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ASSESSMENT OF NURSERY GROWTH MEDIA FOR SEED GERMINATION, SEEDLING GROWTH AND DEVELOPMENT OF AIDON SPICE (*Tetrapluera tetraptera*) TREE IN SOUTH-EASTERN NIGERIA

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Abstract

Good seedling quality is the basis for tree planting success which accounts for higher survival and faster growth rate in the field. A study was carried out to evaluate the effects of different growth media on seed germination, seedling growth and development of Aidon spice tree (*Tetrapluera tetraptera)* seedlings in the nursery unit of Teaching and Research Farm of the School of Agriculture and Agricultural Technology, Federal University of Technology, Owerri. The media consisted of; topsoil alone sawdust alone, mixture of sawdust and topsoil (50:50), topsoil/sawdust in-depth (50:50) and standard nursery mixture (3:2:1). The experimental design used was a completely randomized design (CRD) with seven replications. The growth media were each bagged in perforated black nursery polythene bags measuring 27 × 25 cm and a thickness of 1 mm. Four viable seeds were sown in each medium and watered with half a litre of water three times a week. Data were collected on Days to 50 % seedling emergence, percentage seedling emergence, plant height, number of leaves and leaf area at 4, 8 and 12 weeks after planting, respectively. Data collected were subjected to analysis of variance (ANOVA). Results showed that standard nursery mixture (3:2:1) enhanced seed germination in *T. tetraptera*. There were no significant differences ($P>0.05$ recorded in seed germination on to 50 % germination in all the growth media evaluated. Plant height of seedlings grown in standard nursery mixture was significantly ($P<0.05$) taller at 4, 8 and 12 weeks, respectively. Seedlings grown in sawdust exhibited retarded growth characteristics with age in the nursery. The vigorous seedlings were transplanted and monitored in the Crop Genetic Resource Centre of Crop Science and Technology, Federal University of Technology, Owerri. Seedlings of *T. tetraptera* raised in the standard nursery and transplanted in the field at 12 months after planting is recommended for *T. tetraptera* field establishments.

Keywords: *Aidon spice tree (Tetrapluera tetraptera), nursery, growth media, field establishment*

INTRODUCTION

In Nigeria, Aidon spice (*Tetrapleura tetraptera*) is variously referred to as*:* Oshokirisho (Igbo), Edeminang (Effik), Aridan (Yoruba), Apapa (Ijaw) and Uyayak (Ibibio). *Tetrapleura tetraptera* is a deciduous forest tree spice, the fruit is usually; 15 to 25 cm long by about 5 cm across the wing-like ribs, dark purple brown, glabrous and glossy and usually slightly curved. Two of the wings are hard and woody while the other two are filled with a soft sugary pulp; seeds are hard, black, flat, oval, about 8 mm long, embedded in the body of the fruit, whose fruits are aromatic for seasoning of food and pharmaceutical use; stem and branches for timber and fruit-pulp for industrial uses. The term spice includes all culinary herbs seasonings and condiments of vegetable origin (Sigmund and Gustar, 1991). The value of spices for human nutrition has often been overvalued in the past. Spices are plant products used in flavouring foods and beverages (Govindarajan, 1985). It has nutritional value and often referred to as food accessories or adjuncts because of their

ability to stimulate appetite and increase the flow of gastric juice (Dziezak, 1989). Each spice has a unique aroma and flavor which is derived from phyto-chemicals (Walker, 1994).

By the late 19th Century, Nigeria had about 65 million hectares of rich tropical primary forests, with abundant flora and fauna and presently, these hectarages have been reduced to about 4 million hectares, as Nigeria looses 5 percent of its forest annually (NEST, 2003). Some of the valued forest tree spices are facing the threat of extinction which is caused by high rates of urbanization, deforestation, increasing mobility and development of new housing schemes which resulted in large-scale destruction of the natural forests that are rich sources of plants used as spices locally (Adelaja and Fasidi, 2008).There is an urgent need for the preservation of endangered spice species as some of the valued forest tree spices are facing the threat of imminent extinction. Preservation of endangered spice species of Aidan spice tree (*Tetrapleura tetraptera)* in order to avoid total extinction is a priority. Environmental protection through tree species planting will be achieved to control the menace of flood and land degradation which is seriously devastating South-Eastern, Nigeria.

Good production of permanent tree crop seedlings in the nursery phase is highly influenced by the nursery medium used. The performance of seedlings in the main field is determined to a large extent by their performance in the nursery (Adeyefa, 1991; Agbo and Omaliko, 2006). A poor quality tree will always be a poor quality tree even if planted on a well-prepared, good site. In the field, each poor quality tree wastes space and resources leading to low site productivity. A objective of this study was to assess the impact of nursery growth media on seed germination and seedling growth and development of *Tetrapluera tetraptera* in Southeastern, Nigeria.

MATERIALS AND METHODS

Study Area

The experiment was conducted in 2011/2012 rainy season at the Teaching and Research farm of the Federal University of Technology Owerri Imo state, located between Latitudes 5^0 20'N and 5^0 27' N and Longitude $7^0$00' E and 7^0 07' E (FDALR, 1985). It is of the humid tropics with bi-modally distributed annual rainfall of about 2, 500mm. The soil is a sandy loam, and earlier classified as an ultisol (Orajaka, 1975), who further stated that "Soils were derived from Coastal Plain Sands.

Data Collection

Five (5) growth media constituted the treatments namely: sawdust only, equal mixture of topsoil and sawdust (50:50) by volume, rich topsoil only, standard nursery soil mixture (3:2:1 ratio) as control and topsoil in-depth with sawdust arrangement (50:50) by volume (topsoil was used in filling the lower while sawdust was used in filling the upper half of the bags. The experimental design used was a completely randomized design (CRD) with seven replications. All the growth media were bagged in standard perforated nursery polybags of measuring 27 × 25 cm and 1 mm in thickness. The filling of the nursery bags was done by the use of a hand trowel. The fresh fruits were harvested from healthy stands of protected Aidan spice tree (*Tetrapluera tetraptera)* from Ohaji/Egbema Local Government Area of Imo State. The dried (brown) fruits were cracked and seeds extracted. Each poly-bag was sown with four seeds of Aidan spice tree (*Tetrapluera tetraptera)* and arranged in clusters of four (4) per treatment. The phonological developments were monitored. Data on Days to 50% seed emergence, percentage seedlings emergence, number of leaves, plant height and leaf area at 4, 6 and 8 weeks after planting were collected. The vigorous seedlings were transplanted into the Crop Genetic Resource Centre of Crop Science

and Technology, School of Agriculture and Agricultural Technology, Federal University of Technology, Owerri, Imo State.

Data Analysis

Data analysis was conducted using Genstat (2007).

RESULTS AND DISCUSSION

Table 1 showed that Days to 50% emergence was not significantly different (P>0.05) on time of seedling emergence of (*T. tetraptera*) within the growth media in the nursery. Percentage seedling emergence was significantly (P<0.05) higher in standard nursery mixture (87.7 %), while those in the topsoil were significantly different (P<0.05) (50.0 %) low. At 4 weeks after planting, plant height was significantly taller in the standard nursery mixtures followed by those in the topsoil alone and topsoil /sawdust in-depth arrangement, respectively. Mixture of topsoil and sawdust (50:50) and sawdust alone did not affect plant height significantly (p<0.05%). Number of leaves did not show any significant (P<0.05) difference among the nursery growth media. Leaf area of seedlings of *Tetrapleura tetraptera* seeded in the standard nursery mixture, topsoil alone and topsoil/sawdust in-depth were significantly larger than those in the mixture of topsoil/ sawdust (50:50) and sawdust. Leaf-lamina of seedlings grown with sawdust was significantly narrower compared with those in the topsoil, standard nursery mixture and topsoil/sawdust in-depth, respectively.

Table 2 shows that at 8 weeks after planting, plant height was significantly (P<0.05) taller in the standard nursery mixture (21. 96 cm) followed by those in the topsoil/sawdust in-depth arrangement (15.08 cm) and topsoil (12.44 cm), respectively. Number of leaves of the seedlings in the topsoil and sawdust (50:50) and sawdust alone were significantly (P<0.05) lower than those in the standard nursery mixture, topsoil/in-depth arrangement and topsoil, respectively. Leaf area was significantly (P<0.05) lower in the sawdust compared to those in other growth media. However, leaf area in the standard nursery mixture (132.9 cm) exhibited significantly (P<0.05) broader leaves, followed by those in the topsoil/sawdust in-depth arrangement and topsoil alone, respectively.

Table 3 shows that at 12 weeks after planting the standard nursery mixture, topsoil, in-depth arrangement and topsoil/sawdust mixture (50:50) showed significant increases in plant height of seedlings of *Tetrapluera tetraptera* more than seedlings in the sawdust medium which were the shortest. Sawdust recorded significantly (P<0.05) lower number of leaves compared to the number of leaves in the standard nursery mixture, topsoil/in-depth arrangement, topsoil alone and a mixture of topsoil and sawdust (50:50), respectively. Seedlings in the sawdust medium significantly developed narrower leaf area than those in other growth media. Standard nursery mixture (230.0 cm) recorded significantly broader leaves, followed by topsoil/sawdust in-depth arrangement (152.8 cm) and topsoil (107.2 cm), respectively.

Good production of permanent tree crop seedlings in the nursery phase is highly influenced by the nursery soil used. Standard nursery soil (3:2:1; topsoil, poultry manure and river sand) consistently improved plant height, number of leaves and leaf area growth of Aidan spice tree (*Tetrapluera tetraptera)* in the nursery for 12 months before planting out in the field establishment. This is in agreement with the findings of Peter-Onoh *et al.* (2014) who reported that standard nursery mixture enhanced seedling growth and development of African nutmeg, *M. myristica*, in the nursery. Agbede, *et al.* (2008) reported that, application of poultry manure

increased growth parameters such as (plant height, stem girth, leaf area) of sorghum in South-Western, Nigeria. Seedling quality, vigour, a combination of height, diameter, plant nutrition, health, root size and shape, together, these characteristics determine how well the plant will establish itself in the field, and they affect the rate of survival. Poultry manure is an excellent organic fertilizer, as it contains high nitrogen, phosphorus, potassium and other essential nutrients (Oyewole and Oyewole, 2011). Increase in N as found in poultry manure has its profound effect on the vegetative development of plants and ensures healthy and vigorous growth (Aliyu, 2002).At 4 weeks after planting, number of leaves did not show any significant effect among the growth media. Leaf production in *T. tetraptera* is probably a genetic trait. Sawdust medium significantly affected growth parameters of *Tetrapluera tetraptera* at 8 and 12 weeks after sowing, respectively. This confirmed the work of Peter-Onoh *et al.* (2014) who reported that sawdust should be used for those crops that will not exceed four weeks in the nursery. Wood residues/sawdust contains minor elements essential for plant growth but however, it is low in mineral nutrients. A poor quality tree will always be a poor quality tree even if planted on a well-prepared, good site. In the field, each poor quality tree wastes space and resources leading to low site productivity.

CONCLUSION

Fast tree growth enables a farmer to harvest wood or tree products early, and increase the return on the farmer's investment. We are producing trees for people's livelihood; they depend on having high quality trees, hence standard nursery mixture should be used in the nursery for good seedling quality production as the basis for successful tree planting which accounts for high survival and fast growth rate in the field.

Plate 1: Mature Aidon spice *Tetrapluera tetraptera* tree with fruits

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Table 1: Effects of different growth media on growth attributes of (*Tetrapluera tetraptera)* seedlings (cm) in the nursery.

Treatments	Days to 50% emergence	% seed ling emergence	Plant height (cm), WAP . 4	8	12
Topsoil/sawdust in- depth arrangement (50:50)	10.88	58.40	10.74	15.08	19.49
Topsoil and sawdust mixture (50:50)	11.38	66.70	6.59	5.78	13.69
Sawdust	10.12	62.50	6.17	6.08	6.17
Standard nursery soil mix (3:2:1)	11.38	87.70	14.69	21.96	28.41
Topsoil	12.88	50.00	10.65	12.44	18.01
$LSD_{(0.05)}$	NS	20.02	1.54	1.58	2.12

NS=Not significant; LSD= Least significant difference, WAP= weeks after planting

Table 2: Effects of different growth media on number of leaves of *Tetrapluera tetraptera* seedlings (cm) at 4, 6 and 8 weeks after emergence, respectively.

Treatments	4	8	12 (WAP)
Topsoil/sawdust in-depth (50:50) arrangement	4.36	5.13	6.52
Topsoil and sawdust mixture (50:50)	4.13	4.70	6.38
Sawdust	4.25	4.50	4.63
Standard nursery mix (3:2:1)	4.50	5.75	6.63
Topsoil	4.50	5.25	6.25
$LSD_{(0.05)}$	NS	0.46	0.50

NS=Not significant; LSD= Least significant difference, WAP= weeks after planting

Table 3: Effects of different growth media on leaf area of (*Tetrapluera tetraptera* seedlings (cm^2) at 4, 6 and 8 weeks after planting, respectively.

Treatments	4	8	12 (WAP)
Topsoil/sawdust in-depth arrangement (50:50)	18.19	91.80	152.00
Topsoil and sawdust mixture (50:50)	15.04	15.78	84.90
Sawdust	14.65	48.60	37.00
Standard nursery mix (3:2:1)	17.70	132.90	230.00
Topsoil	19.19	74.00	107.00
$LSD_{(0.05)}$	2.87	13.10	12.57

LSD= Least significant difference, WAP= weeks after planting

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