



GERMINATION PATTERN AND PRE-NURSERY TECHNIQUES OF *MONODORA MYRISTICA* (AFRICAN NUTMEG) IN SOUTHEASTERN NIGERIA

Peter-Onoh, CA, Obiefuna JC, Ogoke IJ, Ngwuta AA. and Ibeawuchi II

Federal University of Technology, Owerri Imo State Nigeria

Corresponding author email: chidinmaonoh@gmail.com

Abstract

A comprehensive account of seed quality and management, seedling production and maintenance and other related seedling production methods. Quality seedling production depends on a sound understanding and implementation of the key principles of nursery planning and management. *Monodora myristica* Dunal- African nutmeg, is an Annonaceae and an endangered tree spice in the tropical rainforest agroecology of Southeastern Nigeria. The fruits are usually collected from elite protected trees. The seeds are processed, dried and sold whole or ground to powder to be used for stews, soups, cakes and desserts. There is need for preservation of endangered spice species as *Monodora myristica* to avoid total extinction. The fruits were picked from the protected elite trees for two seasons 2011 and 2012, respectively, washed, and air-dried under room temperature in Crop Science and Technology Laboratory, of the Federal University of Technology Owerri. The seeds were sown lengthwise at the depth of 3 cm and covered with loose moistened sawdust (2cm thick) and watered at field capacity every three days. Germination was closely monitored and the following germination phases were recorded days after sowing (DAS); protrusion of the taproot out of the seed, taproot downward curvature, hypocotyl elongation, uplifting of the intact seedcoat and dropping/shedding of the seedcoat and finally the 2-leaf stage of the seedlings. At the 28- 30 days after sowing, the cotyledon shedded inside the intact seedcoat, leaving a ring-like scar (structure) on the hypocotyls while the seed coat moved upwards to the epicotyls. The seedcoat dropped at 35-40 days after sowing and a pair of leaf appeared. This work revealed that *Monodora myristica* exhibited Durian the pattern of germination, a subtype of epigeal germination because the hypocotyl elongated and the cotyledons shedded while still enclosed with the seedcoat.

Keywords: Pre-nursery, Durian germination, *Monodora myristica*, Nigeria

1.0 Introduction

Monodora myristica Dunal (African nutmeg), is of Annonaceae family. This fruit tree is of one the endangered indigenous tree spices found in the tropical rainforest agroecology of Southeastern Nigeria.

The fruit is a berry of 20. 0 cm diameter and is smooth, green and spherical and becomes woody at maturity. It is attached to a long stalk which is up to 60. 0 cm long. Inside the fruit the numerous oblongoid, pale brown, 1.50 cm long seeds are surrounded by a whitish fragrant pulp. The odour and taste of the *M. myristica* seed is similar to nutmeg and it is used as a popular spice in the West African cuisine (Chapman, 2007). The fruits are collected from protected trees and the seeds are dried and sold whole or ground to be used in stews, soups, cakes and desserts (Scully, 2002). Plant nursery is a place where plants are

propagated and grown to usable size (Haenicke, 1999). Tree nurseries can provide optimum care and attention to seedlings during their critical juvenile stage, resulting in the production of healthy, vigorous seedlings. The best nursery practices include seed quality and management; seedling production and maintenance; and related seedling production methods (Mulawarman *et al.* 2003).

Germination is defined as the emergence and development from the seed embryo of those essential structures which are indicative of the seed's capacity to produce a normal plant under favourable conditions (Bewley and Black, 1985). Germination starts by the uptake of water by the dry seed-imbibition and is completed when a part of the embryo, usually the radicle, penetrates seed coat (Bewley, 1997).

The threat of extinction is exacerbated by increase in Nigerian population (140 million), urbanization, deforestation (Adelaja and Fasidi 2008). The scenario calls for proper conservation and utilization which are vital to global food security and agricultural sustainability. Conservation of endangered spice species is necessary hence the study investigated the nursery technique and germination pattern of *Monodora myristica* seeds.

2.0 Materials and Method

The samples were collected from *M. myristica* tree located in a flat land of rich fertile and well drained soil of a rainforest of Umuajata Olokoro in Umuahia South Local Government Area of Abia State. The rich fertile soil in the tropical forest ecosystems is achieved the high and rapid circulation of nutrients through the fall and decomposition of litters (Gliessman, 1998). The located site of the fruit tree was geo-referenced using hand-held Geographical Positioning System (GPS) receiver (Garmin Ltd, Kansas (USA)). It was used to determine the latitude, longitude and altitude (latitude of 05° 31' 34" N, longitude 07° 29' 22" E and altitude of 152m) for two seasons 2011 and 2012, respectively. For each season, the processed seeds were washed and air-dried under room temperature in Crop Science and Technology Laboratory (Plate 1). Containers were filled to the brim with sawdust and moistened and allowed to stand for 3 days in the Screen house of the Crop Science and Technology, Federal University of Technology Owerri (FUTO) (Latitude 5° 20' N and 5° 27' and Longitude 7° 00' E and 7° 07' E), found within the Southeast humid forest zone of Nigeria. The seeds were sowed lengthwise at the depth of 3 cm and covered with loose moistened sawdust (2cm deep) and watered with a litre of water every three days. Germination

and seedling emergence were closely monitored and the following phases in days after sowing (DAS) were observed; protrusion of the taproot out of the seed, the taproot downward curvature (DAS), hypocotyl elongation and uplifting of the intact seedcoat and dropping/shedding of the seedcoat and 2-leaf stage for respective year's sowing and the average calculated. The seedlings were pricked to the permanent nursery soil medium (3:2:1; topsoil, poultry manure and river sand) at a 2-leaf stage.

3.0 Results and Discussion

The seeds enlarged after water absorption and that resulted in the cracking of the surface of the moistened rotted sawdust (growth medium) at the 15th day after sowing (Plate 2). At the 18th day, an opening was noticed at the tip of the seedcoat through the cracked surface. As the days progressed, a milky-coloured structure (growth) appeared which later protruded out of the intact seed at the 20th day and continued till the attainment of about 1-1.5 cm in length. The protruded radicle pulled downwards by the force of gravity at the 25th day (Plate 3). As the radicle penetrated inside the growth medium (rotted sawdust), the intact seed was lifted upwards, and this resulted in the elongation of the hypocotyls (Plate 4). At the 28- 30th day the cotyledon shedded inside the intact seed coat, leaving a ring-like scar (structure) on the hypocotyls while the seed coat moved upwards to the epicotyls (Plate 5). The seed coats dropped at 35-40th day and a pair of leaf appeared (Plate 6). Prickling was carried out at this stage of 2-leaves into the black nursery polybags bagged with well mixed standard nursery soil (3:2:1; topsoil, poultry manure, river sand) as a permanent nursery (Plate 7), and water appropriately before field establishment.



1



2



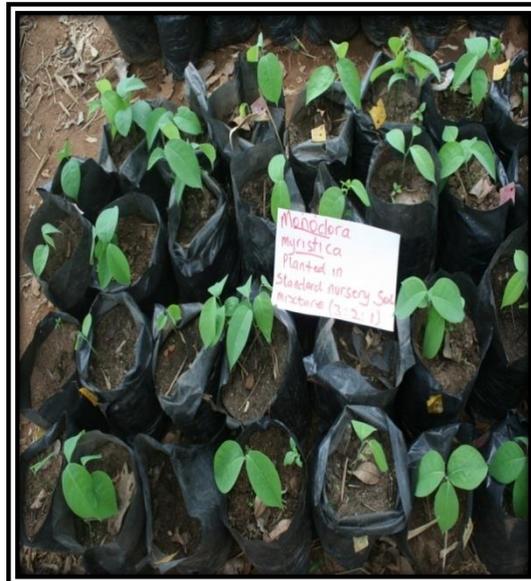
3



6



4



7



5

- Plate 1: Harvested and washed seeds
- Plate 2: Swollen and protruded radicle
- Plate 3: Taproot downward curvature
- Plate 4: Intact seeds about to be lifted upwards
- Plate 5: Hypocotyl elongation, uplifting of the intact seedcoat, shedding of the seedcoat and appearance of the enlarged ring-like scar structure.
- Plate 6: 2-Leaf stage of the seedling
- Plate 7: Permanent nursery (transplanted into the standard nursery soil: 3:2:1, topsoil, poultry dropping and river sand).



Some seeds have very short viability in most of the cases and are to be collected immediately at the time of proper maturity (Robert and King, 1980). Therefore, knowledge of the exact time of flowering, seed collection, seed weight, viability, seed handling and nursery techniques is of utmost importance for the success of a plantation programme. Keeping this in view, an attempt was made by the State Forest Research Institute to collect and collate the scattered information on the nursery techniques of 16 local tree species with the hope that the document may be useful for successfully raising nursery and in planting few trees on the mother earth (Longman, 2002).

Germination begins when water penetrates the seed coat and the seed swells and the opening/cracking of the seed coat which resulted to the protruding of the radicle, confirmed the finding of Bewley (1997) which stated germination starts by the uptake of water by the dry seed-imbibition and is completed when a part of the embryo, usually the radicle, penetrates seed coat. The cotyledon of *Monodora myristica* was shedded inside the intact seed coat. The findings agreed with the findings of NG (1978) which stated that this pattern of germination is called Durian, a subtype of epigeal germination because the hypocotyls elongated and the cotyledon shedded while still enclosed with the seedcoat. To avoid wastage of resource, Wightman, (1999) advised that raising quality seedling requires technical skills including careful planning for all the major components such as quality seeds, appropriate growing media, containers, nursery hygiene and protection. The essence of pricking the seedlings to standard nursery soil is in conformity to Peter-Onoh *et al*; (2014) findings which stated that sawdust should not be used for seedlings that will be nursed for more than 4 weeks. This is because by nature, sawdust is low in mineral nutrients.

Conclusion

It is concluded in this study that epigeal germination which involves the exposure of the cotyledons on the hypocotyl was found to form a ring-like scar (structure) after the seedcoat had dropped (Plate 6). This type of germination is called Durian germination, a type of epigeal germination. Sawdust as a growth media for *Monodora myristica* in the pre-nursery is

preferred because it is light and has high moisture retention.

References

- Adelaja, B. A and I. O. Fasidi (2008). Survey and collection of indigenous Spicegermplasm for conservation and genetic improvement in Nigeria Bioersity International – FAO Published in Issue No.153,67 -74.
- Bewley, J.D, (1997). Seed germination and dormancy. *The Plant Cell*, 9: 1055-1066.
- Bewley, J. D. and M. Black. (1985). *Seeds: Physiology of Development and Germination*. Plenum Press, NY. Agriculture Division, Washington, D.C.: The World Bank.10
- Chapman, P. (2007). *India Food and Cooking. The Ultimate Book on India cuisine*. UK: New Holland Publisher,25-38.
- Gliessman, S.R. (1998). *Agroecology; ecological processes in sustainable agriculture*. Michigan; Ann Arbor Press.8.
- Longman, K.A. 2002. *Tropical Trees: A Practical Manual for Growing Good Nursery Stock*, Blaketon Hall Ltd, Exeter, Devon, UK. 226
- Haenicke, H. (1999), *Good Tree Nursery Practices: Practical Guidelines for Research Nurseries*, ICRAF, Nairobi.
- Mulawarman, J.M., Roshetko, S. M., Sasongko and D Iriantono. 2003. *Tree Seed management*
- Seed Sources, Seed Collection and Seed Handling : a Field Manual for Field Workers and Farmers. World Agroforestry Centre (ICRAF) and Winrock International. Bogor, Indonesia. 54
- NG, F.S.P. (1978). Strategies of establishing in Malayan forest trees. *In* Tropical trees as living systems (Eds. P.B. Tomlinson and M.H. Zimmermann). Cambridge Univ. Press.32-45.
- Peter-Onoh, C.A., Obiefuna, J.C., Ngwuta, A. A., Onoh, P.A., Ibeawuchi, I.I.Ekwugha, E. U., Emma-Okafor, L. C., Nze, E. O., Orji, J. O. and Onyeji, E.C. (2014). Efficacy of Five Different Growth Media on Seedling



- Emergence and Juvenile Phenology of *Monodora myristica* (African nutmeg, *Ehuru*) in the Nursery. *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)* e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 7, Issue 5 Ver. 1.60-63..
- Robert, E.H. and King, M.W. (1980). Storage of recalcitrant seeds. *Int. Union BioI. Sci.* 42: 39-40
- Wightman, K.E. Good Tree Nursery Practices. Practical Guidelines for Community Nurseries.1999. International Centre for Research in Agroforestry (ICRAF), Nairobi, Kenya. 95
- Scully, T. (1995). The art of cookery in the middle ages. Woodbridge, Suffolk; Rochester, N.Y: Boydell and Brewer,35-47.