laid in Completely Randomized Design (CRD).

Data Collection and analysis
Two weeks old seedlings of uniform heights were pricked into polythene pots filled with the different media. Growth characteristics such as plant height (cm), stem diameter (mm), leaf production, and the leaf area (cm^2) were collected weekly for twelve (12) weeks. The data collected were subjected to one-way Analysis of Variance (ANOVA) at 5% level of significance and the means found to be significant were separated using Least Significant Difference (LSD).

Results and Discussion
The results showed that there was no variation among all treatments used. In Table 1, the highest plant height was observed in seedlings raised on loamy soil (T_1) with mean value of 5.24 cm, followed by sandy soil (T_2) with 5.04 cm as compared with T_6 (1:1) which gave the least performance with mean value of 4.42 cm. At week 8, it was observed that there was variation among all treatments used, as the highest plant height was observed when T_1 (loamy soil) was used with mean value 6.70 cm followed by T_5 (loamy + river sand) with 6.42 cm as compared with the least performance T_3 (river sand) with mean value of 5.40 cm. However, at week 12, treatments used were significantly different from one another as the best plant height was recorded when T_1 (loamy soil) was used with mean value of 7.62 cm, followed by T_5 (loamy + river sand) with mean value of 6.68 cm, while the lowest value was recorded when T_3 (river sand) was used as a medium with mean value 6.06 cm.

In all treatments used, application of T_1 caused significantly higher plant height in the seedlings as compared with other treatments used.

As regards the leaves production of *Morinda lucida* seedlings as presented in Table 2; at the end of 12th week, variation was observed among various treatments used. Significant interaction was observed between T_1 and other treatments, as T_1 (10.80 cm) was significantly higher than other treatments used in the experiment. In all treatments, the lowest leaves production was recorded in T_3 (7.60). However, no variation was observed among T_4, T_5, and T_6 ($p \geq 0.05$) but they were significantly different from T_2 and T_3 with mean values of 8.00 and 7.60 respectively.

At week 6, *M. lucida* seedlings grown in T_1 had the highest leaves production when compared to other treatments. The lowest leaves production was recorded in T_3 with mean value of 5.20.

A variation was observed at week 8, as T_1, T_5 and T_6 were not significantly different from one another but significantly higher than T_2, T_3 and T_4. Effects of high soil aeration soil susceptibility to compaction is influenced predominantly by its texture, mainly by its size fraction, soil texture also affects how well nutrients and water are retained in the soil. Soil with finer particles holds nutrients and water much better than sandy soil (Mengel and Kirby, 2001).

In Table 3, stem diameter of *M. lucida* seedlings was not significantly different from one another, but *M. lucida* treated with loamy soil T_1 had the highest stem diameter with mean value of 40.00mm, while T_2, T_3, T_4 had the same value of 38.0mm as compared with T_5 (Loamy soil and river sand) and T_6 (Sandy soil and river sand) having the lowest diameter value of 36.00 mm each. However, at week 2-week 10, variation was observed among all treatments used.

Table 4 showed that there was significant different between T_1 (loamy soil) and other treatments at week 4 and week 6. T_1 had the highest leaf area at both weeks when compared to other treatments (sowing media). Moderate transports from the soil to the root surface also depends on soil moisture which is a function of soil texture (Vetterlein *et al*., 2007) and therefore have an effect on nutrient uptake and leaf production.

Table 4 showed the growing media effect on the leaf area of *M. lucida*. It revealed that seedlings raised on T_1 (loamy soil) produced the widest leaf area with 42.2 cm in the 2nd week of assessment, followed by T_4 with 39.9 cm and T_3 had the least performance with 35.7 cm. Throughout twelve weeks of the experiment, T_1 performed best, followed by T_4 while T_2 (sandy soil) performed poorly. Follow-up test revealed that the use of loamy soil significantly improved the leaf area of *Morinda lucida* seedlings when compared with other treatments.

ANOVA indicated that there is significant difference among the treatments used. This implies that the use of loamy soil growing media gave significant difference in height,

leaf production, and leaf area at 5% probability level and this finding agrees with the statement of Francis (1998) that soil in undistributed natural or artificial forest support growth of *Enterolobium cyclocarpum* seedling*s* and this also occurs in the growth of *Morinda lucida.*

Table 1: Effect of Growing Media on the Height (cm) of *Morinda lucida* seedling*s*

	Week 2	Week 4	Week 6	Week 8	Week 10	Week 12
T_1	5.24^{a}	6.10^{a}	6.42^{a}	6.70^{a}	7.36^{a}	7.62^{a}
T_2	5.08^{a}	5.46^{bc}	5.72^{bc}	5.92^{bc}	6.14^{b}	6.28^{c}
T_3	4.50^{a}	5.04^{d}	5.24^{d}	5.40^{d}	5.78^{c}	6.06^{c}
T_4	5.04^{a}	5.50^{bc}	5.74^{b}	5.90^{bc}	6.12^{bc}	6.20
T_5	4.92^{a}	5.50^{b}	5.78^{b}	6.00^{b}	6.42^{b}	6.68^{b}
T_6	4.42^{a}	5.14^{cd}	5.36^{cd}	5.58^{cd}	6.12^{bc}	6.36^{bc}
LSD	**0.41**	**0.38**	**0.37**	**0.38**	**0.34**	**0.39**

Table 2: Effect of Growing Media on the Leaf Production of *Morinda lucida* seedling*s*

	Week 2	Week 4	Week 6	Week 8	Week 10	Week 12
T_1	4.80^{a}	5.60^{a}	7.20^{a}	8.00^{a}	8.00^{ab}	10.80^{a}
T_2	4.00^{a}	5.60^{a}	5.80^{a}	5.60^{b}	7.20^{b}	8.00^{b}
T_3	4.00^{a}	5.60^{a}	5.20^{cd}	5.60^{b}	7.60^{b}	7.60^{b}
T_4	4.00^{a}	5.80^{a}	6.00^{b}	6.40^{b}	8.00^{ab}	8.80^{ab}
T_5	4.00^{a}	5.80^{a}	6.00^{bc}	8.40^{a}	8.80^{a}	9.20^{ab}
T_6	4.80^{a}	5.60^{a}	6.80^{ab}	8.40^{a}	8.80^{a}	9.20^{ab}
LSD	**0.95**	**0.67**	**1.16**	**1.06**	**1.11**	**1.64**

Table 3: Effect of Growing Media on the Stem Diameter (mm) of *Morinda lucida seedlings*

	Week 2	Week 4	Week 6	Week 8	Week 10	Week 12
T_1	20.0^{a}	26.0^{a}	30.0^{a}	40.0^{a}	40.0^{a}	40.0^{a}
T_2	20.0^{a}	20.0^{a}	26.0^{a}	30.0^{bc}	36.0^{ab}	38.0^{a}
T_3	10.0^{c}	20.0^{a}	22.0^{b}	26.0^{b}	32.0^{b}	38.0^{a}
T_4	14.0^{bc}	24.0^{ab}	24.0^{ab}	30.0^{b}	34.0^{ab}	38.0^{a}
T_5	14.0^{bc}	22.0^{ab}	24.0^{ab}	26.0^{ab}	40.0^{ab}	36.0^{a}
T_6	16.0^{ab}	26.0^{a}	26.0^{ab}	26.0^{b}	36.0^{ab}	36.0^{a}
LSD	**0.50**	**0.50**	**0.60**	**0.70**	**0.60**	**0.50**

Table 4: Effect of Growing Media on the Leaf Area (cm^2) of *Morinda lucida* seedlings

	Week 2	Week 4	Week 6	Week 8	Week 10	Week 12
T_1	42.2^{a}	52.5^{a}	56.5^{a}	59.9^{a}	77.8^{a}	87.4^{a}
T_2	37.6^{ab}	42.9^{b}	44.7^{b}	50.8^{b}	56.7^{bc}	60.5^{bc}
T_3	35.7^{b}	42.1^{b}	44.8^{b}	50.4^{b}	63.4^{b}	70.5^{b}
T_4	39.9^{ab}	46.4^{ab}	49.0^{b}	54.7^{ab}	62.2^{b}	70.5^{b}
T_5	37.5^{ab}	43.6^{b}	46.0^{b}	52.8^{b}	61.1^{bc}	65.0^{bc}
T_6	37.9^{ab}	42.5^{b}	44.5^{b}	49.4^{b}	53.2^{c}	56.1^{c}
LSD	**4.90**	**6.10**	**5.90**	**5.40**	**7.70**	**10.4**

Conclusion

The significant differences observed on *Morinda lucida* growth with respect to different soil media (loamy soil, sandy soil, river sand) is an indication that loamy soil from the forest reserve or natural forest is the best for mass propagation of *Morinda lucida*.

References

Abbiw, D. K. 1990. Useful Plants of Ghana: West African Uses of Wild and Cultivated Plants. *Intermediate Technology Publications, London and Royal Botanic Gardens, Kew, Richmond, United Kingdom,* p. 337.

Adeneye, A. A. and Agbaje, E. O. 2008. Pharmacological Evaluation of Oral Hypoglycaemic and Antidiabetic Effects of Fresh Leaf Ethanol Extract of *Morinda lucida* Benth in Normal and Alloxan Induced Diabetic Rats. *African Biomedical Research*, 11(1): 65-71

Adesida, G. A. and Adesogan, E. K. 1972. Oruwal, A Novel Dihydroanthraquinone Pigment from *Morinda lucida* Benth. *J. Chemical Soci. Chemical Communications*, 1:405-406.

Adewunmi, C. O. 1984. Natural Products as Agents of Schistosomiasis Control Nigeria: A Review Progress. *International Journal of Crude Drug Research* 22:161-166.

Aumeeruddy, Y. 1994. Conservation of the Environment Seen through the Prism of Local Representations. *People and Plants Working Paper* 3, October 1994.

Eyzaguiire, P. 1995. Ethno Botanical Information in Plant Genetics Resources Institutes (IPGRI).

Francis, J. K. 1988. *Enterolobium cyclocarpum* (Jacq.) Griseb. Guanacaste, earpod-tree. US Department of Forestry, Forest Service, Institute of Tropical Forestry, Southern Forest Experimental Station SO-ITS-SM-15, Rio Piedras, Puerto Rico.

Hepper, F. N. and Keay, R. W. J. 1963. *Floral of West Tropical Africa.* Vol. 2. 2nd Edition Crown Agents for Oversea Government and Administrations, London, United Kingdom. 723pp

Irvine, F. R. 1961. *Woody plants of Ghana,* with special references to their uses, *Oxford University press, London, United Kingdom*, 868pp.

Ladipo, D. O., Britwum, S. P. K., Tchoundjeu, Z., Oni, O. and Leakey, R. R. B. 1994. Genetic Improvement of West African Tree Species: Past and Present, pp. 239-248. In: *Tropical trees: the potential for domestication and rebuilding of forest resources*. ed. R.R.B. Leakey & A. C. Newton. HMSO, London.

Lamb, D., Erskine, Peter D. and Parrotta, John A. 2005. Restoration of Degraded Tropical Forest Landscapes. Science 310, 1628. doi: 10.1126/science.1111773

Mengel, K. and Kirby, E. A. 2001. Principles of Plant Nutrition. *Kluwer Academic Publishers, Dordrecht*. 849pp.

Nadrowski, K., Wirth, C. and Sherer-Lorenzen, M. 2010. Is Forest Diversity Driving Ecosystem Functions and Services? *Current Opinions in Environmental Sustainability* 2: 75-79pp.

Vetterlein, D., Szegedi, K., Stange, F. and John, R. 2007. Impact of Soil Texture on Temporal and Spatial Development of Osmotic-Potential Gradients between Bulk Soil and Rhizosphere. *J. Plant Nutrition and Soil Science*. 170, 347-356.