

EVALUATION OF SULPHURIC ACID CONCENTRATIONS AND MECHANICAL SCARIFICATION AS PRE-GERMINATION TREATMENTS IN DATE PALM (*PHOENIX DACTYLIFERA* L.)

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ABSTRACT

An experiment was carried out at the Laboratory of College of Agriculture, Kwara State University, Malete to investigate the effects of pre germination treatments on date palm (*Phoenix dactylifera* L.). The treatments were concentrations of sulphuric acid at 100%, 60%, 40%, scarification, and the control. The treatments were arranged in a completely randomized design and replicated three times. Germination percentage differs significantly among the treatments. Germination commenced earlier in treated seeds with sulphuric acid (40% and 60%) and scarification methods. Highest germination percentage (83.34%) was obtained in the treated seeds with 40% sulphuric acid at 14 days. This treatment completed germination in 21 days and was found to be appropriate for breaking dormancy in date palm.

Key words: germination, date palm, dormancy, concentration

INTRODUCTION

Date palm (*Phoenix dactylifera* L.), called dabino in Nigeria, is a dioeciously heterozygous flowering plant in the family astereacea that is cultivated for its edible sweet fruit. The crop is naturalized in many tropical and subtropical regions. According to FAO. (2014), Egypt is ranked first as the world leading producer of date palm. Generally, palm fruit consist of three layers, collectively referred to as the pericarp (Uhl and Dransfield, 1987). Such layer when present will impede absorption of water and oxygen to the developing embryo and could also mechanically restrict the growth of the developing embryo. Orozco-Segovia *et al.* (2003) reported that germination in many palms commences in about seventeen weeks of shedding suggesting that a period of dormancy is present in such seeds probably due to thick endocarp and testa. Like other palm family, date palm is propagated by seed particularly in breeding programme for selection of clones of desirable character. However, the presence of hard seed coat often delays germination. Hard seed coat is a characteristic feature of most fruit trees. Several studies such as cold and hot water treatments (Adeola and Dada, 1983; Adundola and Adejemo, 2005 ;) acid treatments (Owonubi *et al.*, 2005 ;) and seed scarification (Habila *et al.*, 2016) have been carried to break dormancy in seeds to enhance seed germination. The reported method of breaking dormancy in date palm using sulphuric acid (Habila *et al.*, 2016 and Umar, 2005 and Mohammed *et al.*, 2008) observed that acid treatment reduced seeds germination probably because the embryos were killed and recommended boiling water or seed scarification as a method of breaking dormancy. These authors however did not provide information on various concentrations of the acid. This research was therefore carried out to investigate germination in date palm as affected by various concentrations of sulphuric acid and scarification method.

MATERIALS AND METHODS

The experiment was carried out at the Agricultural Laboratory of Kwara State University, Malete, in February to May, 2017. Dry date palm seeds for the trial were procured at Ipata market, Ilorin. The treatment consisted of scarified seed using sulphuric acid at 100%, 60%, and 40%, concentrations; mechanical scarification using sand paper and cold water. Scarified seeds using sulphuric acid lasted for thirty minutes. During scarification with acid, the seeds were stirred with glass rod, decanted and rinsed thoroughly with water under running tap for one hour. The scarified seeds were then soaked in

cold water for twenty four hours before planting. Mechanical scarification with sandpaper (60 grit, D-weight, aluminum oxide (Abrasive Leaders and Innovators, Fairborn, OH)) was done for twenty minutes by thoroughly and firmly moving the seeds until the scarified seed surfaces were distinctly visible. The control without treatment was planted. The treatments were arranged in a randomized complete block and replicated four times. Thirty seeds of each treatment were planted in perforated polythene bags using sawdust as a germinating medium and water daily. Weekly number of germinated seeds was taken for twenty eight days. A seed was considered to have germinated when the radicle could be seen (Mohammed and Yussef, 2008). The germination rate was computed as the ratio of germinated seeds to the total number of seeds planted (Okunlola *et al.*, 2011).

$$\text{Germination Rate (\%)} = \frac{\text{Number of germinated seeds at time, t}}{\text{Number of planted seeds at time, t}} \times 100$$

Date for germination percentage was transformed using arcsine of square root before the analysis was carried out. Means between the treatments were separated using Duncan Multiple Range Test at $P < 0.05$ (Steel and Torrie, 1996).

RESULTS AND DISCUSSION

The effects of pre-treatments on seed germination differs significantly ($P < 0.05$) among treatments at different days (Table 1). Germination commenced earlier in treated seeds with sulphuric acid (40% and 60%) and mechanical scarification methods. At 14 days 83.34 % and 66.67 % germination were recorded respectively, at 40% H_2SO_4 and scarification methods. Treated seeds with 40 % H_2SO_4 completed germination in 21 days. These germination percentages were significantly different from other treatments except scarification methods at 7 days. The control took longer days to germinate; in fact 29.96% germination was recorded during the trial. Scarification and acid treatments have been reported to increase germination in a number of palm species (Owonubi *et al.*, 2005; Mohammed *et al.*, 2008; Habila *et al.*, 2016)). The excellent germination percentage recorded with sulphuric acid at 40% H_2SO_4 did not conform to the earlier study of Halia *et al.* (2016). The contrast is explainable in the differences in the concentration of acid treatments. The 40% concentration in this study probably softens the hard coat for permeability of water and oxygen and also did not restrict the growth of the developing embryo, whereas in the earlier study, the embryo was killed at higher acid concentration. Based on the results of this study using concentrated H_2SO_4 at 40% concentration was found to be efficient in breaking dormancy in date palm

Table 1: Effects of pre- germination treatments on germination in date palm

Treatments	Germination Days			
	7	14	21	28
H_2SO_4 (100%)	0.0c	60.0b	6.6c	6.70c
H_2SO_4 (60%)	6.67b	43.37c	20.0a	16.70b
H_2SO_4 (40%)	13.26a	83.34a	3.30d	0.0d
Scarification	13.27a	66.72b	16.68b	7.08c
Control	0.0c	3.33d	3.33d	23.3a

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