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Germination techniques for the growth of combretum nigricans

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Abstract

A field research was conducted at the nursery site, fadama area of Usmanu Danfodiyo University, Sokoto. Combretum nigricans is an indigenous tree found in the wild in north east and North West Nigeria. However inadequate knowledge of its silvicultural techniques and threat of extinction due to deforestation from expanding agriculture are the major problems of species. This study was carried out to examine the effect of pre-treatment on germination percentage of C nigricans seeds. The experiment was set up in a completely randomised design involving five treatments replicated three times. Many seeds have difficulty in germination such that their propagation is adversely affected by seed coat dormancy leading to poor growth potential. A field research was conducted at the nursery site, fadama area of UsmanuDanfodiyo University, Sokoto. Data taken on germination percentages of *Combretum nigricans* as been assessed. The results obtained both at 14 days showed significant difference (P>0.05) in all the treatment methods of *Combretum nigricans* seeds. The highest germination recorded (33%) at 14 (days after sowing), followed by hot water (26%), scarification (20%), cold water recorded (14.2%), while the least germination percentage was sulphuric acid (7%). It is therefore recommended that seeds of *Combretum nigricans* should be treated with diluted acid before planting in a standard potting mixture and to be watered once in 2 days for successful nursery technology of *Combretum nigricans* seedlings.

Keywords: *Combretum Nigricans*; Pre-Treatment; Germination; Seedling Emergence

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1. Introduction

Combretum nigricans was mostly found harvesting in the wild in state like Bauchi, Kebbi, State, Zamfara, Borno and Katsina state. *Combretum nigricans* is of primary significance in household and local economics. Several million of household worldwide depend heavily on C. nigricans for subsistence living this species has wide range of industrial application especially the area of food textile and pharmaceutical industries. The application of Combretum industries includes confectionary bakery, and snack, pasties and also used in construction of mortar (FAO, 2005).

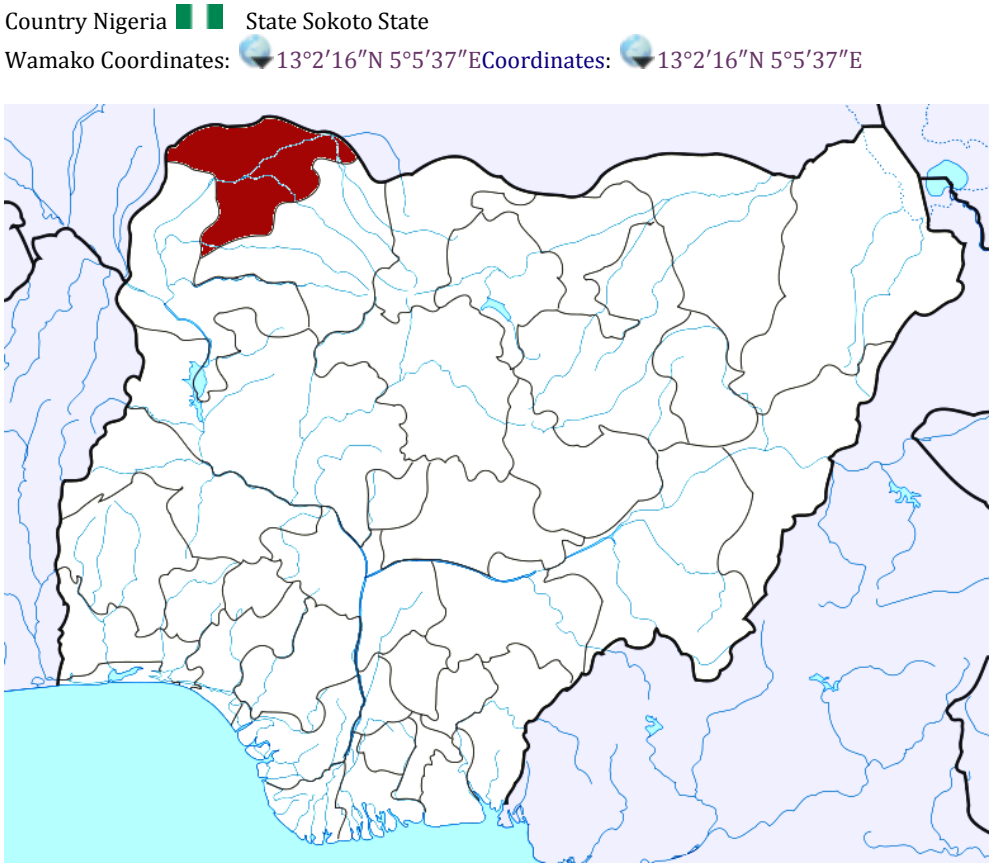
Onyenekenwa et al. (2011) highlight the importance of C. nigricans in environmental protection, in Nigerian the species of C.nigricans is an importance constituents of natural vegetation of the sudan sahellian zones with annual rainfall between 21 to 35 mm. Mckinnel (2002), documented an, impressive trends of Combretum fuel wood in five sahellian countries Burkina Faso, Senegal, Nigerian, Mali, and Gambial. Other Combretum species includes *Combretum aculeatum, Combretum migratum, Combretum paniculatum, Combretum glulinosum, Combretum hypopilinum, Combretum lamprocarpum and Combretum mollea.* In Nigeria there are a lot of potentials for reproduction f food, the leaves are used for preparing different types of product such as tea. The tree yields edible gum, which is traded on local markets. It has good adhesive properties but also used in tanning and leather wash, the product can be used in curing diseases for example the leaves, branches, bark, roots are used for internal ailments, and cure, rheumatism, headaches, cough, gastro intestinal disorders and hepatic trouble (Ali et al., 2012). Although a lot of benefits can be derived from large scales production of Combretum nigricans gum and fuel wood, but there is a yawning gap between supply and demand of the gum due to the following. Dearth of information based on production, processing and marketing of Combretum gum and Combretum fuel wood. Physical problem such as climate, soil, water balance and topography may lead to low productivity of Combretum gun in the country (Teshome et al., 2016). Biological problem such as biological and pest recruiting in rotten and distribution as a result of insect and rodent attacks, browsing by livestock games may also lead to low yielding of the Combretum gum. Indicating that land tenure, rural developmental policies, transportation organisation of local trade, harvesting, processing relating of the Combretum and therefore low of gum production. The *Combretum igricans* is a multipurpose tree species, which is highly valuable for its economic gum. The low level in production of *Combretum nigricans* as results of social economic problems associated with cultivation and utilization of *Combretum nigricans.* All these species problems necessitate the need for base line information that will fill the yawning gap between production and utilization of this important tree's species (*Combretum nigricans*). Thought a lot of research has done on different tree species in the studies area, Fredrick et al. (2017), Agbogidi et al. (2007), However there is little or no research on the germination techniques for the growth of Combretum nigricans seeds.

2. Materials and methods

2.1. Study area

The experiment was carried out at Forestry Department nursery, located at the Usmanu Danfodiyo University located between 11^0 to 13^0 north and longitude 4^0 to 11 east Julius (2013). The state covers an area of about

32,038km² consisting of 23 Local government areas. It is bordered to the North by Niger Republic, to the East by Zamfara and to the West by Kebbi states. According to NPC, (2006) The State has a population of 3,696,999 people. It is essentially an agricultural state with 90% of the population engaged in subsistence farming. The climate is mainly semi-arid characterized by low rainfall usually between 400-700mm annually (NMS, 2011), occurring between May- October with peak in August. The dry season starts from October and ends in May. According to NMS, (2011), temperature ranges from 25⁰C to 43⁰C, humidity can be less than 5% during the harmattan season, and rainfall is usually less than 700mm annually.



Fiqure 1. Map of sokoto state indicating wamako local government

2.2. Experimental design

The experiment was laid out in a completely randomized block design involving six (6) treatments, replicated (3), 6 x 3= 18, Six methods of pre-sowing were applied concentrated sulphuric acid (20minutes) (T1), cold water (24 hours) (T2), hot water (100°Cfor 10 minutes) (T3) Scratching of seeds with pine before sowing in a standard potting mixture, (4) control (no treatment) (T5), Diluted acid (6). A total number of (180) seed were used, 2 seeds were sown per pots. The seeds were sown in black polythene nursery bags. The seeds were sown in a potting mixture filled with river sand, top soil and manure 2: 1:1. Watering was done daily to maintain adequate moisture content in the soil medium. Germination was taken to have occurred when the plumule

emerged from the soil surface. Germination count was taken daily for four weeks until no more germination occurred. Seedlings were watered once in a day, twice in a day and once in two days.

Materials used to carry out the study are; - cold water, pre-treatment, Hot water, sulphuric acid ($H0_20_{4)}$ pines, polythene bags, filling funnel, head pan, shovel, watering can, hand shovel, bucket, river sand, top soil, manure, seed.

2.3. Procedure for experimentation

Treatment 1: The Seeds were soaked in beaker containing cold water and left for 24 hours.

Treatment 2: The Seeds were soaked in a beaker containing boiled water for 5 minutes before it was removed.

Treatment 3: Scratching of seeds with pine before sowing in a standard potting mixture.

Treatment 4: The seeds were placed in an empty beaker; concentrated sulphuric acid was poured into the beaker. The seeds were fully immersed and left in the acid for 5 minutes after which they were removed and washed promptly and thoroughly in cool water for 3 to 5 minutes. This was to remove all traces of acid from the seed and then spread to dry.

Treatment 5: Diluted acid: The seeds were placed in an empty beaker; 50% diluted sulphuric acid was poured into the beaker. The seeds were fully immersed and left in the acid for 10 minutes after which they were removed and washed promptly and thoroughly in cool water for 3 to 5 minutes. This was to remove all traces of acid from the seed and then spread to dry.

2.4. Data collected

Seed germinated as monitored and data were collected

2.5. Data analysis

The data collected were subjected to the analysis of variance (ANOVA) while the significant differences were further subjected to mean comparison using least significant difference test (LSD).

3. Results

3.1. Mean no of seed germination

As indicated in Table 1: Highest mean germination of C. nigricans seeds was observed in sulphuric acid T4(32), followed by hot water T2(26) T3 scarification observed at (20), T1 at (16) while lowest no of germination was observed in T5 at (07).

3.2. Duration of emergence

As indicated in Table 2**:** From the finding diluted acid give the quickest response in (5days) after sowing, sulphuric acid experience (6days) of emergence after sowing, hot and cold water observed (7days) after sowing, while scarification have the lowest level of emergence.

3.3. Germination percentage

As indicated in Table 3: The treatment with highest germination percentage was diluted acid in T5 (32%), followed hot water T2 (26%), scarification observedT3 (20%) followed by cold water T1 (14.2%), while concentrated acid observed the lowest germination T5 at (7%).

Table 1. Highest mean germinated of Combretum nigricans Seed (effects of pre-treatment)

Treatments	Mean number of Germinated
Cold water	16
Hot water	26
Scarification	20
Concentrated acid	07
Diluted acid	32

Table 2. Highest Duration of Combretum nigricans Seed

Treatments	Duration of Germination
Cold water	7
Hot water	7
Scarification	8
Concentrated acid	6
Diluted acid	5

Table 3. Highest Percentage of Combretum nigricans Seed

Treatments	Percentage (%)
Cold water	14.2%
Hot water	26%
Scarification	20%
Concentrated acid	7%
Diluted acid	32%

4. Discussion

The analysis of variance at 14 days after sowing showed highly significant difference among the treatment methods in the germination of *Combretum nigricans* seeds after sowing. The main aim of seed pre-treatment is to enhance fast and even germination (Falemara et al., 2013). Highest mean germination of C. nigricans seeds was observed in sulphuric acid T4 (32), followed by hot water T2 (26) T3 scarification observed at (20), T1 at (16) while lowest no of germination was observed in T5 at (07). Duration after sowing, diluted acid give the quickest response in (5days) after sowing, sulphuric acid experience (6days) of emergence after sowing, hot and cold water observed (7days) after sowing, while scarification have the lowest level of emergence. Germination percentage**,** the treatment with highest germination percentage was diluted acid in T5 (32%), followed hot water T2 (26%), scarification observedT3 (20%) followed by cold water T1 (14.2%), while concentrated acid observed the lowest germination T5 at (7%).There was a significant differences ($p<0.05$) in germination emergence among the various treatments. The significance of early emergence and short duration of germination in silvicultural techniques is saves time and reduces the cost of production of seedlings in the nursery. This is because the dormancy has to be breaking before germination occurs and highest germination percentage was recorded in diluted sulphuric acid this agreed. This finding that with earlier studies which reported that acid treatment can enhance the germination of seeds (Amusa, 2011; Fredrick et al., 2016). This is also in agreement with studies carried out by Nigerian Journal of Agriculture, Food and Environment. Fredrick et al. (2017) who observed the useful role of hydrogen peroxide in the breaking down of seed coat leading to wall loosening during the extension growth of plants cell. According to (FAO 2002). This therefore appears that different species have varying ability to withstand level of temperature which is one of the primary conditions suitable for germination. This result shows that seeds of *Combretum nigricans* can also be scratched with a pin to make some punch sowing in standard potting mixture. Although, scarification have to be done carefully without affecting the embryo inside. According to Kimura et al. (2002) that mechanical scarification varies depending on genus and species and even species with the same genus and cultivars within the same species. Mechanical scarification also improved seed coat permeability in *Leucaenia leacacephala* seeds. This variation may be caused by the difference in seed coat structures.

5. Conclusion

Conclusively, the experiment was carried out to study the germination techniques for the growth of *Combretum nigricans*. The results showed that, the seeds of *Combretum nigricans,* most be treated before sowing in order to break the dormancy. This is because treated seed with diluted acid yielded higher percentage germination at(32%) follow by hot water (26%) scarification has (22%) cold water observed (14.2%), while sulphuric acid has the least percentage of (07).Therefore, the seed of C. nigricans need to undergo pre- treatment method before germination occurs. *Combretum nigricans* do not survive in southern part of Nigeria because the environment is not conducive for their growth.

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