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EFFECTS OF SCARIFICATION ON EMERGENCE AND GROWTH OF DATE PALM (*Phoenix dactylifera*) IN MAKURDI, SOUTHERN GUINEA SAVANNAH

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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 and seedling establishment of some date varieties. Factorial combination of five seed treatments (hot water, cold water, H_2SO_4, moist sawdust and control) and three varieties (Ajwah, Matinal, and Deglenurr) were laid in a Complete Randomized Block Design replicated three times. Data were collected on Germination Percentage, plant height, leaf width, stem girth and number of leaves at 4 – 18 weeks after planting. Data were subjected to two way analysis of variance (ANOVA) and means separation by Duncan Multiple Range Test (DMRT) at 5% level of significance. Results revealed that sawdust scarification had the highest average germination percentage of 83.20%, plant height (43.91 cm), leaf width (1.96 mm), leaf length (25.17 cm), stem diameter (14.12 mm) and number of leaves (4.50). The results further showed that Degletnur variety had the highest germination percentage of 81.04%, plant height of 25.38cm, stem diameter (7.74 mm) and number of leaf (3.83) at the end of the study. The study revealed that breaking dormancy with sawdust material is effective and Degletnur variety of date palm gave the highest growth parameter so also 2021 season gave the highest in all the parameters considered. Therefore scarification using sawdust should be adopted in breaking dormancy in date's palm with Degletnur variety.

Keywords: Date palm, Scarification, Varieties and Growth

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) a member of the family *Arecaceace* (Palmae) is a key plantation crop of many countries of arid regions of West Asia and North Africa. Almost every part of the plant is used for food or industrial products. Dates are produced in the hot arid regions of the world and marketed world-wide as high value confectionary (Mahmoudi *et al.*, 2008). Date palm (*Phoenix dactylifera* L.) is believed to have been introduced in Nigeria in the early 8th century by Arab traders from North Africa. Date fruit called "Dabino" in Hausa is a highly valued delicacy among many communities in Nigeria, particular the Northern part of the country. The fruits are especially used during marriage/naming ceremonies, Sallah/Durbar festivals and during breaking of fast among the Muslim faithfuls. Despite the tremendous benefits that can be derived from growing *Phoenix dactylifera*, it's cultivation in Nigeria has continued to be a challenge because of the difficulty of its establishment using seeds. Reports have shown that most palm seeds have a poor record of germination success. Whereas, viable date palm seeds can germinate between 14 and 21 days in ideal conditions, healthy date seeds may take as much as 100 days to germinate (Amy, 2010), because of dormancy problems. Seed dormancy is defined as nature's way of setting a time clock that allows seeds to initiate germination when conditions are normally favorable for germination and establishment of the seedlings (Baskin, 2004). Viable seed that do not germinate are said to be dormant. Therefore, dormancy is a mechanism plants used to prevent germination during unsuitable conditions, that is, when the probability of seedling survival is low (Black and Hadmen, 2006). Date palms can take 4 to 8 years after planting before they will bear fruit and start producing viable yields for commercial harvest between 7 and 10 years. Mature date palms can produce 150-300 1b (70 – 140kg) of dates per harvest season. They do not all ripe at the same time so several harvests are required. To obtain fruit of marketable quality, the bunch of dates must be thinned and bagged or covered before ripening so that the remaining fruits grow larger and are protected from weather and animals such as birds, that also like to eat them (Walid and Richard, 2003). Despite the advantages that the country has in the production of dates due to the presence of conducive environmental/climatic conditions and the capacity of the crop to provide income, raw materials, food and foreign exchange earnings for the country, the production of date palm in Nigeria especially in the Southern Guinea Savannah is neglected talk less of establishing a date plantation in the area. Ndubizu (1982) states that Nigerian population and economic growth is increasing which calls for high demand in date fruits, if the demand is higher than supply to meet up with the demand is needed. Most date fruits are gotten from the female plants, however, the male plants are more than the female plants and unfortunately one cannot identify the female seeds and plants until flowering. Female plants are needed more than the males because they bear the fruits. Unfortunately, the seed sprouts in two to five months, this delays the fruits production. The objectives of the study were to evaluate the effect of different seed treatment on seed germination and seedling establishment of some date varieties in the study area.

MATERIAL AND METHODS

This study was conducted in April, 2020 and 2021 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. 7.41^0N and Long. 8.28^0E and 97m above the sea level. The area falls within the Southern Guinea Savannah Agro-Ecological zone of Nigeria. The date seeds used in this experiment were obtained from the Nigeria Oil palm Research Institute (NIFOR) Date palm Sub-Station, Jigawa State. The date varieties are Ajwah, Degletnur and Matinal. The Sulpheric acid was sourced from the Chemistry Laboratory of the Federal Polytechnic Mubi, Adamawa State while polythene bags were procured from Kaduna main market. The design used in conducting the study was a Complete Randomized Design in a factorial arrangement replicated three (3) times with the date varieties serving as the main plot treatment while the H_2SO_4 acid, Hot water, Cold water, Sawdust served as the sub plot treatments while control (seeds were not treated).Top soil samples collected at the depth of 30cm from Federal University of Agriculture Makurdi was mixed with manure (dried cow dung) 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. Cleaned seeds of three varieties of date palm were soaked in cold water for 24hours and hot water for 15 minutes in a beaker labeled respectively before planting. For the acid treatment, seeds of date palm were soaked in a beaker for 20 minutes in a dilution of 5 mil of sulfuric acid in 1litre of water before planting, moist sawdust was used for 24 hours before planting. The control seeds were sown without pre-planting treatment. A minimum of fifteen (15) seeds of each of the three varieties of date palm was planted in each polythene bags. A total of six hundred and seventy five polythene bags was used. The experimental set up and were watered daily. Weeding was done by hand-picking of the weeds. The following data were collected during the study: average germination percentage. Plant height (cm) at two (2) weeks after emergence (WAE), number of leaves per plant at 2 weeks after emergence (WAE). leaf length (cm) at 2 weeks after emergence (WAE), leaf breadth (mm) at 2 after emergence (WAE), stem diameter (mm) at 2 after emergence (WAE),.

Statistical Analysis

All data collected were subjected to analysis of variance using Genstat. A two way analysis of variance (ANOVA) and means separated by Duncan Multiple Range Test (DMRT).

RESULTS AND DISCURSION

Table one (1) is effects of scarification methods and average percentage emergence of date palm at Makurdi in 2020 and 2021, the result shows significant difference ($P < 0.05$) in both scarification method and varieties on the average percentage emergence, with the use of sawdust recording the highest in emergence percentage (83.29%) when compared with other scarification method, followed by sulfuric acid (79.27%), hot water (68.14%) with control having the least (56.29%), this could be attributed to the fact that moist sawdust under goes decomposition thereby leading to break dormancy, this finding is in line with the work of Amy (2010) who stated that moist sawdust aid in early emergence due to its ability to break seed dormancy he also added that of germination success of most palm seeds is poor, while viable seeds can germinate within 14 – 21 days under ideal conditions but shorter with moist sawdust.

On varieties the use of Degletnur outperformed the other varieties used on emergence percentage (81.04%), this could be attributed to the fact that the variety under consideration had soft seed coat due to its fast germination and probably genetic makeup. This finding is corraborated by the work of Capenter (1993) who reported that the ability of a seed to emerge basically tied up in seed coat, water, temperature, oxygen, medium, seed viability and genetic make-up. High emergence percentage was recorded in 2020 season (85.23%) when compared with 2021 season (73.91%) as reported in this finding, which could be link to temperature, media preparation, relative humidity as reported by the finding of Baskin and Baskin (2004)

Table 2 is an interaction between scarification method and variety on the percentage emergence of date palm in Makurdi. The result shows significant difference ($P<0.05$) where a perfect interaction existed between scarification method and variety, where the combination of sawdust and Deglemur gave the highest emergence percentage when compared with other treatment, this is not far from the fact that germination media, seed coat, and environmental factor has caused it, FAOSTAT (2009) agrees to the above accretion stating that, temperature, seed coat, relative humidity, germination media affect seed germination and plant growth at early stage which later translate to yield.

Table1. The effects of scarification and varieties on emergence percentage of date palm in 2020 and 2021.

Treatments	**Average Percentage Emergence**
Scarification Methods	**APE (%)**
Cold water	67.75%^{C}
Hot water	68.14^b
Sawdust	83.29^a
H_2SO_4	79.27^b
Control	56.29^d
F-LSD(0.05)	2.23
Varieties	**APG (%)**
Ajwah	69.48^b
Degletnur	81.04^a
Matinal	67.78^c
Mean	72.76
F-LSD(0.05)	1.82
Season	

2020	85.23[a]
2021	73.91[b]
F-LSD(0.05)	5.23
Interaction	**
MxV	

Means having the same superscript in a column are not significantly different (P ≤ 0.05)

Table 2: Interaction between the scarification methods and variety on emergence percentage (%) of Date seeds in Makurdi

	Varieties		
	Ajwah	Degletmur	Matina
Cold water	24.59[a]	18.71[d]	15.96[c]
Hot water	23.06[b]	19.43[c]	11.04[d]
Sawdust	19.94[d]	27.19[a]	22.74[b]
H_2SO_4	20.53[c]	25.19[b]	15.96[c]
Control	23.06[b]	22.57[c]	23.48[a]
F-LSD (0.05)	0.12	0.18	0.01

Means having same superscript letter in a column are not significantly different (P ≤ 0.05)

Results on effects of scarification methods and varieties on plant height are presented in Table 3. The result showed significant different (P<0.05) on the scarification methods and variety, on scarification method, sawdust had the highest plant height, followed by sulfuric acid while the least height was recorded in control plots in all weeks in consideration. The heat generated during the decomposition of the sawdust as plays a role in hastening the softening of the hard date seed coat. This study is in agreement with the work of Solomon (2002) who reported that enzymes of actinomyces play significant role in the decomposition and fermentation of sawdust softening the seed coat, breaking dormancy and leading to early emergence which eventually affect plant height. (Oli et al., 2003) reported that sawdust fermentation changes the microbial community inhibiting pathogenic microbes' growth, enhancing the optimal biological and mechanical sawdust conditions for plant germination and seedling growth physiology.

On variety, Dehletnur outperformed the other varieties in plant height, followed by Ajwah, Matinal and control having the least, this 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 over-all yield. On season 2020 had taller plant when compared to 2021, this difference can be linked to seasonal climatic factors thereby affecting plant height as reported by Idowu and Samuel (2019)

Table 3: Plant Height (ph) as affected by Scarification methods and Varieties in the Nursery

Treatment	**Weeks After Planting**							
Method	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**
Cold water	23.96[a]	24.59[c]	23.91[d]	24.62[c]	29.26[b]	30.96[b]	34.96[c]	34.96[c]
Hot water	23.34[a]	23.97[d]	24.37[b]	28.58[b]	29.44[b]	30.34[b]	32.28[d]	34.28[b]
Sawdust	25.91[a]	27.00[a]	29.95[a]	31.31[a]	32.08[a]	33.91[a]	38.98[a]	43.91[a]
Control	20.91[a]	21.46[b]	22.96[c]	23.41c	24.64[d]	25.03[c]	25.84[bc]	29.84[d]
H_2SO_4	25.88[a]	21.76[b]	22.63[c]	22.82[d]	28.43[c]	30.88[b]	35.88[b]	36.88[b]
F-LSD(0.05)	0.84	0.76	0.72	0.94	1.46	0.84	0.82	0.82
Varieties								
Ajwah	25.00[a]	25.49[a]	26.30[a]	27.99[b]	28.01[c]	27.00[a]	28.08[c]	28.90[c]
Degletnurr	24.96[a]	25.49[a]	26.54[a]	27.20[a]	29.19[a]	30.96[a]	31.96[a]	32.96[a]
Matinal	24.03[a]	24.79[b]	25.46[b]	26.37[b]	27.72[b]	28.03[b]	28.96[b]	29.95[b]
F-LSD(0.05)	0.81	10.03	0.32	0.98	1.13	1.96	2.76	3.11
2020	25.78[a]	25.67[a]	27.34[a]	30.34[a]	31.32[a]	32.78[a]	34.23[a]	35.32[a]
2021	24.78[b]	24.21[b]	25.12[b]	29.23[b]	30.12[b]	31.87[b]	33.21[b]	34.11[b]
F-LSD(0.05)	0.91	0.87	1.00	0.99	0.67	0.98	0.64	0.78
Interaction								
M x V	NS	NS	NS	NS	NS	NS	NS	NS

Means having the same superscript in a column are not significantly different (P ≤ 0.05)

Means effect of scarification methods and date varieties on stem diameter of date seedlings is presented in Table 4. Results showed gradual increase in the means during the period of the studies in both scarification method and variety, on scarification method, the results showed scarification differences (P<0.05) between the scarification methods however, sawdust was found to have recorded increase in stem diameter (25.91-43.91mm) from 1st to 18th weeks after

planting, followed by sulfuric acid (25.88 – 36.88mm) with control having the least (20.91-29.84mm). This is not far from the fact that fermentation; decomposition might have led to fast release of nutrient thereby leading not only plant height but also increase in stem diameter, this work is collaborated with the finding of Solomon (2002) who not only reported the need for decomposed nutrient source in plant growth but also reported that decomposition of organic manure like sawdust have tremendously increased stem diameter plant height and fruits, seeds and nut (overall yield).

On effects of variety on stem diameter the result revealed no significant different (P>0.05), however Degletnur variety was found to record a higher stem diameter from 1st to 18th weeks after planting with (4.96 - 32.96mm), followed by Matinal stem diameter from 1st to 18th weeks after planting with (24.03 – 29.95mm), while variety Ajwah recorded the high in 4-12 weeks after planting (25.00 - 27.99mm) and least stem diameter in 13-18 weeks after planting (28.01 - 28.90mm). This work is in agreement with the finding of Mohammed (2018) who reported that dormancy breaking methods, storage period, environments and seed viability has significant role in early growth and developments of seedlings.

On season 2020 had wider steam diameter (25.78 – 35.32mm) than 2020 with (24.78 – 34.11mm), this true due to the facts climate changes affects not only the environment but also plant and its physiological activities, which steam diameter is one as reported by the work of Zaid and de Wet (2002b)

Table 4: Stem Diameter SD (mm) of Dates Seedlings as Affected by Seed Treatment in the Nursery

Treatment	**Weeks After Planting**							
Method	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**
Cold water	3.02^{d}	4.04^{c}	4.32^{d}	4.79^{c}	4.96^{d}	5.02^{c}	5.02^{c}	5.09^{c}
Hot water	3.47^{c}	4.60^{b}	4.79^{b}	4.96^{b}	5.62^{c}	6.47^{b}	6.47^{b}	7.47^{ab}
Sawdust	4.18^{a}	4.96^{a}	3.42^{a}	5.59^{a}	6.87^{a}	9.18^{a}	9.82^{a}	14.12^{d}
Control	2.24^{e}	3.02^{d}	3.44^{e}	3.75^{e}	3.93^{e}	4.24^{d}	4.89^{d}	5.19^{b}
H_2SO_4	3.91^{b}	4.00^{e}	4.48^{c}	4.73^{d}	5.68^{b}	6.92^{ab}	7.02^{ab}	7.72^{a}
F-LSD(0.05)	0.16	0.16	0.09	0.14	1.13	1.16	2.16	3.16
Varieties								
Ajwah	3.98^{a}	4.00^{a}	4.33^{b}	4.52^{b}	4.89^{b}	5.98^{b}	6.08^{b}	6.98^{b}
Degletnurr	3.77^{b}	3.86^{b}	4.35^{a}	4.63^{a}	5.73^{a}	6.77^{a}	6.94^{a}	7.74^{a}
Matinal	3.15^{c}	3.76^{c7}	4.23^{c}	4.12^{c}	4.82^{c}	5.15^{c}	5.42^{c}	5.72^{c}
Season								
2020	4.00^{a}	4.67^{a}	4.89^{a}	5.34^{a}	6.00^{a}	7.34^{a}	8.93^{a}	10.90^{a}
2021	3.83^{b}	3.99^{b}	4.00^{b}	4.34^{b}	4.93^{b}	5.67^{b}	7.00^{b}	9.56^{b}
F-LSD(0.05)	0.23	0.45	0.12	0.89	1.03	1.23	1.00	1.01
Interaction								
M x V	NS	NS	NS	NS	NS	NS	NS	NS

Means having the same superscript in a column are not significantly different ($P \leq 0.05$)

Results on effects of scarification methods and different varieties of dates on number of leaves is presented on Table 5. Results revealed no significant difference (P<0.05) between the scarification methods and date varieties, were sawdust scarification having the highest followed by sulfuric acid with control having the least Purohitt el al (2015) assayed that the microbiome in fermented sawdust can affect leaves formation in seedling growth. 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. Similarly scarification with H_2SO_4 in the study was also significant and thus could be attributed to the influence of the acid that acted on the seed coat by penetration, thus inhibiting the chemical compound causing dormancy. These observations are similar with the studies of Northcutt et al (2012); Puwhit, (2015) and Mohammed et al., (2019). The variable response of the other scarification methods (hot water and cold water) in this study could be due to the removal or softening of the cuticle of the seeds as was observed by Okunlola et al (2019) when breaking dormancy using hot water and cold water in *Parkia biglobosa* during their study. Similarly, deglenur variety was found to have the highest plant leaves followed by matinal and Ajwah, this can be attributed to the genetic makeup of the variety when compared with the varieties under consideration as reported by Oh et al (2011) on season 2020 had higher number of leaves when compared with 2021 which could be as a result of media composition, temperature, relative humidity and varietal difference as reported by Zirari (2010)

Table 5: Number of Leaves (NL) of Dates Seedling as Affected by Seed Treatment methods and Date Varieties in the Nursery

Methods	**Weeks After Planting**							
	4	**6**	**8**	**10**	**12**	**14**	**16**	**18**
Cold W	2.50^{a}	2.48^{c}	2.97^{b}	3.00^{b}	3.20^{b}	3.50^{b}	3.58^{b}	3.75^{c}
Hot W	2.44^{b}	2.60^{b}	2.81^{c}	2.90^{c}	3.13^{c}	3.21^{c}	3.21^{c}	3.43^{d}
Sawdust	2.50^{a}	2.73^{a}	3.30^{a}	3.40^{a}	3.80^{a}	3.95^{a}	4.50^{a}	4.50^{a}
Control	2.33^{c}	2.47^{ab}	2.60^{d}	2.81^{d}	2.90^{d}	3.04^{d}	3.19^{d}	3.39^{e}
H_2SO_4	2.33^{c}	2.72^{ab}	3.20^{ab}	3.31^{b}	3.42^{b}	3.83^{b}	4.33^{b}	4.33^{b}
F-LSD(0.05)	0.12	0.194	0.23	022	0.76	0.12	0.13	0.130
Variety								

Ajwah	2.00[c]	2.13[b]	2.40[b]	2.40[b]	2.63[c]	2.67[c]	2.81[c]	2.96[b]
Degleneur	2.33[a]	2.73[a]	3.00[a]	3.20[a]	3.49[a]	3.49[a]	3.63[a]	2.83[c]
Matinal	2.10[b]	2.13[b]	2.04[b]	2.30[c]	3.00[b]	3.15[b]	3.47[b]	3.47[a]
F-LSD(0.05)	0.100	0.073	0.19	0.171	0.23	0.100	0.101	0.101
Season								
2020	2.76[a]	2.89[a]	3.34[a]	3.52[a]	3.71[a]	3.87[a]	4.00[a]	4.21[a]
2021	2.01[b]	2.34[b]	3.01[b]	3.12[b]	3.23[b]	3.45[b]	3.71[b]	3.89[b]
F-LSD(0.05)	0.02	0.09	0.03	0.05	0.03	0.04	0.05	0.06
Interaction								
M x V	NS	NS	*	NS		NS	NS	NS

Means having the same superscript in a column are not significantly different (P ≤ 0.05)

Table 6 is the interaction between scarification and variety on number of leaves of seedlings grown in Makurdi, where significant difference (P<0.05) with perfect combination between sawdust and Degletnur which could be attributed to treated with sawdust might be due to the fermentation and decomposition effects of the sawdust which releases heats and some substrates such as tanins and saponins which helps in softening the seed cuticle of seeds thereby making the seeds to germinate early thus giving them a head start over in terms of plant height and number of leaves couple with varietal difference found in Degletnur having softer seadcoat when compared to the rest of the variety under consideration as reported by Junaik et al (2021)

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Table 6: Interaction between scarification methods and varieties on number of leaves of seedlings grown in Makurdi

Method	**Varieties**		
	Ajwah	**Degletmur**	**Matina**
Cold water	2.00[c]	2.32[b]	2.50[b]
Hot water	2.00[c]	2.00[e]	2.00[d]
Sawdust	2.33[a]	2.17[d]	2.51[a]
H2SO4	2.17[b]	2.33[a]	2.17[c]
Control	2.17[b]	2.30[c]	2.00[e]
F-LSD(0.05)	0.10	0.13	0.21

Means having the same superscript are not significantly different (P ≤ 0.05)

Leaves Length (LL) of Date Seedlings as Affected by Varieties and Scarification Methods.

Table 7 presents the results on effects of varieties and scarification methods on leave length of some date seedlings. Results revealed significant differences (P<0.05) between the scarification methods and variety, with Sulfuric acid having the longest leaf length followed by cold water scarification while the least leaf length was recorded in control, this could as a result of chemical reaction, leading to increase in leave length, the above accretion is supported by the work of Covy et al (2016) who reported that chemical reaction affect plant growth via their hormones either positive or negative. On the performance of the varieties, results showed significant differences (P<0.05) in their performances however Ajiwah was observed to obtained the longest leaf length, followed by Deglenur while the least leaf length was recorded against matinal. This is not far from the fact that plant genetic makeup has great effects on leaf length, Al-Sakran and Muneer (2006) Lend support to this finding starting that most difference observed in plant varieties are primarily influenced by genetic makeup and environmental factors. On season, 2020 season had wider leave length that 2021 season this is not far from the fact media composition, decomposition and also climatic changes as reported by Johnson (2011).

Table 7: Leaf Length (LL) of Dates Seedling as affected by Seed Treatment and Varieties in the Nursery

Methods	**Weeks After Planting**							
	4	**6**	**8**	**10**	**12**	**14**	**16**	**18**
Cold Water	22.24[ab]	22.43[ab]	22.65[b]	22.85[bc]	29.139[a]	22.24[c]	23.24[c]	22.24[d]
Hot Water	22.00[b]	22.19[ab]	22.43[bc]	27.61[c]	22.9[c]	23.00[b]	23.43[b]	23.63[b]
Sawdust	21.17[d]	21.97[c]	22.33[bc]	22.82[c]	23.77[ab]	23.97[a]	24.77[a]	25.17[a]
Control	20.93[c]	21.13[c]	21.64[c]	21.88[c]	21.99[d]	22.13[d]	22.87[d]	22.87[c]
H_2SO_4	22.35[a]	22.79[a]	23.24[a]	23.01[b]	23.37[ab]	22.85[c]	22.95[d]	24.85[ab]
F-LSD(0.05)	0.59	0.63	0.012	0.808	0.081	0.57	0.57[a]	0.57[a]
Varieties								
Ajwah	22.66[a]	22.30[b]	23.11[b]	23.83[a]	23.83[b]	23.99[b]	22.36[c]	24.66[b]
Degleneur	22.38[b]	22.53[a]	23.23[a]	23.80[b]	23.99[a]	24.38[a]	24.79[a]	25.38[a]
Matinal	21.68[c]	21.97[c]	22.17[c]	22.96[b]	22.96[b]	23.18[c]	23.60[b]	23.98[c]
F-LSD(0.05)	0.42	0.45	0.09	0.26	0.37	0.46	0.44	0.44

Season								
2020	22.42a	22.67[a]	22.87[a]	23.23[a]	23.45[a]	23.78[a]	24.12[a]	24.43[a]
2021	21.54[b]	21.67[b]	21.87[b]	22.00[b]	22.12[b]	22.63[b]	23.00[b]	23.21[b]
F-LSD(0.05)	0.54	0.41	0.52	0.65	0.72	0.81	0.89	0.91
Interaction								
M x V	NS	NS	NS	NS	NS	NS	NS	NS

Means having the same superscript letters in a column are not significantly different (P ≤ 0.05)

Leave Breadth (LB) of Date Seedlings as Affected by Seed Scarification Method and Varieties.

Results on effects of seed treatment methods and date varieties on leaf breath is presented in Table 8. Results showed significant differences (P<0.05) between scarification method and variety, sawdust was observed to relatively have the widest breath, followed by cold water. Junisk et al (2021) had earlier observed higher biomass weight, longest true leaf and hypocotyl in peanut seedlings whose seeds were treated with fermented sawdust. They further reported that microbial community in the sawdust changes as the fermentation process progressed, indicating that the microbial community seems to affect seed germination physiology and seedling growth parameters as was observed in this study. Wowu and Samuel (2019) also reported that cocoa seeds treated with a mixture of poultry manure and saw dust, enhances seed germination and seedling development.

Varieties also showed significant performances (P<0.05) amongst them in regard to leaf breath but Matinal was observed to have the widest leaf breath of followed by Ajiwah while Deglenur recorded the least, this not far from the fact that genetic variability might have cause that, as reported in the work of Basu and Mukhernice (2000) who reported that early and later stage of plant growth is directly link to its genetic makeup, environmental factors, rainfall and agronomic practice.

Table 8: Leaf Breath (LB) Of Dates Seedling as affect by Seed Treatment and Varieties in the Nursery

Methods			**Weeks**	**After**	**Planting**			
	4	**6**	**8**	**10**	**12**	**14**	**16**	**18**
Cold Water	0.31[b]	0.34[b]	0.88[a]	1.02[c]	1.23[c]	1.32[c]	1.32[c]	1.32[c]
Hot Water	0.22[c]	0.36[ab]	0.86[ab]	1.03[b]	1.12[e]	1.22[d]	1.24[d]	1.25[d]
Sawdust	0.76[a]	0.85[a]	0.22[d]	1.34[a]	1.63[a]	1.76[a]	1.76[a]	1.96[a]
Control	0.22[c]	0.26[c]	0.85[b]	1.11[d]	1.16[d]	1.23[e]	1.23[e]	1.23[e]
H_2SO_4	0.22[c]	0.61[d]	0.83[c]	1.11[d]	1.38[b]	1.42[b]	1.42[b]	1.62[b]
F-LSD(0.05)	0.256	0.073	0.018	0.318	0.038	0.256	0.256	0.256
Varieties								
Ajwah	1.23[c]	1.35[b]	1.82[b]	1.88[b]	1.97[b]	2.03[c]	2.23[c]	2.23[c]
Degleneur	1.29[b]	1.33[c]	1.82[c]	1.74[c]	1.90[c]	2.22[b]	2.29[b]	2.29[b]
Matinal	1.60[a]	1.66[a]	1.81[a]	1.97[a]	2.05[a]	2.62[a]	2.59[a]	2.39[a]
F-LSD(0.05)	0.198	0.052	0.014	0.02	0.03	0.11	0.12	0.13
Season								
2020	1.10[a]	1.34[a]	1.56[a]	1.87[a]	1.99[a]	2.11[a]	2.24[a]	2.35[a]
2021	0.89[b]	1.00[b]	1.12[b]	1.32[b]	1.56[b]	1.89[b]	2.00[b]	2.09[b]
F-LSD(0.05)	0.07	0.08	0.07	0.08	0.09	0.11	0.13	0.14
Interaction								
M x V	NS	NS	NS	NS	NS	NS	NS	NS

Means having the same superscript in a column are not significantly different (P ≤ 0.05)

CONCLUSION

The study showed that all the scarification methods under consideration responded differently in the values of parameters in this study, however moist sawdust scarification was found most effective in breaking dormancy of date palms in the study area by consistently obtaining high values for the germination and early plant growth parameters. Among the varieties, Degletnur supersede all the varieties under consideration in all the parameters measured, it was also found to interact effectively with the various scarification methods most especially moist sawdust by consistently obtaining higher values on all growth parameters studied in this experiment. This study therefore, shown that date palm cultivation of seedling in the study area is possible with moist sawdust used as pre-planting treatment of seeds and Degletnur variety, which is therefore recommended.

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