Global Journal of Research in Agriculture & Life Sciences
ISSN: 2583-4576 (Online)
Volume 03| Issue 04 | July-Aug. | 2023
Journal homepage: https://gjrpublication.com/gjrals/

ResearchArticle

Effect of Seed Treatment on Germination and Early Seedling Growth of African Pear (Dacryodes edulis (G. Don). H.J. Lam)

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DOI: 10.5281/zenodo.8226447 **Submission Date: 10 July 2023 | Published Date: 09 Aug. 2023**

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Abstract

This experiment was carried out at the Teaching and Research Farm of Imo State University, Owerri to evaluate the effect of pre-sowing seed treatment on germination and early seedling growth of African Pear (Dacryodes edulis (G. Don) H.J. Lam). The design used was Complete Randomized Design (C.R.D) with four (4) treatments and fifteen (15) replications. The four treatments were boiled H2O at 1000C (for 3 minutes), roasting in hot ash at 1000C (for 3 minutes), removal of mesocarp and an untreated (control). A total of sixty (60) African pear fruits were used, 15 fruits per treatment. They were sown after treatment in 60 polybags each containing 6 kg topsoil. Data on germination and early seedling growth parameters were collected. Seedling root length, height and leaf area were also recorded ten weeks after sowing. The analysis of data revealed that the highest germination percentage of 86.64%, significantly different ($P<0.05$) from all others was obtained from the seeds without mesocarp. The highest number of days to 50% germination was 17.2 days recorded from the control treatment and this differed significantly ($P<0.05$) from others. Removal of fruit mesocarp before planting (T4) gave both the largest mean seedling leaf area of 45.18cm2 and tallest seedlings of 14.10cm, significantly different ($P<0.05$) from all others at 10 weeks after planting. Planting of seeds of African pear without mesocarp was recommended.

Key Words: African pear, seed treatment, germination, seedling growth.

INTRODUCTION

The genus Dacryodes Vahl belongs to the family Burceraceae and has over fifty (50) species. Some economically important members of this genus includes: D. exelsa (Vahl) and D. hexandra (Griseb), both of which are of great value in lumber forestry. Dacryodes edulis (G. Don) H.J. Lam) commonly called African pear or bush butter in English, Saphubaum in German and sofoutier or safou in French is a very important food supplement in Nigeria and some other parts of West and Central Africa. It is normally consumed in combination with fresh maize (Zea mays L.) or baked cassava (Manihot spp.) during the hunger periods, following the planting of major food crops (Okorie et al., 2000; Okorie, 2001). In Southeastern Nigeria, the trees are grown around home steads and are protected in nearby forests. It normally flowers between January to April and the major fruiting season is between May and October (Emebiri and Nwufo, 1990; Kengue and Nyagatchuo, 1990).

The chemical composition, nutritional and industrial potentials of both the seeds and pulp of African pear (D. edulis (G. Don) H.J. Lam) fruit types have been documented (Okorie et al., 2006; Bassey, 1982; Silou, 1991). Despite the

nutritional and industrial potentials of this endangered tree species, certain factors have made the propagation and perpetuation of desirable variants of African pear particularly very difficult. The seeds loose viability very quickly and can be stored for only a few days (Kengue et al., 1994). The species produce mostly one seed per fruit (unlike most other fruit species) seriously limiting the availability of planting materials. In addition, there is a high incidence of parthenocarpicity, mostly within the large and late maturing fruit types.

Early attempts to propagate the African pear vegetatively did not succeed (Okafor, 1983; Okorie et al., 2000). In later years, it has been possible to propagate the species vegetatively using air layering or rooting hormones (Silou, 1996; Okorie et al., 2001). These methods are however cumbersome and time consuming requiring some technical skills. The above factors, in addition to seasonality and high cost of the fruits have aggravated the propagation constraints in African pear. The objective of this study is to evaluate the effects of seed treatment on the germination and early seedling growth of this tree species.

Materials of Methods

The experiment was conducted at the Teaching and Research Farm of Imo State University, Owerri. The experiment was laid out in a Complete Randomized Design (C.R.D.), with four treatments and fifteen (15) replications. The treatments were as follows: (i) Untreated fruits (T¬¬1), (ii) Soaking in boiled water – 1000C (T2), (iii) Roasting in hot ash (T3) and (iv) Removal of Mesocarp (T¬4). The boiling water was brought down from the stove and 15 fruits of African pear were dropped inside the boiled water (1000C) and covered. They were then removed after 3 minutes. The hot ash treatment involved roasting another set of 15 fruits in hot ash for 3 minutes. In the removal of mesocarp treatment (T4), care was taken not to scatter or damage the cotyledons of the seeds. The untreated fruits (T1) served as the control.

After the treatments, the seeds were planted in sixty polybags measuring 25.5cm to 26.5cm containing top soil weighing 10kg each. The polybags were arranged under a shade. One seed was planted in each polybag. The planting dept was 5cm. watering was carried immediately after planting and subsequently once every 2 days.

The statistical methods used for data analysis were completely randomized design in Statgraphics 16.0 package. Means were separated using the Duncan's New Multiple Range Test (DNMRT). Percentage was calculated where appropriate following the produce described by Snedecor and Cochran, (1980).

Results and Discussion

The effect of treatments on number of days to 50% germination and germination percentage are presented on Tables 1 and 2; respectively. The removal of mesocarp (T4) gave both the highest percentage germination of 86.64% and the lowest mean number of days to 50% germination of 5.6 days significantly different ($P<0.05$) from all others. The untreated fruits (seeds), that is (T¬1) gave both the lowest germination percentage of 39.96% and the highest number of days to 50% germination of 17.2 days, significantly different ($P<0.05$) from all others (Tables 1 and 2).

Similarly, the removal of fruit mesocarp before planting (T¬4) gave both the largest mean seedling leaf area of 45.18cm2 and tallest seedlings of 14.10cm, significantly different ($P<0.05$) from all others at 10 weeks after planting (Tables 3 and 4), while the control treatment (T¬1¬) produced the seedlings with the lowest mean leaf area value of 18.03cm2 significantly different ($P<0.05$) from all others. Seeds planted after the fruits have been soaked in boiled water for 3 minutes (T2) produced the shortest seedlings significantly different ($P<0.05$) from all others at 10 weeks after planting (Tables 3 and 4).

Soaking of seeds in boiled water for 3 minutes (T¬2) or roasting in hot ash for 3 minutes produced no significance difference ($P<0.05$) in the mean root length of the seedlings at 10 weeks after planting. The mean seedling root length values for T2 and T3 were 11.38cm and 11.90cm, respectively (Table 5). Removal of fruit mesocarp (T4) gave the longest mean root length of seedlings at 10 weeks after planting significantly different from all others.

Pre-sowing seed treatment had significant effect on germination percentage and the seeds mesocarp attained significantly ($P<0.05$) the highest value, while the untreated seeds had the least germination percentage. This finding is in agreement with that reported by Clement, (1990) that seeds without mesocarp responded more positively to the environmental conditions than others.

The number of days to 50% germination was also influenced by seed treatment. The untreated seeds took more days (17. 2 days) to germinate, while the seeds without mesocarp took the least (5.6 days) to germinate. The result indicates that the seeds without mesocarp absorbed water faster than other seeds which might lead to quicker activation of enzymes in the seeds. The present result is in agreement with Leaky, (2002) that African pear seeds with any pre-sowing treatment normally germinate between 12 to 14 days resulting in early seed germination. The reason might also be due to easy emergence of plumules and radicles (Leaky et al., 2002).

Differences in seedling root length at 10 weeks after sowing were observed among the seeds. This finding might be due to early water imbibitions by removed mesocarp seeds which hastened the physiological reactions in seed germination, thereby leading to more root elongation (Okafor, 1983). The mean value of seedling height obtained from seeds without mesocarp was higher than others, while the least was recorded from the untreated seeds. This indicates that quick activation of enzymes occurred in seeds without mesocarp because of fast water imbibitions resulted to faster seedling shoot elongation.

In terms of leaf area, the same trend was applicable similar to that of the seedling height. The seeds that were treated with hot

ash and boiled water might have been affected physiologically by heat stress thereby causing reduction in the rate of leaf formation (Leaky et al., 2002).

Summary and Recommendation

African pear (D. edulis (G. Don) H.J. Lam) is a very important economic fruit tree with pomological, ecological, pharmacological and industrial potentials. The rapid loss in the genetic diversity of this species needs to be checked by using the best propagation methods. Among the seed treatments and early seedling growth parameters monitored, the removal of mesocarp produced the best results and this is therefore recommended.

Table 1: Effects of fruit treatment on number of days to 50% germination in African pear (Dacryodes edulis (G. Don). H.J. Lam)

Treatment	Number of days to 50% germination
T_1 - Control seeds	17.2^{a*}
T_2 – Soaked in boiled water for 3 minutes	15.4^{b}
T_3 – Roasted in hot ash for 3 minutes	12.0^{c}
T_4 - Removal of mesocarp (pulp)	5.6^{d}

Table 2: Effect of seed treatment on germination percentage of African pear (Dacryodes edulis (G. Don). H.J. Lam)

Treatment	Germination
T_1	39.96^{d*}
T_2	46.62^{c}
T_3	66.62^{b}
T_4	86.64^{a}

Table 3: Effect of seed treatment on mean leaf area of African pear seedlings at 10 weeks after planting

Treatment	Leaf Area (cm)
T_1	18.03^{d*}
T_2	20.04^{c}
T_3	25.12^{b}
T_4	45.18^{a}

Table 4: Effect of seed treatment on African pear seedling height at 10 weeks after planting

Treatment	Leaf Area (cm)
T_1	11.40^{c*}
T_2	9.90^{d}
T_3	12.70^{b}
T_4	14.10^{a}

Table 5: Effect of seed treatment on seedling root length of African pear at 10 weeks after planting

Treatment	Root length (cm)
T_1 - Control seeds	8.70^{c*}
T_2 – Soaked in boiled water for 3 minutes	11.38^{b}
T_3 – Roasted in hot ash for 3 minutes	11.90^{b}
T_4 - Removal of mesocarp (pulp)	13.40^{a}

***Means on the same column followed by the same letters are not significantly (P<0.05) different.**

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CITE AS
Nwagbaraocha, N. T., Okorie, H.A., Njoku T.C., & Nwagbaraocha, M. (2023). Effect of Seed Treatment on Germination and Early Seedling Growth of African Pear (Dacryodes edulis (G. Don). H.J. Lam). Global Journal of Research in Agriculture & Life Sciences, 3(4), 15–18. https://doi.org/10.5281/zenodo.8226447