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Germination and Seedling Growth of African Pear (*Dacryodes edulis* Don. G. Lam. H.J.) As Affected by Different Planting Media

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Abstract: A study was conducted in 2006 to determine the germination and seedling growth of African pear (*Dacryodes edulis*) as affected by different planting media: top garden soil, sharp sand, sawdust and a mixture of top soil and sawdust in a ratio of 50:50 in the Teaching and Research Farm of the Delta State University, Asaba Campus, Delta State, Nigeria. The experiment was laid out in a Randomised Complete Block Design (RCBD) with four replications. The results showed that seeds planted in sharp sand had the highest germination percentage (93.5%) and were significantly different ($p \leq 0.05$) from those (88.4, 60.7 and 48.0%) sown in the other media (TS/SD, SD and TS) respectively. The results also indicated that the performance of the seedlings in terms of height, number of leaves, leaf area and collar diameter planted in top garden soil was better and differed significantly ($p \leq 0.05$) compared to those in the other growth media. This study has established that the germination and seedling growth of *Dacryodes edulis* are significantly affected by planting media; while sharp sand favoured greater germination percentage, topsoil is recommended for the seedling growth when more nutrients would be required for normal metabolic activities.

Key words: Seedling emergence, growth, *Dacryodes edulis*, planting media, cultivation

INTRODUCTION

Dacryodes edulis commonly called African pear, bush butter is an important food supplement that is available during the early growing season in Nigeria (Bankens and Okolie, 1993). *D. edulis* is a delicacy among the people of southern Nigeria where it is consumed as an accompaniment with fresh maize (Onuegbu, 2000; Agbogidi and Eshegbeyi, 2006). It is a highly nutritious fruit (Ayuk *et al.*, 1999). Onuegbu (2000) stated that the edible pulp contains ash (10.8%), fibre (17.9%), oil (31.9%), protein (25.9%), energy (444.7 kcal/100 g), carbohydrate (13.5%) and moisture content (12.04%). *D. edulis* is a tropical fruit tree which grows in the humid tropics. The bark is thin and the leaves pinnate with leaflets measuring between 3-4 cm by 2-3 cm. The plant is dioecious and the female plants do not flower at the same time, so pollen storage is necessary to control pollination (Youmbi *et al*., 1998). The plant flowers between May and October and fruits about 5-6 years after planting (Dalziel, 1987). The immature fruits vary from orange to red in colour but turn blue purple at maturity. The fruit consists of a large seed surrounded by a thin mesocarp. The gathering of the fruits of *D. edulis* serves as a veritable source of employment and income for rural populace (Agbogidi and Eshegbeyi, 2006).

With increasing population pressure and high demand for this multipurpose forest fruit tree species and consequent on the fact that very few farmers domesticate and cultivate *D. edulis* in Nigeria,

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due in part to the limited information on the germination of the seeds (Embiri and Nwufo, 1990; Leakey and Ladipo, 1996) as well as the seasonality of fruit production and inability of the fruits to store well for a long period of time (Onuegbu, 2000), the need to develop the best planting medium required for the germination and early seedling growth of *D. edulis* cannot be overemphasised. *D. edulis* has also been included in the list of endangered forest species (Leakey, 1999; Nwoboshi, 2000), which if no attempt is made to domesticate and enhance their acceptability to local farmers, the future generation may be deprived of the inherent benefits of this economically important fruit tree species. This study was therefore; set out to evaluate the germination and seedling growth of *Dacryodes edulis* as affected by different planting media with a view to contributing to the improvement of germination of *D. edulis* and stimulating more interest in its cultivation, consumption and utilisation to the rural populace.

MATERIALS AND METHODS

The study was carried out in the teaching and research farm of the Department of Forestry and Wildlife, Delta State University, Asaba Campus, Delta State, in 2006. Asaba is located at latitude 06^0 14'N, longitude 06° 49'E of the equator (Asaba Meteorological Station, 2006). Asaba lies in the tropical rainfall zone. The rainy season is usually between April and October, with an annual rainfall range of 1505-1849.3 mm. The mean temperature is 28±6°C. The relative humidity is 69-8% and the monthly sunshine is 4.8 bars (Asaba Meteorological Station, 2006). Matured fruits of *D. edulis* were procured from Ugbolu market in Oshimili-North Local Government Area of Delta State. Healthy seeds were sorted out by simple flotation technique following the procedure of Agbogidi and Eshegbeyi (2006). The fruits were mechanically depulped to expose the seeds which were planted in poly pots containing the various treatments. Bottom perforated poly pots (45/38 cm) filled with top garden soil (TS), Sharp Sand (SS), sawdust (SD) and a mixture of top soil and sawdust in a ratio of 50:50 (TS/SD), constituted the treatments. There were therefore, four treatments replicated four times. Four seeds were sown per poly pot and each treatment consisted of 10 poly pots. The experiment was laid out in a Randomized Complete Block Design (RCBD). The trail was monitored for 9 weeks while parameters were measured forth night staring from the 3rd week after planting (WAP). Parameters measured included seedling emergence (germination percentage) (%). This was done on the 18th Day after Planting (DAP). Germination counts were recorded per treatment at the 18th day after planting and germination percentage was calculated following the method of Agbogidi and Ofuoku (2005). Seed sprouting was however observed between 12th and 14th day after planting. Other parameters assessed were plant height, number of leaves, leaf area and collar diameter. Plant height was determined with a meter rule at the distance from soil level to the top of the terminal bud, the number of leaves was determined by visual counting of the leaves, leaf area was determined by multiplying the length and breath measurements of a leaf multiplied by the number of leaves in the plant and finally by a correction factor of 0.75 following the procedures of Agbogidi and Ejemete (2005) and Agbogidi and Ofuoku (2005). Collar diameter at 3 cm above soil level was determined using veneer calipers. Data colleted were subjected to analysis of variance while the significant means were separated with the Duncan's Multiple Range Test (DMRT) using SAS (1996).

RESULTS AND DISCUSSION

Significant differences ($p \leq 0.05$) were observed in the germination percentages of *D. edulis* seeds sown in the different planting media. Seeds sown in the sharp soils had the highest germination percentage and were significantly different ($p \leq 0.05$) from those planted in the other media (Table 1). Seeds planted in 50:50 (TS/SD) also had appreciable germination percentage which differed

significantly ($p \leq 0.05$) from those sown in top garden soil and pure sawdust (Table 1). For instance, while 93.5% germination was recorded for *D. edulis* seeds sown in sharp soil, 48.0% germination occurred in seeds planted in top garden soil. Seeds sown in TS/SD produced 88.4% germination.

The height, number of leaves, leaf area and collar diameter of *D. edulis* seedlings planted in TS were significantly ($p \leq 0.05$) greater when compared with those in the other growth media (Table 2-5), respectively. Seedlings planted in a mixture of TS and SD also had significant higher growth relative to those in SS and pure SD. For instance, the highest plant height of 27.6 cm was recorded for seedlings

Table 1: Germination percentage (%) of *Dacryodes edulis* seeds as affected by different planting media

Plant media	Germination (%)
TS	48.0d
SD	60.7c
SS	93.5a
TS/SD	88.4b

Means with different letter(s) are significantly different from each other at ($p \leq 0.05$) using the Duncan's multiple range test

Table 2: Height (cm) of *D. edulis* seedlings as influenced by different planting media

	Week after planting/height			
Planting media	3	6	9	Means
TS	14.4	20.2	27.6	20.7a
SD	9.2	11.7	18.3	13.1c
SS	8.6	10.3	13.5	10.8d
TS/SD	12.3	17.8	23.7	17.9b
Means	11.1	15.0	20.8	

Means with different letter(s) in the same column are significantly different at $p \leq 0.05$ using Duncan's multiple range test

Table 3: Number of leaves of *D. edulis* seedlings as affected by different planting media

	WAP/ No. of leaves			
Planting media	3	6	9	Means
TS	6.2	7.9	10.3	8.1a
SD	4.6	5.4	6.2	5.4c
SS	3.2	3.9	4.5	3.9d
TS/SD	5.7	6.3	9.0	7.0b
Means	4.9	5.9	7.5	

Means with different letter(s) in the same column are significantly different at $p \leq 0.05$ using Duncan's multiple range test

Table 4: Leaf area (cm^2) of *D. edulis* seedlings as influenced by different planting media

	WAP/leaf area			
Planting media	3	6	9	Means
TS	34.6	54.4	76.8	82.3a
SD	22.4	32.6	40.5	31.8c
SS	19.4	22.5	28.2	23.4d
TS/SD	29.8	46.7	60.3	45.6b
Means	26.6	39.1	51.5	

Means with different letter(s) in the same column are significantly different at $p \leq 0.05$ using Duncan's multiple range test

Table 5: Collar diameter (cm) of *D. edulis* seedlings as affected by different planting media

	WAP/collar diameter			
Planting media	3	6	9	Means
TS	1.1	2.2	2.8	2.0a
SD	0.5	0.7	1.0	0.7c
SS	0.3	0.5	0.8	0.5d
TS/SD	0.7	1.5	1.8	1.3b
Means	0.7	1.2	1.6	

Means with different letter(s) in the same column are significantly different at $p \leq 0.05$ using Duncan's multiple range test

in TS at 9 WAP while seedlings exposed to SS had 13.5 cm as plant height at 9 WAP. The number of leaves, leaf area and collar diameter followed the same trend as that observed for plant height (Table 3-5), respectively.

The observed significant higher germination percentage of *D. edulis* seedlings sown in sharp sand could be attributed in part to the greater porosity when compared to the other media consequent upon the greater spaces for air and water, which are the basic conditions for seed germination. Although sharp sand is poor in nutrients Epstein (1972) and Isirimal *et al.* (2003) maintained that they are ideal for seed germination as the germinating embryos depend on stored nutrients within the seed for their initial growth and other metabolic activities. This finding is similar to earlier reports by Duguma *et al.* (1985) on *Leucaena leucocephala* seeds and Awodola (2002) and Otegbeye and Momodu (1994) on *Parkia biglobos* seeds who noted higher germination in seeds grown in sharp soils than in top soils. Similarly, Owonubi *et al.* (2005) recorded fairly good germination for *Azadirachta indica* seeds planted in sharp soils. Bradbeer (1988) also reported that seed dormancy could be reduced by planting in different growth media thereby improving its germination.

The significant differences in the performance of *D. edulis* seedlings planted in the top garden soil relative to the other media indicated that top soils contain both macro and micro nutrients required by plants for their normal growth and developmental activities as seedlings after germination have been shown by Gill *et al.* (1986) to depend heavily on nutrients in the soil.

CONCLUSION

This study has established that the germination and seedling growth of *Dacryodes edulis* are significantly affected by planting media. While seeds sown in sharp sand had the highest germination percentage, top garden soil favoured the performance of the seedlings after germination. Sharp sand is therefore recommended to farmers during germination but the seedlings should be transferred to top soil after germination in order to get the required nutrients for normal activities.

REFERENCES

Agbogidi, O.M. and O.R. Ejemete, 2005. An assessment of the effects of crude oil pollution on soil properties, germination and growth of *Gambaya albida* (L.). Uniswa Res. J. Agric. Sci. Technol., 8: 148-155.

Agbogidi, O.M. and A.U. Ofuoku, 2005. Response of sour sop (*Annona muricata* Linn.) to crude oil levels. J. Sustainable Trop. Agric. Res., 16: 98-102.

Agbogidi, O.M. and O.F. Eshegbeyi, 2006. Performance of *Dacryodes edulis* (Don. G. Lam. H.J.) seeds and seedlings in a crude oil contaminated soil. J. Sustainable For., 22: 1-14.

Asaba Metrological Station, 2006. National Meteorological Report. In: Meteorological Bulletin 2006, Lagos, Nigeria.

Awodola, A.M., 1994. Aspect of germination in seeds of African locus bean tree (*Parkia biglobosa*) (Jacq) Bemth. J. Trop. For. Res., 10: 82-91.

Ayuk, E.T., B. Duguma, S. Franzel and J. Kengue, 1999. Uses, management and economic potential of *Dacryodes edulis* (Burseracase) in the humid lowlands of Cameroun. Econ. Bot., 53: 292-301.

Bankens, O.N. and P. Okolie, 1993. Nutritional constituents of the seeds of African pear (*Dacryodes edulis*). Food Chem., 46: 297-299.

Bradbeer, J.W., 1988. Seed Dormancy and Germination. 1st Edn., Blackie and Sons Ltd., London.

Dalziel, J.M., 1987. The Useful Plants of West Tropical Africa. Longman Publishers, UK.

Duguma, B.B., T. Kang and D.U.U. Okali, 1988. Factors affecting germination in *Leucaena leucocephala* seeds. Sci. Technol., 16: 489-500.

Embiri, L.C. and M.I. Nwofo, 1990. Effect of fruit type and storage treatments on biodeterioration of African pear (*Dacryodes edulis* G. Don H. J. Lam). Int. Biodeterioration, 26: 43-50.

Epstein, E., 1972. Mineral Nutrition of Plants: Principle and Perspectives. John Wiley, New York.

Gill, L.S., J.R. Jegede and S.W. Hassine, 1986. Studies on the seed germination of *Acacia farnesiana* (L.) Wild Leguminoseae. Nig. J. Weed Sci., 3: 11-15.

Isirimah, A.O., A.A. Dickson and C. Igwe, 2003. Introductory soil chemistry and biology. Osia Publishers Ltd, Diobu. Port. Harcourt., pp: 187.

Leakey, R.R.B. and D.O. Ladipo, 1996. Trading on genetic variation-fruits of *Dacryodes edulis*. Agrofor. Today, 8: 16-17.

Leakey, R.R.B., 1999. Farmers Top Priority: Fruit tress. Agroforestry Today. Published by ICRAF, Nariobi.

Nwoboshi, L.C., 2000. The nutrients factor in sustainable forestry University Press, Ibadan.

Onuegbu, N.C., 2000. Effect of Different Pre-Treatment Methods on Storage of African Pear (*Dacryodes edulis* G. Don. H.I. Lam.). In: Nkama, I., V.A. Jideani and J.A. Ayo (Eds.), Proceedings of the 24th Annual Conference of Nigeria Institute of Food Science andTechnology (NIFST) Held in Bauchi, Bauchi State, between 20 and 24th November, 2000, pp: 197-198.

Otegbeye, G.O. and A.B. Momodu, 2002. Preliminary study of germination technique for the seeds of *Parkia biglobosa*. J. Agric. Environ., 3: 405-409.

Owonubi, J.J., G.O. Otegbeye and C. Nwokedi, 2005. Development of Pre-Germination Investigation. In: Popoola, L., P. Mfon and P.I. Oni (Eds.), Proceedings of the 30th Annual Conference of the FAN Held in Kaduna, Kaduna State, Nigeria Between 7 and 11th November, 2005, pp: 497-505.

Statistical Analytical System (SAS), 1996. User's Guide. Statistics Version 5, SAS Institute Inc. Raleigh, NY, USA., 1996.

Youmbi, E., M.T. Cerceau-Larrival, A.M. Verbille and M.C. Carbonnier-Jarreau, 1998. Germination of *Dacryodes edulis* (Burseraceae): Parameters for optimal germination. Grana, 37: 87-92.