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EFFECTS OF GROWING MEDIA ON GROWTH PERFORMANCE OF *Irvingia wombulu* SEEDLINGS

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ABSTRACT

The study evaluated the effect of different growing media on the seedling growth performance of Irvingia wombulu to examine the potential growing media of amended soil with rice husk. The treatment combinations were topsoil + rice husk (1:1), topsoil +rice husk (2:1), topsoil + rice husk (3:1), rice husk (1), and topsoil (control). The experiment was laid out in a Completely Randomized Design (CRD) with 4 replicates. Data were subjected to analysis of variance, least significant difference (LSD) test was used to compare means at 0.05 level of significance. The results showed that topsoil + Husk (1:1) = 1.83 cm^2 while Husk = 1.69 cm^2 in terms of leave area at week 9 implying that topsoil + Husk (1:1) treatment had the highest total area of leaves while the Husk treatment had the least. Also, in week 6, the results indicated that topsoil + Husk (1:1), topsoil + Husk (3:1), and topsoil all had 100% survival rates, whereas topsoil + Husk (2:1) and Husk had survival rates of 97% and 81%, respectively. The media effect was significantly different on two parameters (height = 0.001, survival rate = 0.0001, p≤0.05) while there was no significant difference in the media effect on the other two parameters (leaf area = 0.09, leaf number = 0.09, p≤0.05). The study concluded that seedling growth of Irvingia wombolu is significantly influenced by soil media and that topsoil + husk (1:1) recorded better growth performance, which is therefore recommended for raising Irwingia wombulu species in the nursery establishment.

Keywords: Rice Husk, Top Soil, Growing Media, Growth Performance, *Irvingia wombulu*

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INTRODUCTION

Various ecological services that forest provide benefits people's well-being and the advancement of human society. According to FAO (2020), the well-established techniques of planting new forests and replenishing the areas that have been harvested assist the growth and regeneration of forest ecosystems and are anticipated to boost global efforts to restore degraded forests. One of the most popular ways to develop or regenerate forests is through the planting of seedlings. However, for planting operations to be successful, seedlings must be able to live and flourish under a variety of environmental circumstances that depend heavily on the seedling quality and soil conditions. Forest nurseries are frequently used to raise seedlings, hence the processes utilized for producing them must be sustainable. This implies, among other things, that seedlings must be produced and delivered on schedule, in the required quantity

and quality, following the most recent idea of sustainable forest operations (Marchi *et al*., 2018)

Raven, *et al*. (2005) and Hartmann *et al*. (2007), as cited in Oyebamiji *et al*. (2019), claimed that a variety of elements, including the soil type, and environmental variables like oxygen, water, temperature, and light in the case of some plant species, affect seedling germination. According to research conducted by Baiyeri and Mbah (2006), as quoted in Raza *et al*. (2020), soil medium is generally thought to have the greatest impact on seedling quality in nurseries. According to Nnadiukwu *et al*., (2023), rice husk contains a good amount of potassium (48.28 mg/kg), calcium (29.49 mg/kg), magnesium (19.32 mg/kg), iron (14.01 mg/kg), and manganese (11.54 mg/kg), while other minerals such as copper (9.85 mg/kg), zinc (6.13 mg/kg), phosphorus (4.02 mg/kg), sodium (2.81 mg/kg), cobalt (1.85 mg/kg) and selenium (1.25 mg/kg) existed in lower concentrations.

Choosing the right soil medium makes it easier to produce seedlings of high quality. This has an impact on how the large functional root system develops and is maintained afterward. A good soil medium gives the plant enough support, acts as a reservoir for nutrients and water, allows oxygen to get to the roots, and allows gaseous exchange between the roots and the environment outside the root substrate (Luoranen *et al., 2018*). According to Agbo and Omaliko, (2006), as cited in Bhardwaj, (2014), the creation of healthy, high-quality seedlings is influenced by good and appropriate nursery potting material and soil. Hence, the re-establishment in the field, a garden, or a forest depends largely on the quality of the seedlings you receive from a nursery. Especially, the increasing demand for fruits and other non-wood products from the reduced natural forests such as the *Irvingia wonbulu*.

In West and Central Africa, there is a hardwood multi-purpose tree named *Irvingia wonbulu*, sometimes known as wild mango, African mango, bush mango, dika, or ogbono. They produce mango-like fruits that are prized for their high protein and fat content. In Nigeria, they are cultivated for their fruits and kernels, which are referred to as ugiri and ogbono, respectively, in the Igbo language (Okoro and Igwokwe, 2023). In addition, food, fuel, fiber, medicine, construction materials, and building materials are all provided by this tree (Lowe *et al*., 2000; Atangana *et al*., 2002; Omokhua *et al*., 2012). Due to its commercial and dietary importance, it is considered the most significant species. A significant Non-Timber Forest Product (NTFP), notably in Nigeria, is *Irvingia wombolu* (bush mango), the source of "ogbono" (Ladipo, 2000; Chah *et al*., 2014). Most bush mangoes are harvested from the wild. The sustainability of these natural resources has raised concerns for several stakeholders due to the high demand for bush mango kernels, which has resulted in an unsustainable pace of forest exploitation (National Research Council (NRC), 1991). Given that most forest trees have been eliminated as a result of extensive deforestation in Nigeria, the long-term availability of *Irvingia* fruits is dubious. For better management, increased food security, revenue creation, and to secure the supply of such fruits in commercial numbers, valuable fruit trees like Irvingia spp. should be produced in farmlands and perhaps in plantations (Omokhua *et al*., 2012).

It is crucial to remember that the natural regeneration and re-establishment of any plant species are necessary for biodiversity preservation and maintenance, which aids in the development of a region's plant population through time and space. Deforestation, desertification, and over-exploitation are the most difficult and evident causes of biodiversity loss in the forest (Marchi *et al*., 2018). Through reforestation, regeneration, re-establishment, and afforestation programs, these limiting limitations can be addressed and eventually reduced. Nevertheless, to realize these programmes, seedling pre-treatment procedures must be taken into consideration, although the optimum growth of seedlings is often very difficult to raise. Therefore, as a result of the foregoing, it is necessary to identify the most appropriate growth medium suitable for raising *Irvingia wombolu* seedlings under different soil media in the nursery.

Dolor, (2011) examined the germination and seedling performance of *Irvingia wombulu*

(Vermoesen) using different propagation media such as sawdust, clayey soil, and topsoil. Also, Shodeke *et al*. (2017) observed the highest growth of *Irvingia wombulu* in poultry manure mixed with NPK and other organic manures. However, there are limited studies on the response of *Irvingia wombulu* to the mixture of rice husk with topsoil at the early stage of development. The study, therefore, examined the effect of different soil media on the growth performance of *Ivingia wombulu seedlings.*

MATERIALS AND METHODS

Study Area

The experiment was carried out at Aponmu Field Station Nursery of Rainforest Research Station of Forestry Research Institute of Nigeria (FRIN), which lies between latitudes (7°16' and 7°18' N) and longitudes (5° 9' and 5°11') E in Akure South Local Government Area of Ondo State, Nigeria. Aponmu lies in the tropical rainforest zone with an annual rainfall ranging between 1500mm and 1900mm. The rainy season generally occurs between March and October while the dry season occurs between November and February yearly. Also, the mean annual temperature is about 26°C (minimum 19°C and maximum 34°C) (Adekunle *et al*., 2013).

Treatment and Experimental Design

The seedling growth experiment of *Irvingia wombulu* was carried out between February and April 2023. The experimental treatment consists of five distinct combinations of growth media in a Completely Randomized Design (CRD). Topsoil with rice husk (collected from the rice milling factory) was mixed at different ratios and filled into polyethylene pots (10cm x 12cm). The treatments are topsoil + rice husk (1:1) (T1), topsoil + rice husk (2:1) (T2), topsoil + rice husk (3:1) (T3), and rice husk (1) (T4) were used as treatments while the topsoil as control (T5). *I. wombulu* fruits were collected in the Akure forest reserve, in February. After four weeks, the seedlings' emergence was evident on the germination bed as pricking and transplanting of young seedlings into pots with 4 replicates (40) in each treatment at the fifth week with daily watering. Weekly parameter observations included survival percentage, leave area, seedling height, and leave number recorded for five weeks after germination.

Data Analysis

Data collected on seedling growth were subjected to descriptive statistics (percentages, mean, and standard deviation) and Analysis of variance (ANOVA). Where significant differences occurred among the treatment means, the least significant difference (LSD) method was used to compare the means. All data were transformed, the percentage data were arcsine, while plant height and leaf area data were log-transformed, and the number of leaves was square root transformed (Gomez and Gomez 1984).

RESULTS

Effects of the planting soil media on the seedling growth performance of *Irvingia wombulu* where leaf area, seedling height, survival rate, and the number of leaves produced are used as parameters are presented below.

Table 1: Effect of Planting Soil Media on Leaf Area of *Irvingia wombulu*

Planting Media	Week 5	Week6	Week7	Week	Week 9
T1	1.37	1.55	1.69	1.74	1.83
T2	1.38	1.57	1.69	1.70	1.76
T3	1.39	1.56	1.67	1.69	1.75
T4	1.39	1.56	1.59	1.61	1.69
T5	1.38	1.54	1.60	1.69	1.73

The results from Table 1 showed no visible effect of treatments at week 5 with the leave area of *Irvingia Wombulu* estimated to be 1.37cm^2, 1.38cm^2, 1.39cm^2, and 1.39 cm^2 for topsoil + Husk (1:1), topsoil + Husk (2:1), topsoil + Husk (3:1), and Husk respectively. This trend continued through week 6, until week 7 when it was noted that topsoil + Husk (1:1) and topsoil + Husk (2:1) recorded the highest value of 1.69 cm^2 while the Husk had the lowest value of 1.59 cm^2. Similar treatment performance was recorded in week 8, at week 9 topsoil + Husk (1:1) retained the highest value of 1.83cm^2 while the Husk had the lowest value of 1.69cm^2.

Table 2: Effect of Planting Media on Early Seedlings Height of *Irvingia wombulu*

Planting Media	Week5	Week6	Week7	Week8	Week9
T1	1.06	1.21	1.36	1.44	1.46
T2	1.07	1.16	1.19	1.25	1.28
T3	1.04	1.17	1.26	1.41	1.44
T4	1.05	1.08	1.15	1.22	1.27
T5	1.07	1.14	1.18	1.27	1.30

The results in Table 2 showed that the effect of the treatments was pronounced between the weeks, at week 5 topsoil had the highest value of 1.07cm while topsoil + Husk (3:1) had the lowest height of 1.04cm. The trend of topsoil having the highest value and the topsoil + Husk (3:1) having the lowest value continues through weeks 6 to 8, at week 9 topsoil + Husk (1:1) recorded the highest value of 1.46cm and the least treatment effect was Husk with 1.27 cm.

Table 3: Effect of Planting Soil Media on Survival Rate of *Irvingia wombulu*

Planting Media	Week5	Week6	Week7	Week8	Week9
T1	39.23	39.23	38.05	38.05	38.05
T2	39.23	38.05	38.05	36.87	36.87
T3	39.23	39.23	39.23	39.23	39.23
T4	39.23	31.94	26.56	21.97	21.97
T5	39.23	39.23	39.23	39.23	39.23

Table 3 showed the effect of treatments on the survival rate of *Irvingia wombulu*. From the results, a 100 % survival rate (39.23) was recorded in week 5 for all the soil media. The result for week 6 showed a 100% survival rate (39.23) for topsoil + Husk (1:1), topsoil + Husk (3:1), and topsoil while the survival rate of 97% and 81% for topsoil + Husk (2:1) and Husk respectively. For week 7, topsoil + Husk (3:1) and topsoil maintained a 100% survival rate while Husk treatment had the least survival rate of 68%. Week 8 and week 9 also showed a 100% survival rate for topsoil + Husk (3:1) and topsoil while Husk had the least survival rate of 56%.

Table 4: Effect of Planting Soil Media on Leaf Number of *Irvingia wombulu*

Planting Media	5week	6week	7week	8week	9week
T1	1.25	1.39	1.57	1.88	2.15
T2	1.23	1.39	1.59	1.88	2.13
T3	1.19	1.37	1.58	1.85	2.08
T4	1.20	1.32	1.49	1.79	1.97
T5	1.19	1.36	1.56	1.86	2.03

The result in Table 4 showed the effect of treatments on the number of leaves produced by *Irvingia wombulu*. The values for all the treatments at week 5 are 1.25, 1.23, 1.19, 1.20, and 1.19 respectively. For week 6, topsoil + Husk (1:1) and topsoil + Husk (2:1) have the highest value of 1.39 each while Hust has the lowest value of 1.32. This trend continued through week 8 with Husk having the least value of 1.79. The final assessment at week 9 showed that topsoil + Husk (1:1) had the highest value of 2.15 while Husk had the lowest value of 1.97.

Table 5: ANOVA Result Comparing Mean Effects of Different Planting Media on *Irvingia wombulu* Seedlings

Planting Media	Leave Area	Height	Leave Number	Survival Percentage
T1	1.64±0.18 [a]	1.35±0.09 [a]	1.65±0.37 [a]	38.52±0.64 [a]
T2	1.62±0.15[a]	1.32±0.10 [ab]	1.65±0.36 [a]	37.81±0.98 [a]
T3	1.61±0.14 [a]	1.23±0.08[bc]	1.61±0.36 [a]	39.23±0.0 [a]
T4	1.57±0.11 [a]	1.15±0.04[cd]	1.56±0.32 [a]	28.33±1.35[b]
T5	1.59±0.14 [a]	1.06±0.013[d]	1.59±0.35 [a]	39.23±0.0 [a]
P-value (≤ 0.05)	<0.09	<0.001	<0.09	<0.0001

Means followed by the same letter (a) within the same column and treatment are not significantly different at P<0.05 level of probability using Least Significant Difference (LSD)

Table 5 shows the mean effect comparison of the planting media on the growth parameters of *I. wombulu* seedlings. From the result, the treatment effect was significantly different on two growth parameters (height = 0.02, survival rate =0.00) at p≤0.05 while there was no significant difference in the treatment effect on the other growth parameters (leave area = 0.09, leave number = 0.09) at p≤0.05 in the study area.

DISCUSSION

The research showed that the treatments affect the growth performance of *Irvingia wombulu*, however, there was a significant effect on the growth parameters when the topsoil + rice husk (1.1) was used as treatment. This is supported by recent research carried out by Nnadiukwu et al., (2023) which concluded that rice husk is rich in various macronutrients namely Phosphorus (P), Potassium (K), Calcium (Ca), and Magnesium (Mg), and some micronutrients which include Iron (Fe), Zinc (Zn) and Copper (Cu) which are essential nutrients for plant growth. The findings are in agreement with Faria *et al*. (2001), who reported that carbonized rice husks can be used as a sole or partial substrate for plant cultivation. Rice husk has been used as soil improvement to get better plant yield and to manage plant pathogens including fungi, bacteria, nematodes, and viruses (Aliyu, *et al*., 2011). This result of the significant influence of topsoil + rice Husk (1:1) compare to topsoil, rice Husk and other media, could be related as reported by Purwantoro, (2016) that the porosity of river sand medium allows imbibition by the seeds and adequate aeration.

Rice husk, when mixed with other materials (compost, manure, soil, and so on.) provides volume, drainage, and porosity, characteristics essential for growing sensitive seedlings of vegetables and fruit trees (Patrick, 2019). This assertion contrasted with the findings of Okunomo *et al*. (2004, 2009) who obtained a higher germination percentage in topsoil with *Dacryodes edulis* and *Persea americana* respectively, citing the presence of adequate nutrients for germination and growth in topsoil help to build strong root system for plant growth. The finding is also in contrast with the finding of Agbogidi *et al*., (2007) who recorded the highest seedling performance in topsoil with *D. edulis*. This could be attributed to the soil characteristics present favouring the rapid growth of the different tree species. Furthermore, the finding of the study showed that there was no significant difference among the soil media on parameters; leave area, and the number of leaves except for height and survival rate where there was a significant difference. This shows that the soil media employed had no significant effect on the growth of *I. wombulu* seedlings as long as adequate growth treatments were carried out on them. The insignificant effect observed on the

number of leaves and leave area in the finding may be the result of using only two growth media (topsoil and husk) though at a varying ratio. The finding is in agreement with the findings of Oyebamiji, *et al.* (2019) where no significant difference was found among different soil media on the number of leaves, wet and dry matter weight except on leaf area.

CONCLUSION

The study showed that *irvingia wombulu* seedling had the highest leaf area, leaf number and height when topsoil + Husk (1:1) growth medium was used while the lowest leaf area, leaf number and height was observed in the Husk alone treatment. Furthermore, *irvingia wombulu* seedling had a complete survival rate in three growth media (topsoil + Husk (1:1), topsoil + Husk (3:1), and topsoil) as against other treatments (topsoil + Husk (2:1) and Husk). The study therefore concluded that seedling growth of *Irvingia wombolu* is significantly influenced by soil media and that topsoil + husk (1:1) recorded better growth performance among other treatments. The study provided information on potential benefits of different types of growth media as an improvement to top soil nutrients for *irvingia wombulu* seedling. Based on the findings, understanding the impact of soil media will help in choosing the right soil medium that makes it possible to produce a large number of *irvingia wombulu* seedlings of high quality. Also, to adopt specific management approaches to improve the growth performance in its re-establishment for biodiversity, preservation, and maintenance due to deforestation, desertification, and over-exploitation because of its economic importance.

RECOMMENDATION

Based on the findings of the study, it is therefore recommended that topsoil with rice husk (collected from the rice milling factory) be mixed at ratio (1:1) and filled into polyethylene pots (10cm x 12cm) to raise *Irvingia wombulu species* in the nursery establishment. However, the study is limited to only *Irvingia wombulu.* Further study could be carried out on effect of topsoil + rice husk on the growth parameter of other species of *Irvingia* and other tree species.

REFERENCES

Adekunle V.A.J, Olagoke, O.A, Akindele O.S (2013). Tree species diversity and structure of a Nigerian Strict nature reserve. *International Society for Tropical Ecology.* 54(3): 275-289

Agbo C.U, Omaliko C.M (2006). Initiation and growth of shoots of Gongronema latifolia Benth stem cuttings in different rooting media. *African Journal of Biotechnology*. 5: 425-428.

Aliyu H, Balogun, O.S, Alade O.O. (2011). "Assessment of the effect of rate and time of application of rice-husk powder asian organic amendment on cowpea (Vigna unguiculata L. Walp) inoculated with cowpea mottle virus," *Agriculture and Biology Journal of North America*. 2(1): 74–79.

Atangana A.R, Ukafor V, Anegbeh P, Asaah E, Tchoundjeu Z, Fondoun J.M, Ndoumbe M, Leakey, R.R.B (2002). Domestication of *Irvingia gabonensis*: the selection of multiple traits for potential cultivars from Cameroon and Nigeria. Agroforestry Systems. 55: 221-229.

Baiyeri K.P (2006). Seedling emergence and growth of pawpaw (*Carica Papaya*) grown under different coloured shades of polyethylene. International. Agro-phy, 20 in press.

Baiyeri K.P, Mbah B.N (2006). Effects of soilless and soil-based nursery media on seedling emergence, growth and response to water stress of African breadfruit (*Treculia Africana a Decne*). *African Journal of Biotechnology*. 5: 1405-1410.

Chah J, Ani N.A, Anugwa I, Agwu E.A (2014). Exploitation of Bush Mango (Irvingia wombolu and Irvingia gabonensis) Among Rural Household in Enugu State, Nigeria. *Journal of Agricultural Extension.* DOI 18. 6. 10.4314/jae.v18i2.6.

Dolor D. (2011). Effect of propagation media on the germination and seedling performance of *Irvingia wombolu* (*Vermoesen*). *American Journal*

Biotechnology and Molecular Sciences. 1(2): 51-56.

FAO, (2020). The State of the World's Forests. Forests, Biodiversity, and People; FAO: Rome, Italy, p. 188, ISSN 2521-7542.

Faria R.T, Rego LD, Bernardi A, Molinari H (2001). Performance of different genotypes of Brazilian orchid cultivation in alternative substrates. *Brazilian Archives of Biology and Technology.* 44(4): 337–342.

Hartmann H.T, Kester D.E, Davies F.T, Genve R.I (2007). Hartmann and Kester's plant propagation, principles and practices. Seventh edition. Prentice-Hall of India Private Limited. pp880.

Marchi E, Chung W, Visser R, Abbas, D, Nordfjell T, Mederski P.S, McEwan A, Brink M, Laschi A. (2018). Sustainable forest operations (SFO): A new paradigm in a changing world and climate. *Science of the Total Environment.* 6(34): 1385–1397.

Ladipo D.O (2000). Harvesting of *Irvingia gabonensis* and *Irvingia wombulu* in Nigerian forests; potentials for the development of sustainable systems. Paper presented at the Seminar Harvesting of Non-Wood Forest Products held at Menemen-Izmir, Turkey on 2–8 October 2000. http://www.fao.org/ documents/show_cdr.asp?url_file=/ DOCREP/005/Y4496E/ Y4496E32.htm.

Lowe A.J.A, Gillies C.M, Wilson J, Dawson, I.K (2000). Conservation genetics of bush mango from central/west Africa: Implications from random amplified polymorphic DNA analysis. *Molecular Ecology.* 9: 831-841.

Luoranen J, Saksa T, Lappi J (2018). Seedling, planting site, and weather factors affecting the success of autumn plantings in Norway spruce and Scot pine seedlings. *Forest. Ecology and. Management.* 4(19): 79–90.

Nnadiukwu U.C, Onyeike E.N, Ikewuchi C.C, Patrick-Iwuanyanwu K.C (2023). Phytochemical and Nutrient Composition of Rice Husk. *Tropical Journal of National Product Research* 7(2):2457-2463 http://www.doi.org/10.26538/tjnpr/v7i2 .24

NRC (National Research Council) (1991). Opportunities in the Hydrologic Sciences. National Academies Press, Washington DC.

Okoro S.E, Igwokwe P.K (2023). Extraction and Characterization of Mucilage from Irvingia Gabonesis and Irvingia Wobolum Seeds. *International Journal of Scientific Engineering and Science*. 7(5): 133-141.

Okunomo K, Oghenerhoro E.O, Ojeifo I.M (2004). Effect of soil type on the germination and growth of *Darcryodes edulis* (Don. G. Lam H.J.*). Journal of Sustainable Tropical Agricultural Research*. 12: 46-50.

Okunomo K, Ogisi D.O, Bosah B.O (2009). Effect of growth media on germination and seedling growth of *Persea americana* (Mill). *Journal of Food, Agriculture, and Environment.* 7(1): 111-113.

Omokhua G.E, Ukoima H.N, Aiyeloja A.A (2012). Fruits and seeds production of *Irvingia gabonensis* (O' Rorke) and its economic importance in Edo Central, Nigeria. *Journal of Agriculture and Social Researc*h. 12 (1): 149-155.

Oyebamiji N.A, Ogor A.A, Abdulrahman H.D (2019). Effect of Different Growing Soil Media on Seed Germination and Growth of Tamarind as Influenced by Seed Dormancy Breaking Approaches. *International Journal of Environment, Science and Natural Research*. 17(1): 555-954.

Patrick J. T (2019). Rice Hull Gold: 10 On-Farm Uses of Rice Hulls. ECHO Asia's notes, e ECHO Asia Impact Center in Thailand issues. 37: 1-8 DOI: 10.13140/RG.2.2.23708.62080

Raven P.H, Ray F.E, Susan E.E (2005). Biology of plants. In: WH Freeman (Ed.), (7th ed), New York, USA.

Raza1 T, Kazmi Z.H, Ullah M.A, Kanwal I, Imran S, Rizwan Ahmad R, Hyder S.I (2020). Comparative Effectiveness of

Different Growth Media on Growth, Biomass and Morphology Features of Kinnow Mandarin Seedling. *Journal of Food Processing & Nutritional Science.* 1(1): 1-7

Shodeke D.K.A, Adejoh O.P, Olayiwola V.A, Sulaiman O.N, Afolabi J.O (2017). Effect of organic and inorganic fertilizers on the shoot Growth of *Irvingia womboluVermoesen*. *Journal of Forestry Research and Management* 14(1): 110-120.