ASSESSEMENT OF NURSERY GROWTH MEDIA ON SEED GERMINATION AND SEEDLING GROWTH OF *TETRAPLUERA TETRAPTERA* IN SOUTHEASTERN NIGERIA

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Abstract

Good quality seedling is the basis for successful tree planting. A study was carried out to evaluate the effects of different growth media on seed germination, growth and development of *Tetrapluera tetraptera* seedlings at 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 sole, sawdust sole, mixture of sawdust and topsoil (50:50), the conventional topsoil/sawdust standard nursery mixture (3:2:1). The experiment was laid in a completely randomized design (CRD) with seven replications. The growth media were each bagged in black nursery polythene bags measuring 27cm × 25 cm when laid flat (with thickness of 1mm). Viable seeds were sowed in each medium and watered regularly. Data were collected on days to 50% seedling emergence, percentage seed emergence, seedling height, number of leaves per seedling and leaf area at 4, 8 and 12 weeks after planting respectively. Data collected were subjected to analysis of variance (ANOVA), using Genestat (2007) model. Results showed that standard nursery mixture soil (3:2:1) enhanced seed germination in *T. tetraptera*. There was no significant difference recorded in seed germination of time to 50% germination. Plant height of seedlings grown in standard nursery soil mixture was significantly (p>) 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 *Tetrapluera tetraptera* raised in standard nursery soil and transplanted to the field at 12 months after planting is recommended for *T. tetraptera* field establishments.

Keywords: *Tetrapluera tetraptera,* nursery, growth media, field establishment

Introduction

Aidon tree, *Tetrapleura tetraptera* (Oshokirisho Igbo), Edeminang (Effik), Aridan (Yoruba), Apapa (Ijaw), Uyayak (Ibibio).

It is a deciduous forest tree spice, 15-25 cm long by about 5cm across the wing like ribs, dark purple brown, glabrous and glossy, usually slightly curved. Two of the wings are hard and woody and the other two filled with a soft sugary pulp; seeds are hard, black, flat, oval, about 8mm 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 derive from phytochemicals (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, this hectareage has been reduced to about 4 million hectares, as Nigeria lost 5 percent of its forest annually (NEST, 2003). Available reports also indicate that Nigeria still loses an annual average of 350,000 hectares of forest cover (Ogbonaya, 2003; NEST, 2003). Some of the valued forest tree spices are facing the threat of extinction caused by high rates of urbanization, deforestation, increasing mobility, and development of new housing schemes which resulted in the 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 preservation of endangered spice species as some of the valued forest tree spices are facing the threat imminent of extinction. Preservation of endangered spice species *T. tetraptera* to avoid total extinction is a priority. Environmental protection through tree specie planting will be achieved to control the menace of flood and land degradation seriously devastating Southeastern 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 study was carried out to assess the impact of nursery growth media on the seed germination and seedling growth of *T. tetraptera* in Southeastern Nigeria.

Materials and Methods

The experiment was conducted in 2011/2012 at the Teaching and Research farm of the Federal University of Technology Owerri Imo state, located between between Latitudes 40 40 and 80 15 N, and Longitude 6 40 and 8 15 E 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 bimodally-distributed annual rainfall of about 2500mm. 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. 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 bag). The experimental design was laid in a completely randomized design (CRD) with seven replications. All the growth media were bagged in the standard perforated nursery polybags of 27cm × 25cm and the thickness of 1mm. 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 *T. tetraptera* from Ohaji/Egbema Local Government Area of Imo State. The dried (brown) fruits were cracked and seeds extracted. Each polybags was sown with four seeds of *T. tetraptera* and arranged in clusters of four (4) per treatment. The phenological developments were monitored. Data on Days to 50% 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 in 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 was conducted using Genestat (2007).

Results and Discussions

Results (Table 1) showed that Days to 50% emergence was not significant in 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 soil mixture (87.7%) while those in topsoil were significantly (50.0%) low.

At 4 weeks after planting, the plant height was significantly tall in standard nursery soil mixtures followed by those in topsoil sole and topsoil /sawdust in depth arrangement respectively. Mixture of topsoil and sawdust (50:50) and sawdust sole did not affected plant height significantly ($p<0.05\%$). Number of leaves did not show any significant ($P<0.05$) difference among the nursery growth media. The leaf area of seedlings of *T. tetraptera* seeded in standard nursery soil, topsoil sole and topsoil/sawdust in depth were significantly larger than those in mixture of topsoil/ sawdust (50:50) and sawdust. Leaf-lamina of seedlings grown sawdust was significantly narrower compared with those in topsoil, standard nursery soil mixture and topsoil/sawdust in depth respectively.

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

Results (Table 3) at 12 weeks reported that standard nursery soil mixture, topsoil, in depth arrangement and topsoil/sawdust mixture (50:50) showed significant increase in plant height of the seedling of *T. tetraptera* more than seedlings in sawdust growth medium which were the shortest. Sawdust recorded significant ($P<0.05$) smaller number of leaves compared to the number of leaves in standard nursery soil mixture, topsoil/in depth arrangement, topsoil sole and mixture of topsoil and sawdust (50:50) respectively. Seedlings in sawdust were significantly developed narrower in leaf area than in other growth media. Standard nursery soil mixture (230.0 cm) recorded significantly broad leaves, followed by topsoil/sawdust in depth (152.8 cm) and topsoil (107.2 cm) respectively.

Discussion

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 *T. tetraptera* in the nursery for 12 months before field establishment. This is in agreement with the findings of Peter-Onoh *et al.* (2014) who reported that standard nursery soil mixture enhanced seedling growth and

development of *M. myristica* in the nursery. Agbede, *et al.* (2008) reported that, application of poultry manure increased growth parameters (plant height, stem girth, leaf area) of sorghum in Southwestern Nigeria. Seedling quality vigour is 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). Increased 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 growth media. Leaf production in *T. tetraptera* is probably a genetic trait. Sawdust medium insignificantly affected the growth parameters of *T. tetraptera* at 8 and 12 weeks after sowing respectively. This confirmed the work of Peter-Onoh *et al.* (2014) which reported that sawdust should be used for those crops that will not exceed four weeks in the nursery. Wood residues/sawdust contains minor element essential to 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, increasing 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 soil mixture should be used in the nursery for good seedling quality production as the basis for successful tree planting through which accounts high survival and fast growth rate in the field.

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Table 1. Effect of different growth media on growth attributes of *Tetrapluera tetraptera* seedling **(cm) in the nursery.**

Treatments	Days to 50% emergence	% seed emergence	Plant height (cm) 4	8	12WAP
Topsoil/sawdust in-dept arrangement	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	62.5	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

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

Treatments	4	8	12 (WAP)
Topsoil/sawdust in-dept 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 soil 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

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

Treatments	4	8	12 (WAP)
Topsoil/sawdust in-dept arrangement	18.19	91.80	152.0
Topsoil and sawdust mixture (50:50)	15.04	15.78	84.90
Sawdust	14.65	48.60	37.00
Standard nursery soil mix (3:2:1)	17.70	132.90	230.00
Topsoil	19.19	74.00	107
LSD $_{(0.05)}$	2.87	13.10	12.57

LSD= Least significant difference