Analysis of Different Seed Priming Techniques on the Germination and Initial Development of *Diospyros ebenum* (Kaiwa)

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ABSTRACT

This research aims to determine the effect of different pre-sowing treatments on germination and early growth pekkk TQrformance of Diospyros ebenum. It was conducted at the seedling nursery of Kebbi State University of Science and Technology. This study consisted of six (6) treatments replicated six (6) times laid out in Randomize Complete Block Design (RCBD) which gives a total of (36) replicate. The results obtained in this study indicated that Diospyros ebenum germination in control treatment recorded a high germination rate of (83.3) followed by hot water (61.1%) and scarification and HCL recorded the least and the same germination percentage (16.6%). There was no significant effect between treatments on plant height, number of leaves and collar diameter of (Diospyros ebenum). The highest plant height (1.32cm) was produced by seeds treated with sulphuric and the least by seeds treated with hot water (0.52cm). H2SO4 produced a larger collar diameter (4.50mm) while hot water produced the smallest collar diameter (2.33mm). The highest number of leaves (3.67) was produced from the seeds treated with H2SO4 and the least was produced from hot water (1.33). It is recommended that of the treatments used anyone can be used to propagate Diospyros ebenum

INTRODUCTION

Tropical forests contain much terrestrial biodiversity, provide food, shelter, health care, protect water and soil resources, store carbon in biomass and maintain the delicate composition of the atmosphere (Neuwinger, 2000). One very important material provided by forests is wood which is used in construction, as fuel, in making furniture and other implements. Tropical timbers are preferred as a source of wood because of their natural durability and good working properties (Miller and Wiedenhoeft, 2002). Despite these important uses, tropical forests are threatened by unsustainable land and resource use (De Capua, 2005). The greatest constraint to forest regeneration projects is the lack of good planting material. The common way by which plants regenerate naturally is propagation by seed. For research and rapid improvement of undomesticated species, however, artificial regeneration by vegetative propagation methods offers

several advantages. Individuals may be recognized within a population that produces a higher quality of the desired products or services. It would therefore be advantageous to propagate these individuals vegetatively to „capture" the genetic variation expressed which may otherwise get lost or diluted during sexual propagation. Vegetative propagation methods have been developed and used for centuries.

Diospyros is a large genus belonging to the family Ebenaceae native to India and Srilanka. It is a low-growing wing medium-sized tree up to 30m tall and up to 90cm in diameter, bole straight, with buttresses up to 2m high. Crown dense, bark surface is scaly, fissured, black to grey (Finkel et al., 2002). Many trees of widely different affinities produce the heavy black hardwood called ebony. The most important source of ebony was Diospyros ebenum, the first species of the genus to be recognized botanically in Ceylon and was described by Koenig in 1776. Diospyros ebenum Koenig belongs to the family Ebenaceae commonly called "Kari Mara" or ebony. It is a large evergreen tree with a dense crown of dark green leaves and attains a height of about 25m, with a clear bole of about 8m and a girth of 2.50m. The species is under threat due to large-scale illicit felling for its timber quality. The fruits are recalcitrant and germination is staggered with sparse distribution of its establishment in natural conditions. To combat the problem of regeneration an attempt was made to get more sprouts through vegetative propagation techniques of air layering with different concentrations of IBA.

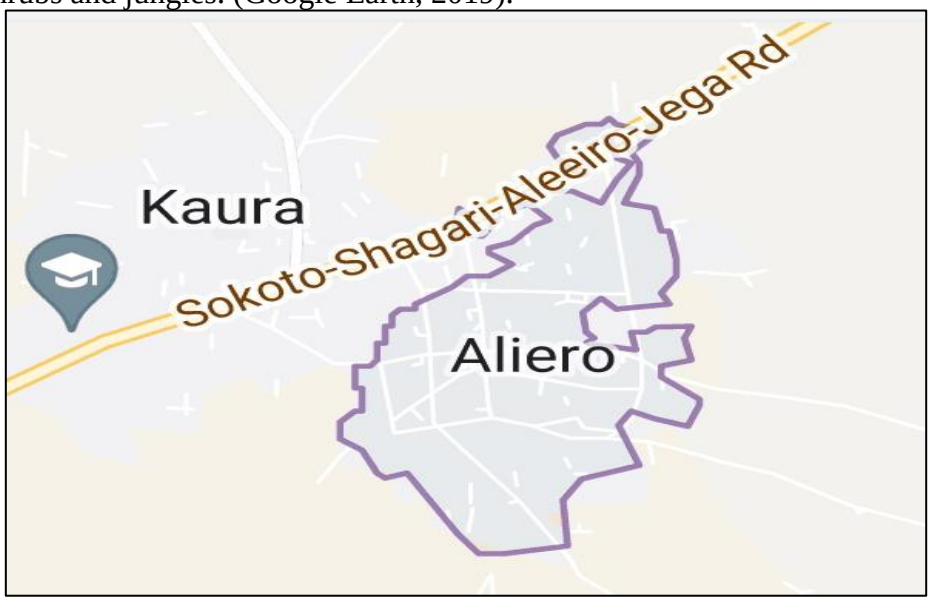
Diospyros ebenum is not easily grown or germinate very fast or early, this resulted in the lack of D. ebenum in many environments due to the poor performance on seed germination as well as poor growth performance of the newly germinated seedlings because this indigenous tree species is gradually becoming rare and the plantation is not encouraged in many Nurseries. Then, there is a need for this research to evaluate different pre-sowing treatments on D. ebenum germination and early growth performance.

Pre-sowing treatment refers to the method used to prepare the seeds before planting. In the case of Diospyros ebenum, which is a species of tree commonly known as black ebony, pre-sowing treatment can have an impact on germination and early. This is a soil management practice that is in charge of soil preparation for a new crop. This is the final preparation stage before the sowing. The main purpose of pre-sowing ploughing is to meet the requirements of crop seeds as soon as possible (Nabin, Farhad., 2015). Seed scarification is the mechanical or chemical abrasion of the seed coat to facilitate water absorption and promote germination (Akbari, A. and Mosavi, A. 2014). Seed priming Controls the hydration of seeds to trigger the germination process and enhance germination rate and seedlinvigouror (Ashraf, M. and Foolad, M.R. 2005). Seed soaking Immerse the seed in water for a specific period to speed up germination by hydrating the seed coat (Maurya, S. and Sudan, J.P., 2020). Seed disinfection: Treatment of seeds using chemical agents to eliminate pathogenic microorganisms and reduce the incidence of diseases (Agrios, G.N., 2005). Seed stratification Exposing seeds to a period of cold, moist conditions to simulate winter and break dormancy Bonner, (F.T. and Karrfalt, R.P. 2008). Seed pelleting Encasing seeds in a protective coating to improve handling, reduce damage, and provide nutrient supplements. (Harris, N., Sauseau, M. and Guérold, F., 2019).

MATERIALS AND METHODS

Study Area

The study was conducted at the seedling nursery of Kebbi State University of Science and Technology Aleiro (KSUSTA), which is located at latitude 13° 06'. 89" N and longitude 5° 11'. 80" E (Google Earth, 2019). Kebbi state covers a total of 36,800km of land area, bounded by Sokoto state to the north and east, Niger state to the south and Benin Republic to the west. The state enjoys tropical continental type of climate and this is largely controlled by two air masses, namely tropical maritime and tropical, blowing from the Atlantic and Sahara dedesertsespectively, these air masses determine the two dominant seasons wet and dry, the wet season from April to October in the south and May to September in the north, while the dry season lasts for the remaining period of the year. Mean annual rainfall is about 800mm in the north and 1000m in the south. Temperature is generally high with a mean annual temperature of about 26◦c in all locations. However, during the Harmattan season (December to February) the temperature can go down to about 21◦c and up to 40◦c during April and June. Night temperatures are generally lower with low relative humidity for most of the year except during the wet season when it reaches an average of eighty. This explains the hot dry environment which is in sharp contrast to a hot humid environment in the southern parts of Nigeria. The natural vegetation of the state varies, in the extreme north, Sahel shrubs are found, the central part The savannah type of vegetation is covered with thick shrubs and jungles. (Google Earth, 2019).



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Kebbi state was created out of the former Sokoto state on 17 August 1991. The state has a total population of 3,137,989 people as projected from the census, within 21 local government areas. (Google Earth, 2019).

The state has Sudan and Sahel savannah. The southern part is generally rocky with the Niger River traversing the state from Benin to Ngaski Local government.

The northern part of the state is sandy with the Rima River passing through Argungu to Bagudo Local government where it empties into the Niger.
Agriculture is the main occupation of the people especially in rural areas, Crops produced are mainly grains; animal rearing and fishing are also common.

Materials
The materials used are; Seeds, Water, Watering can, Record book, Concentrated H2SO4, Concentrated HCL

Methodology
The experiment was carried out in the field using a Randomize Complete Block Design (RCBD) replicated six times.

Treatment 1: *D. ebenum* seeds were soaked in cold water for 24 hours before sowing.

Treatment 2: *D. ebenum* seeds were soaked in hot water for 30 minutes, after boiling at 100^{n}c

Treatment 3: *D. ebenum* seeds were soaked in concentrated H2SO4 solution for 10 minutes and with plenty of water for a further 10 minutes before sowing

Treatment 4: D. ebenum was treated with concentrated HCL for 10 minutes and treated seeds were washed with water for a further 10 minutes before sowing

Treatment 5: *D. ebenum* seeds were scarified on both sides before sowing

Treatment 6 (control): Seeds of D. ebenum were directly sown into polythene bags without any treatment.

All the treated seeds were washed with distilled water before sowing

Data Collection & Data Analysis
The data was collected basically on the following parameters, germination percentage, plant height, collar diameter, and number of leaves for six weeks. Data collected were analysed through analysis of variance (ANOVA) using SAS. Least Significant Difference (LSD) was used to separate the mean value where t exists among the treatment mean.

RESULT PRESENTATION and DISCUSSION

Germination

The term germination refers to the resumption of growth by the embryo of the plant which has been dormant in the seeds. Germination begins as soon as the seeds imbibe moisture and radicle immerges beyond the seed coat. Germination is accomplished if the seed passes through three stages inhibition of water, activation of metabolic process, and development of embryo.

Actual germination is said to have occurred when the radicle has elongated by far beyond the seed coat giving indications that the seeds will develop into healthy seedlings (Olatunji *et al*., 2012).

The result of the effect of pre-sowing treatment on seed germination of *Diospyros ebenum* is presented in Figure 1. *Diospyros ebenum* the seeds that were not treated (control) recorded the highest germination percentage (83.3%) followed by hot water (61.1%) then H_2SO_4 (33.3%), cold water (22.2%) where scarification and HCl recorded theand the same germination percentage (16.6%).

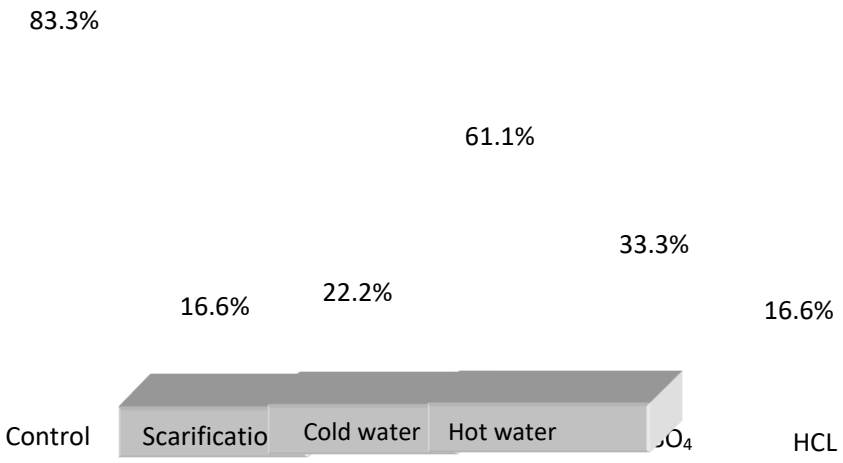

Fig 1: Effect of pre-sowing treatments on seed germination of *Diospyros ebenum.*

Early Growth Performance

The result of the effect of pre-sowing treatment on plant height, number of leaves and colar diameter is presented a 4.1. There was no significant effect of treatments on plant height, number of leaves and colar diameter of (*Diospyros ebenum*). The highest plant height (1.32cm) was produced by seeds treated with sulphuric followed by Cold water (1.25cm) and the least height was produced by seeds treated with hot water (0.52cm). H_2SO_4 produced a larger colar diameter (4.50mm) followed by cold water (4.00 mm) while hot water produced the smallest colar diameter (2.33mm). The highest number of leaves was produced from the seeds treated with H_2SO_4 (3.67) followed by cold water and HCL with 3.00 each and was produced from hot water (1.33).

TABLE 4.1 Effect of different pre-sowing and on plant height, collar diameter, number of leaves of *Diospyros ebenum*in Aliero local government.

Treatment	Plant height(cm)	Collar diameter(mm)	Number of leaves
Control	0.70	2.83	2.00
Scarification	1.00	3.33	2.83
Hot water	0.52	2.33	1.33
Cold water	1.25	4.00	3.00
Sulphuric acid	1.32	4.50	3.67
HCl	0.90	3.00	3.00
LSD (0.05%)	NS	NS	NS

Means followed by different letters (a,b,c) are statistically different at (0.05%); cm=centimeter.

Discussion

The positive effect of propagation pre-sowing treatment on the germination of *Diospyros ebenum* has proved successful in this study. The highest germination percentage recorded in control is in agreement with Dastanpoor *et al.* (2013) and Elias Soltani *et al.* (2015) who obtained the highest germination percentage on control methods on germination of *Diospyros ebenum* seeds

The result presents that there is no significant effect of treatments on plant height, number of leaves and colar diameter. This finding is similar to Sandi *et al.* (2014), ebony cultivation, such as management of seed, scarification germination, and seedling growth increment (height and diameter) in the nursery.

Conclusion

The results obtained in this study indicated that *Diospyros ebenum* germination in control recorded the highest germination percentage (83.3%). Pre-sowing treatments applied do not significantly increase seedling height, colar diameter and the number of leaves.

Recommendation

From the result of this study, the following recommendations are made:

1. It is recommended that *Diospyros ebenum*seeds should be sown directly in the soil without any treatment method.
2. Since different pre-sowing treatment does not increase seedling height, colar diameter and number of leaves, anyone can be used.

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