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Influence of Scarification on Germination and Early Seedling Establishment in Date Palm (*Phoenix dactylifera*) in Benue Nigeria

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Abstract

The Study was conducted at the nursery of the Teaching and Research Farm Joseph Sarwun Taker University (JOSTUM), Makurdi, Nigeria. The objectives of the study were to evaluate the effect of different seed treatment on seed germination characteristics and seedling establishment of two date varieties. Factorial combination of four seed treatments (compost, hot water, H₂SO₄, and control) and three varieties (Ajwah, and Deglenurr) were laid in a Complete Randomized Block Design replicated three times. Data were collected on Seed area(mm), Seed length(mm), Seed diameter(mm), 100 seed weight(g), Germination (%), plant height, stem diameter and number of leaves at 4 – 12 weeks after planting other parameters taken are Leaf Length (LL), Leaf area(LA), Net assimilation rate(NAR), Chlorophyll content(CC). All data collected will be subjected to analysis of variance (ANOVA), while least significant difference (LSD) at 5% level of probability is used in separating means. Results revealed significant difference ($P<0.05$) in seed characteristics, and other parameters measured with Degletnur variety had the highest in seed characteristics (seed area (9.24), seed length (22.02), seed diameter (17.82), 100-seed weight (22.12) and germination % (90.02). On scarification methods compost scarification had the tallest (25.21), seed diameter (8.60), number of leaves (6.53), leave length (23.11), leaf area (24.00), net assimilation rate (4.21) and chlorophylls content (29.04). Degletnur variety out performed Ajwah in all the parameter measured such as plant height (25.32), seed diameter (7.02), number of leaves

(6.23), leave length (22.24), leaf area (23.02), net assimilation rate (4.82) and chlorophylls content (29.11). The study revealed that breaking dormancy with compost material is effective and Degletnur variety of date palm gave the highest germination parameters and early plant establishments. It can be therefore be recommended that date palm farmers use compost in breaking dormancy for early seed germination characteristics and seedling establishment in the tropics and the adoption of Degletnur variety.

Keywords: scarification, germination, seedlings and varieties

Introduction

The date palm (*Phoenix dactylifera* L.) is a significant agricultural crop, particularly in arid and semi-arid regions, valued for its nutritional, economic, and cultural importance. Known for its resilience and adaptability, the date palm thrives in harsh climates, providing essential sustenance and income to millions of people worldwide. (Mahmoudi *et al.*, 2008). The cultivation of date palms dates back thousands of years, and they are often referred to as "the tree of life" in many cultures due to their various uses, including food, shelter, and traditional medicine. One of the challenges in date palm propagation is seed dormancy, a physiological state that prevents seeds from germinating even under favorable environmental conditions. Dormancy is a crucial survival mechanism that ensures seeds remain viable until conditions are optimal for growth. In date palms, dormancy can be influenced by various factors, including seed coat structure, hormonal balance, and environmental cues such as temperature and moisture. (Amy, 2010)

Understanding the mechanisms of seed dormancy is vital for improving germination rates and enhancing propagation techniques. Effective seed treatment methods, such as scarification and soaking, can break dormancy and promote successful germination, which is essential for the establishment of healthy seedlings in nursery settings. As the demand for date palms continues to rise due to their economic and nutritional benefits, research focused on overcoming seed dormancy becomes increasingly important. By optimizing seed treatment strategies, growers can ensure better establishment and growth of date palm seedlings, thereby supporting sustainable agricultural practices and food security in date-producing regions (Walid and Richard, 2003). Breaking seed dormancy using advanced technologies involves several innovative techniques that enhance germination rates. Here are some of the most effective methods: Seed Priming

Hydropriming: Soaking seeds in water for a specific period allows them to imbibe moisture without germinating. This pre-conditioning can enhance metabolic activity and hasten germination once planted. **Osmopriming:** Involves soaking seeds in a solution of osmotic agents (like polyethylene glycol) to control water uptake. This method can improve seed vigor and reduce dormancy. **Mechanical Scarification:** Using precision tools to physically alter the seed coat can promote water absorption and initiate germination. Techniques include laser cutting or sandblasting to create small openings in the seed coat. **Chemical Treatments;**

Hormonal Treatments: Application of growth hormones such as gibberellins can promote germination by breaking dormancy. Hormones can be applied through soaking seeds or as foliar sprays on seedlings. **Acid Treatments:** Soaking seeds in mild acid solutions (like H₂SO₄) can weaken the seed coat, facilitating germination. **Thermal Treatments;** **Controlled Heat:** Exposing

seeds to specific temperature regimes can mimic natural seasonal changes and help in breaking dormancy. (Danlingi *et al.*, 2022). **Techniques include** hot water treatments or controlled thermal cycling. **Biotechnology Approaches;** **Genetic Engineering:** Modifying specific genes associated with dormancy can create varieties with reduced dormancy. **CRISPR** and other gene-editing technologies can be used to target and modify genes controlling dormancy traits. **Tissue Culture:** In vitro techniques allow for the propagation of seedlings without the dormancy issue, bypassing the seed stage entirely. **Nanotechnology;** **Nanoparticle Coatings:** Utilizing nanoparticles to enhance seed treatments can improve nutrient uptake and promote germination by affecting the seed's physiological processes. **Smart Agriculture Technologies;** **Precision Agriculture:** Using sensors and data analytics to monitor environmental conditions can help determine the optimal time and method for seed treatments, ensuring successful germination. By integrating these advanced technologies, researchers and growers can develop effective strategies to overcome seed dormancy in date palms and other crops, improving germination rates and seedling establishment. This not only enhances agricultural productivity but also supports sustainable farming practices. Idowu and Samuel (2019)

Date palms (*Phoenix dactylifera*) are cultivated globally, with numerous varieties adapted to different climates and preferences. Here are some of the most notable varieties: **Medjool:** Large, sweet, and chewy fruits, highly sought after for their flavour, High in fiber, vitamins, and minerals, making them a nutritious snack, Good storage capabilities, extending their marketability. **Deglet Noor:** Semi-dry fruit with a mild flavor, popular for its versatility in culinary uses, High sugar content and excellent texture, making it ideal for baking and cooking, Good resistance to pests and diseases, ensuring better yields. **Ajwah:** Known for its unique flavor and health benefits, including high antioxidant content, Traditionally prized in Middle Eastern cultures, enhancing market value, Soft texture and rich in nutrients, making it a popular choice for consumption. **Barhi:** Enjoyed fresh or dried; has a sweet, caramel-like flavour, Can be eaten in various stages of ripeness, increasing its market appeal, Good for cultivation in diverse climatic conditions. **Khadrawy:** Soft and sweet fruits, often considered a delicacy, High moisture content makes it ideal for fresh consumption. **Adaptable** to different soil types, enhancing its cultivation prospects **Sefri:** Known for its high yield and resistance to harsh conditions, Medium-sized, sweet fruits that are popular in regional markets, Thrives in arid environments, making it suitable for desert agriculture. **Zahidi:** Harder texture with a unique nutty flavor, ideal for processing into various products, High fiber content and nutritional value, making it a healthy option. Good storage life, allowing for extended market availability. Okunlola *et al* (2019) The diverse varieties of date palms each offer unique advantages, catering to different consumer preferences and

agricultural conditions. By selecting appropriate varieties, growers can optimize yields, enhance marketability, and meet the nutritional needs of consumers, thereby contributing to sustainable agricultural practices and economic growth in date-producing regions Okunlola et al (2019).

MATERIAL AND METHODS

This study was conducted in 2023 at the nursery of the Teaching and Research farm of the Department of Crop production of Joseph Sarwun Taker University Makurdi (JOSTUM), Benue State, Nigeria. Makurdi is located on Lat. 7.410N and Long. 8.280E and 97m above the sea level, a tropical region falls within the Southern Guinea Savannah Agro-Ecological zone of Nigeria. The objectives of the study were to evaluate the effect of different seed treatment on seed germination characteristics and seedling establishment of two date varieties. Factorial combination of four seed treatments (compost, hot water, H₂SO₄, and control) and three varieties (Ajwah, and Deglenurr) were laid in a Complete Randomized Block Design replicated three times. Data were collected on Seed area(mm), Seed length(mm), Seed diameter(mm), 100 seed weight(g), Germination (%), plant height, stem diameter and number of leaves at 4 – 12 weeks after planting other parameters taken are Leaf Length (LL), Leaf area (LA), Net assimilation rate (NAR), Chlorophyll content (CC). During the experiment, the seeds were kept in paper bags at room temperature (22 ± 2°C). From where each variety, seeds were characterised for physical parameters (area, seed length and diameter). The germination was

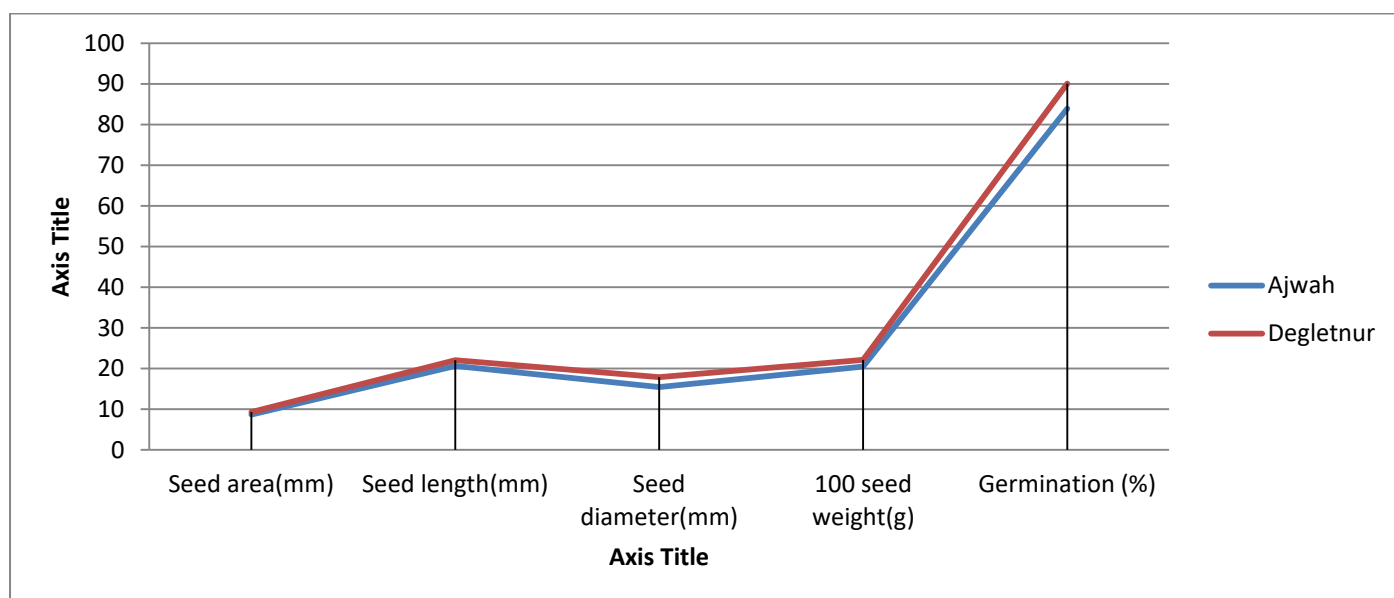
recorded on a daily basis from 2 to 14 days from sowing. Seeds were considered germinated when the radicle was at least 2 mm long, before germination seeds were placed in their respective treatment such as; compost where the seeds are placed in compost made from rice husk, rice straw and poultry dropping generating heat to break the dormancy for 3 days, hot water; hot water at 100°C was poured on the seeds for 30 minutes from where it was test for germination, For the acid treatment, seeds of date palm were soaked in a beaker for 30 minutes in a dilution of 5 ml of sulphuric acid in 1 litre of water before planting. Garden soil was mixed with manure (poultry droppings) in a ratio 3:1 to improve the soil nutrients. The mixed soil was filled into the polythene bags and was regularly watered for 7 days before the seeds were planted. The control seeds were sown without pre-planting treatment. The experimental set-up were watered daily. Weeding was done manually by hand-picking. The following data were collected during the study: germination percentage (divide the number of seeds germinated by the total seeds planted then multiply by 100), seed diameter (vener calliper), number of leaves (counted), leaf length (used meter ruler), leaf area (used leaf area meter), net assimilation rate ($E = (1/L_A) (dW/dt)$) and chlorophylls content (used a chlorophylls meter). All data collected will be subjected to analysis of variance (ANOVA), while least significant difference (LSD) at 5% level of probability is used in separating means at 5% level of significance.).

Result and Discussion

Table 1: Seed characteristics of two varieties of date and scarification methods (area, length, diameter, 100-seed weight and germination)

Varieties	Seed area(mm)	Seed length(mm)	Seed diameter(mm)	100 seed weight(g)	Germination (%)
Ajwah	8.62	20.63	15.40	20.45	83.91
Degletnur	9.24	22.02	17.82	22.12	90.02
F-LSD (0.05)	0.78	1.11	1.23	1.68	0.30

LSD= Least Significant Differences at 5% Level of Probability,



This study evaluates the seed characteristics and germination rates of two date palm varieties: Ajwah and Degletnur. Measurements were taken for seed area, seed length, seed diameter, and 100-seed weight, along with germination percentages. The Ajwah variety exhibited a seed area of 8.62 mm², a seed length of 20.63 mm, a seed diameter of 15.40 mm, and a 100-seed weight of 20.45 g, with a germination rate of 83.91%. In contrast, Degletnur showed superior metrics with a seed area of 9.24 mm², a seed length of 22.02 mm, a seed diameter of 17.82 mm, and a 100-seed weight of 22.12 g, achieving a germination rate of 90.02% this is similar with the finding of (Labouriau 1983a) who stated that the global

germination process is constituted by three partial processes, including the imbibition, the activation process, and intra-seminal growth that is completed with embryo protrusion. Nazifi et al., (2024) reported that variation between varieties could also be linked the genetic make-up and seeds inherent characters. Akinyemi et al., (2024) reported seeds vigor and effective germination is associated to the amount of stored food in the endosperm which is associated to seed area, length and diameter. Statistical analysis using Fisher's Least Significant Difference (F-LSD) at a 0.05 level indicated significant differences between the two varieties across all measured parameters, underscoring the potential of Degletnur as a more viable option for cultivation. These findings contribute to the understanding of seed quality in date palms and inform agricultural practices for optimizing germination and growth.

Table 2: Plant Height (PH) as affected by Scarification methods and Varieties in the Nursery

Varieties	4	6	8	10	12
Ajwaha	8.23	10.99	12.34	17.92	22.21
Degletnur	9.00	12.00	14.96	19.23	25.32
F-LSD (0.05)	1.21	1.65	1.32	2.00	2.02
Scarification Methods					
H2SO4	6.32	9.21	13.11	15.23	20.23
Hot water	7.34	10.12	13.89	16.00	22.32
Compost	8.21	11.21	14.23	18.21	25.21
Control	5.93	7.43	9.01	11.23	15.90
F-LSD (0.05)	1.02	1.31	0.23	2.28	2.20
Interaction					
VXS	NS	NS	NS	NS	NS

LSD= Least Significant Differences at 5% Level of Probability,

This study investigates the effects of various scarification methods and date palm varieties on plant height (PH) in a nursery setting. Two date palm varieties, Ajwaha and Degletnur, were subjected to five growth intervals (4, 6, 8, 10, and 12 weeks) alongside four scarification treatments: compost, hot water, H2SO4, and a control group. Statistical analysis using Fisher's Least Significant Difference (F-LSD) at 0.05 ($P < 0.05$) level confirmed significant differences in plant height across varieties and treatments indicating that both the choice of variety and scarification method are critical for optimizing growth in date palms. Results indicate that the Degletnur variety consistently exhibited taller plants compared to Ajwaha, reaching a maximum of 25.32 cm at 12 weeks, while Ajwaha reached 22.21 cm. Degletnur outperformed Ajwaha variety could be attributed to varietal difference as reported by the finding of Kimura and Islam (2012) Who reported that variety differ in their response to germination, plant height and early plant establishment due to some factors as seeds coat and water imbibition duration which varies with variety. Among the scarification methods, compost recorded the highest plant heights,

particularly at the 12-week mark, where it reached 25.21 cm, followed by hot water at 22.32 cm. The control group showed the least growth, with a maximum height of 15.90 cm, this could be linked to the facts that compost generate heat which could have broken the dormancy in the seeds leading to taller plant than the other treatments in all the weeks under consideration, this accession is confirmed with the finding of Madina et al., (2023) who reported that compost generate heat that can break dormancy and is cheaper where every farmer can do at home than the other treatment used, in contracts with these finding of (Northcutt *et al.*, 2012; Purohit, 2015) who reported treatment of seeds with concentrated sulphuric acid was found to induce the highest germination rate. This could largely be attributed to the influence of the acid that acted on the seed coat. This also may have penetrated the seed coat and triggered chemical compounds causing early germination. These findings in this work provide valuable insights for horticultural practices aimed at enhancing the growth performance of date palm seedlings and early establishment.

Table 3: Stem Diameter SD (mm) of Dates Seedlings as Affected by Seed Treatment in the Nursery

Varieties	4	6	8	10	12
Ajwaha	2.62	3.63	4.00	5.23	6.91
Degletnur	3.24	4.02	5.82	6.01	7.02
F-LSD (0.05)	0.08	0.11	0.23	0.28	0.30
Scarification Methods					
H2SO4	2.00	3.80	5.00	6.41	7.11
Hot water	3.23	4.21	5.87	6.21	7.12
Compost	3.89	5.00	6.43	7.21	8.60

Control	1.23	2.32	3.54	4.65	5.89
F-LSD (0.05)	0.08	0.11	0.23	0.28	0.30
Interaction					
VXS	NS	NS	NS	NS	NS

LSD= Least Significant Differences at 5% Level of Probability,

This study evaluates the impact of seed treatment methods on stem diameter (SD) of date palm seedlings in a nursery environment. Two date palm varieties, Ajwah and Degletnur, were assessed across five growth intervals (4, 6, 8, 10, and 12 weeks) under four scarification treatments: compost, hot water, H₂SO₄, and a control. Results demonstrated that the Degletnur variety consistently achieved greater stem diameters compared to Ajwah, with a maximum measurement of 7.02 mm at 12 weeks, while Ajwah reached 6.91 mm, this could be related to genetic make-up and growing condition favouring Degletnur than Ajwah variety, this work agrees with the finding of Zirar (2010) who attributed variety variability to inherent character and growing environmental conditions. Among the scarification methods, compost treatment produced the largest stem diameters, peaking at 8.60 mm, followed closely by hot water at 7.12 mm. The control group exhibited the smallest growth, with a maximum stem diameter of 5.89 mm this could be linked to the facts that compost produce moderate heat that could soften dormancy and trigger chemical reaction leading

to secretion of some hormones like cytokines and gibberellins which regulate shoot elongation through cell growth this finding is in agreement with the report of Iyong et al., (2024) where they reported that composting can generate heat that can break dormancy leading to early plant establishment considering seed size, seed diameter and seed length as reported in (table 1), the result in these research is a par with the finding of (Arias et al. 2018) starting that seedling growth parameters gradually decreased with increasing NaCl and H₂SO₄ concentration, this is a common occurrence for plants under salt stress condition affecting cell division, steam diameter and early plant establishment. Statistical analysis using Fisher's Least Significant Difference (F-LSD) at a 0.05 level revealed significant differences in stem diameter across both varieties and treatments, indicating the importance of seed treatment methods in promoting optimal growth of date palm seedlings. These findings provide crucial insights for horticultural practices aimed at improving seedling development in date palms.

Table 4: Number of Leaves (NL) of Dates Seedling as Affected by Seed Treatment methods and Date Varieties in the Nursery

Varieties	4	6	8	10	12
Ajwah	2.02	2.83	3.00	4.34	5.01
Degletnur	2.24	3.62	4.82	5.90	6.23
F-LSD (0.05)	0.08	0.11	0.23	0.28	0.30
Scarification Methods					
H ₂ SO ₄	2.40	2.03	3.23	4.41	5.00
Hot water	2.12	2.45	3.01	5.00	5.65
Compost	2.54	3.01	4.01	5.43	6.53
Control	2.00	2.53	3.12	2.62	3.21
F-LSD (0.05)	0.08	0.11	0.23	0.28	0.30
Interaction					
VXS	NS	NS	NS	NS	*

LSD= Least Significant Differences at 5% Level of Probability

This study investigates the effects of seed treatment methods and date palm varieties on the number of leaves (NL) in seedlings during nursery growth. Two date varieties, Ajwah and Degletnur, were analyzed over five growth intervals (4, 6, 8, 10, and 12 weeks) under four scarification treatments: compost, hot water, H₂SO₄, and a control group. Statistical analysis using Fisher's Least Significant Difference (F-LSD) at a 0.05 level indicated significant differences in leaf count across varieties and treatments, highlighting the importance of both seed treatment methods and variety selection in enhancing leaf development of date palm seedlings. Results revealed that the Degletnur variety consistently produced a greater number of leaves compared to Ajwah, achieving a maximum of 6.23 leaves at 12 weeks, while Ajwah reached 5.01 leaves, this can be attributed to soft seed coat when

compared with Ajwah and probably its inherent genetic make up and metabolic activities that aid in leaf initiation and growth as reported by Oh et al (2011). Among the treatments, compost exhibited the most significant effect, with the highest leaf count of 6.53 at 12 weeks, followed by hot water at 5.65 leaves. The control treatment showed the least leaf development, with a maximum of only 3.21 leaves, this finding is in conformity with the work of Madina et al (2022) who reported that compost scarification aid in fast germination and have led to leaf ignition due to useful microbial activity, he also added that the microbiome in fermented sawdust and other decompose plant residual affect leaves formation in young plants. Mohammed (2018) also reported that seeds of plants with hard seed coat that had passed through the guts of animals were found to germinate and established faster than

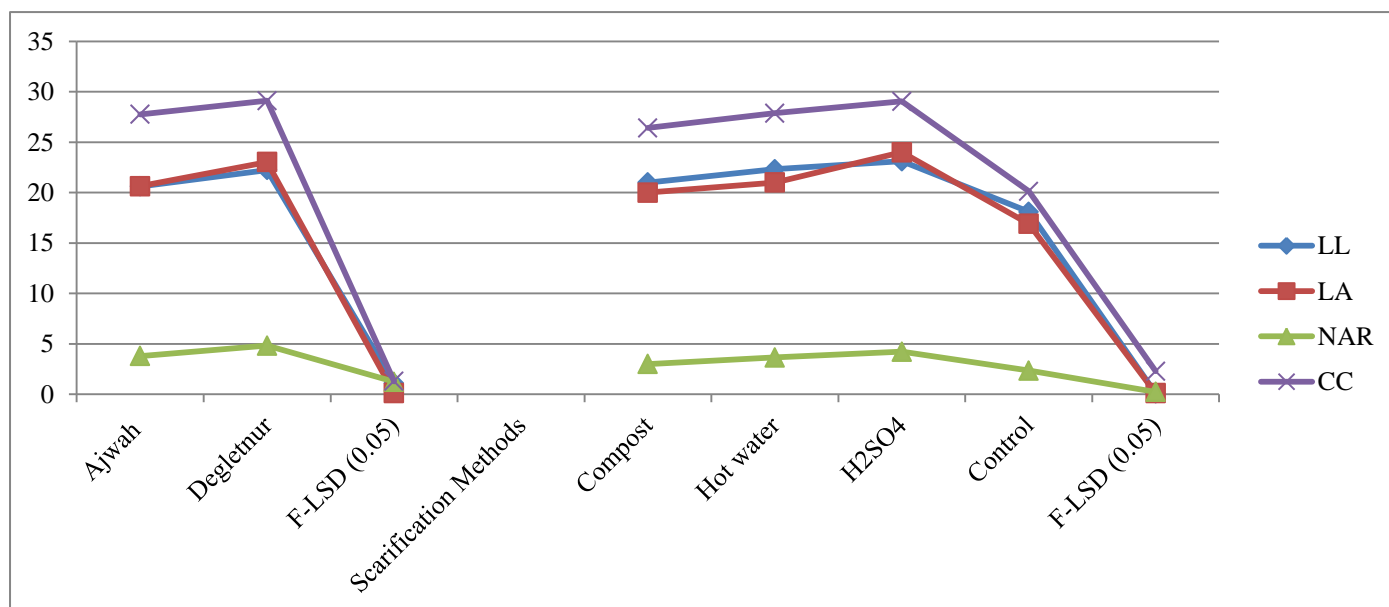
those that lie in the ground. These findings in this work provide valuable insights for improving nursery practices aimed at

optimizing early seedling establishment and growth

Table 5: Leaf Length (LL), Leaf area(LA), Net assimilation rate(NAR), Chlorophyll content(CC) of Dates Seedling as affected by Seed Treatment and Varieties in the Nursery

Varieties	LL	LA	NAR	CC
Ajwah	20.62	20.63	3.78	27.76
Degletnur	22.24	23.02	4.82	29.11
F-LSD (0.05)	1.08	0.11	1.23	1.28
Scarification Methods				
H2SO4	21.00	20.00	3.00	26.41
Hot water	22.32	21.00	3.65	27.87
Compost	23.11	24.00	4.21	29.04
Control	18.09	16.90	2.34	20.12
F-LSD (0.05)	0.08	0.11	0.23	2.28
Interaction				
VXS	*	*	NS	*

LSD= Least Significant Differences at 5% Level of Probability



This study examines the effects of seed treatment methods and date palm varieties on various growth parameters of seedlings, specifically leaf length (LL), leaf area (LA), net assimilation rate (NAR), and chlorophyll content (CC). Two date varieties, Ajwah and Degletnur, were evaluated under four scarification treatments: compost, hot water, H2SO4, and a control group. Statistical analysis using Fisher's Least Significant Difference (F-LSD) at a 0.05 level revealed significant differences in growth metrics between treatments and varieties, underscoring the critical role of seed treatment methods and variety selection in enhancing the growth performance of date palm seedlings. Results indicated that Degletnur outperformed Ajwah across all parameters, recording a maximum leaf length of 22.24 mm, leaf area of 23.02 mm², NAR of 4.82 mg cm⁻² day⁻¹, and chlorophyll content of 29.11 µg g⁻¹, this could be related to planting depth, genetic make-up and environmental conditions and cultural practice, these work collaborate with the work of Basu and Mukhernice (2000) who

reported that genetic make-up, leaf arrangement solar radiation, planting depth and nutrients absorption affects photosynthetic activities in relation to leaf length, leaf area, net assimilation rate, and chlorophyll content. Among the treatments, compost proved most effective, yielding a leaf length of 23.11 mm, leaf area of 24.00 mm², NAR of 4.21 mg cm⁻² day⁻¹, and CC of 29.04 µg g⁻¹. The control group exhibited the lowest values across all parameters, with a leaf length of 18.09 mm and a CC of only 20.12 µg g⁻¹. These findings provide essential insights for optimizing nursery practices aimed at improving seedling quality agreeing to the facts that leaf length, leaf area, net assimilation rate, and chlorophyll content and highly influence by, seed size, seed diameter and early germination as collaborated in the finding of Baskin and Baskin (2004) who added that nutrient availability through-out the plant growth cycle and ability for nutrients absorption is a key factor for early plant growth and over all yield. Johnson (2011) and Al-Mssallem et al (2013) in his work reported that Leaf Length, Leaf area, Net assimilation rate, Chlorophyll

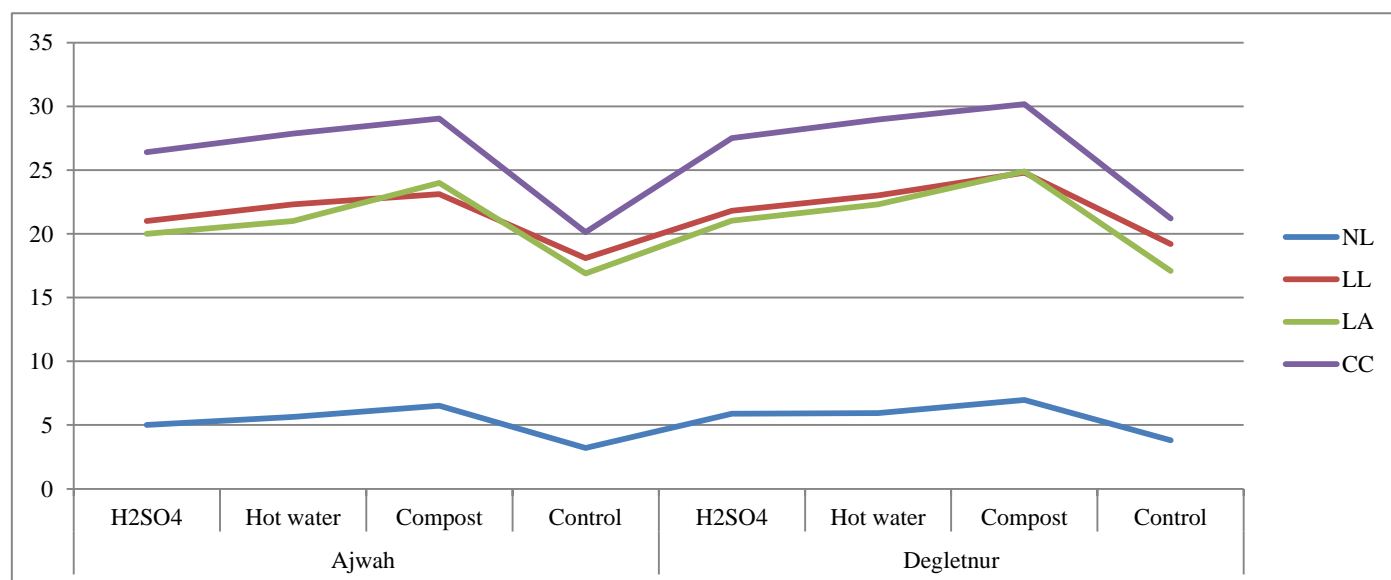
content in plants plays a viral role is solar radiation interception and in converting it to produce energy for physiological, metabolic and reproductive activities, he added that for all of this to happen it

has to start from effective germination and the use for nursery media.

Table 6 Interaction between variety and scarification methods on number of leaf, leaf length, leaf area and chlorophyll content of date palm in Makurdi, Nigeria

Varieties	Scarification Methods	NL	LL	LA	CC
Ajwah	H2SO4	5.00	21.00	20.00	26.41
	Hot water	5.65	22.32	21.00	27.87
	Compost	6.53	23.11	24.00	29.04
	Control	3.21	18.09	16.90	20.12
Degletnur	H2SO4	5.90	21.80	21.04	27.52
	Hot water	5.95	23.02	22.32	28.97
	Compost	6.98	24.81	24.90	30.18
	Control	3.81	19.19	17.10	21.21
F-LSD (0.05)		0.10	0.16	0.18	2.14

LSD= Least Significant Differences at 5% Level of Probability **NL**= number of leaf, **LL**= leaf length, **LA**= leaf area and **CC**= chlorophyll content



This study examines the interaction between date palm varieties and scarification methods on key growth parameters in Makurdi, Nigeria. Two varieties, Ajwah and Degletnur, were subjected to four scarification treatments: H2SO4, hot water, compost, and a control group. Measurements were taken for the number of leaves (NL), leaf length (LL), leaf area (LA), and chlorophyll content (CC). Statistical analysis using Fisher's Least Significant Difference (F-LSD) revealed significant differences at the 5% level, underscoring the effectiveness of scarification methods in optimizing growth. Results indicated that compost treatment significantly enhanced all measured parameters, with Ajwah exhibiting a maximum leaf area of 24.00 cm² and chlorophyll content of 29.04. Degletnur also benefited from compost, achieving a leaf area of 24.90 cm² and chlorophyll content of 30.18. In contrast, control treatments consistently produced the lowest values across all parameters. This can be trace form seed size, seed length and germination percentage that could have led to vigor is early plant establishment as reported by Junaik et al., (2012) who stated that seeds viability, seed vigor, seed size and

amount of stored food in the seeds couple with scarification method that can trigger germination. In addition he added that soil nursery media influences number of leaves, leaf length, leaf area and chlorophyll content leading to early plant establishment and over all yield. These findings suggest that the choice of scarification method, particularly compost application, plays a critical role in enhancing the growth and health of date palms, with implications for agricultural practices in similar climates. Eche,et al., (2020)

Conclusion

The study reveal significant difference in both variety and scarification methods under consideration, however compost scarification was found most effective in breaking dormancy in date palms which consistently supersede in all the parameters and weeks under consideration, the study also revealed that seed size, seed length, seed diameter affect germination positively with high value for the germination and early plant establishment. Among the varieties, Degletnur supersede all the varieties under consideration in all the parameters measured. This study therefore recommended

farmers in the study area to plant Degletnur variety and use compost for early seedling establishment, the use of hot treatment is also recommended since is easy and fast to use to break dormancy is data palm seeds.

REFERENCES

1. Akinyemi B. K., Obute J. O. and Madina P.(2024) Growth and Yield Response of Okra (*Abelmoschus esculentus* L.) to Organic Manures and their effect on Postharvest in Makurdi, Benue state, Nigeria. Research Journal of Pure Science and Technology E-ISSN 2579-0536 P-ISSN 2695-2696 Vol 7. No. 1 2024 www.iiardjournals.org (Online Version)
2. Arias, S., Pire, C., Ferrer, J. and Bonete, M.J. (2018) Identification of *Phoenix dactylifera* L. varieties based on amplified fragment length polymorphism (AFLP) markers. *Cellular and Molecular Biology Letter*, 8(4): 891– 899.
3. Al-Mssallem, I., Hu, S., Zhang, X. and Dada, U.W. (2013). Genome sequence of the date palm *Phoenix dactylifera* L. National Conference of horticulture, pp: 274-292.
4. Amy, R. (2010). How long will it take a date palm tree seed to germinate? Retrieved from <http://homeguides.sfgate.com/long-date-palm-tree-seedgerminate-44206.html> (12 march 2017).
5. Basu, U. and Mukhernice, S. H. (2000). The effects of various treatments on the germination of important leguminous shrub-tree species on the cultivate of Oman. Seed Science and Technology conference, Pp: 691 – 699.
6. Baskin J. M. and Baskin, C. C. (2004). A classification system for seed dormancy. *Seed Science Research journal* 14, 1- 16. Black, M. H. and Halmer, P. (2006). The Encyclopedia of Seeds. Science, Technology and uses Wallingford, Macmilian Publishers, pp: 231-345.
7. Danlingi H. G, Odiaka N. I., Ugehe F. D. and Madina P. Effects Of Scarification On Emergence and Growth of Date Palm (*Phoenix Dactylifera*) in Makurdi, Southern Guinea Savannah *Fudma Journal of Sciences (FJS) ISSN online: 2616-1370 ISSN print: 2645 – 2944 Vol. 6 No. 1, March, 2022, pp 240 – 246 DOI: <https://doi.org/10.33003/fjs-2022-0601-894>*
8. Eche, C.O., Oluwatayo J.I., Esang, D.M., Madina, P. Uloko, A. (2020) Antilelmintic Effect of sawdust mixed with Eucalyptus Biohar on Plant Parasite Namatodes associated with Beniseed (*Sesamun Indicum* L.) in Makurdi. *Nigria Journal of Namatology*, vol. 5, 2020. ISSN: 2545-5362. www.nijon.org. pp 9-18
9. Idowu, B.F. and Samuel, O.A. (2019). Cocoa growth and development under different nursery and field conditions. In technology open conference, pp:80-90 Junisk, T. P., M. J. Hill & Margot E. H. Johnston (2021). "I. Acid Treatment and mechanical scarification". *New Zealand Journal of Experimental Agriculture*.3:81–84
10. Iyough, D. D., Madina, P., and Siki M. D. (2024) The Effect of Concentration Rate and Variety on the Mortality of Weevils (*Callosobruchus maculatus*) in stored Cowpea at Makurdi, Benue State, Nigeria. Research Journal of Pure Science and Technology E-ISSN 2579-0536 P-ISSN 2695-2696 Vol 7. No. 1 2024 www.iiardjournals.org (Online Version).
11. Johnson, D.V. (2011). Introduction: date palm biotechnology from theory to practice. In: Jain, S.M., Johnson, D.V. and Alkhayri, J.M. (Eds). Springer Science +Business media B.
12. Junaik G.S., Malik K.L., Amber G.R. and Islam E.Y. (2012) Germination in vitro, micropropagation and cryogenic storage for three rare pitcher plants. *Sarracenia oreophila* Raf and *S. purpurea* spp. Venosa (Raf) Wherry. *Journal of Horticultural Science* 47(1): 74 – 80.
13. Kimura, E. and Islam, M.A. (2012). Seed scarification methods and their use in forage legumes. *Research Journal of Seed science*, Vol.2: 120-122. <http://scialert.net/fulltextmobile/doi=rjss.2012.38.50>.
14. Labouriar, M., (1983a). Heat-treatment and germination of oil palm seeds (*Elaeis guineensis*). *Journal of Seed Science*, 35(3): 296–301.
15. Madina P, Michael O. A. and Iyough, D. D (2021) Productivity of cabbage (*Brassica oleracea* L.) as affected by organic manure and varieties grown in Jos Plateau State, Nigeria. *Journal of Agricultural Science and Food Technology* Vol. 9 (1), pp. 1-5, January 2023
16. Madina, P, Esang, D. M. and Yunusa A. (2023). Effect of Variety and Organic Manure on the Growth and Yield of Pepper Grown in Makurdi Benue State, Nigeria. *International Journal of Agriculture and Earth Science (IJAES)* E-ISSN 2489-0081 P-ISSN 2695-1894 Vol 9. No. 7 2023 www.iiardjournals.org
17. Mahamoudi, H., G. Hosseininia, H. Azadi and M. Fatemi Ndubizu, T. O. C (2008) Enhancing date palm processing, marketing and pest control through organic culture. *Journal of organic systems*. 3(2): 29-39
18. Mohammed, M. T. (2018). The effect of Prawnning and artificial dormancy breaking techniques on germination and seedling establishment of date palm. *Research and Review: Journal of biology*. 6: (3)13 – 17.
19. Nazifi, M.I., Madina, P., and Imrana, B. Z. (2024) Production of Roselle (*Hibiscus sabdariffa* L.) as Influenced by density and fertilizer rate in Kano State, Nigeria. *International Journal of Agriculture and Earth Science (IJAES)* E-ISSN 2489-0081 P-ISSN 2695-1894 Vol 10. No. 3 2024 www.iiardjournals.org (Online Version)
20. Northcutt, M., Lima W.A.A., de Figueiredo A.F., Atroch A.L., Lopes R., da Cunha R.N.V. and Teixeira P.C. (2013). Heat-treatment and germination of oil palm seeds (*Elaeis guineensis*). *Journal of Seed Science*, 35(3): 296–301.
21. Oh, S. J., Shin, P. G., Weon, H. Y., Chon, G. H. (2003). Effect of fermented sawdust on *Pleurotus* Spawn. *Microbiology Journal* 31(1): 46 – 49.
22. Okunlola, A. I., Adebayo, R. A. and Orimogunye, A. D. (2019). Methods of breaking seed dormancy on germination and early seedling growth of African locust bean (*Parkia biglobosa*). *Journal of Horticulture and Forestry*, 3(1): 1 – 6.
23. Purohitt, S., Nandi, S. K., Palni, L. M. S., Giri, L. and Bhatt, A. (2015). Effect of sulphoric acid treatment on breaking hard seedcoat dormancy and subsequent seedling establishment in *Zanthoxylum armatum* DC: An endangered medicinal plant of the Himalayan region. *Journal of academic Science*, 38(4): 301 – 304.

24. Walid, G.T. and Richard, N.W. (2003) Seed behaviour in *Phoenix reclinata* Jacquin, the wild date palm. *Seed Science Research*, 14(2): 197-204
25. Zirari A., (2010). Effects of Time of Pollination and of Pollen Source on Yield and Fruit Quality of 'Najda' Date Palm Cultivar (*Phoenix dactylifera* L.) horticultural conference (2009), Pp: 89–94.