Effects of Different Water Sources and Soil Types on Seed Pre-Treatment of Pycnanthus angolensis Welw.

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Abstract: Effect of different water sources on seed pretreatment and soil types on Pycnanthus angolensis Welw. was examined with 120 seeds being collected from the wild, soaked in four different types of water sources: borehole water BW, Rain Water RW, Well Water WW, and Stream Water SW for 24 hours, laid in 500g of three different soil types (Sandy, Clayey, and Loamy, L.) in polythene bags replicated ten times in twelve treatments (BWL, BWS, BWC, RWL, RWS, RWC, WWL, WWS, WWC, SWL, SWS, and BWC) laid in 4x3 factorial Completely Randomized Design. Emergence of Radicle (days), Root Length (cm), Shoot Height (cm), Number of Nodes, Number of Leaves, and Percentage Survival were measured, recorded and analyzed using descriptive statistics. Early germination at 44 days was observed in BWL and BWC, late germination at 59 days was observed in RWC while SWL, WWS, WWL, and BWL failed to germinate. The highest percentage survival (50%) was observed in BWL, lowest percentage survival (10%) in RWS, RWC, and SWS. Borehole water clay (BWC) had the highest E.R 24.10 (days), R.L 2.44 (cm), S.H 6.52 (cm), N.L 3.70, N.N 4.20, and 50% percentage survival, lowest E.R 4.70 and 4.60 (days) in (SWS) and (SWL) respectively. Highest R.L 0.20 cm, S.H 0.20 cm, N.L 0.30 in RWS, and N.N 0.60 in RWL, lowest P.S 10% was observed in RWS, RWL, RWC, and SWS. Rain water showed deficiency in the survival and germination of the seed of Pycnanthus angolensis, while borehole water aided the survival and rapid germination of the seed. Therefore, seed of Pycnanthus angolensis should be soaked in cold borehole water and planted on clay soil for best growth and development.

Keywords: Effect, Water, Sources, Seed, Germination and Pretreatment.

INTRODUCTION

Pycnanthus angolensis Welw. belongs to the nutmeg family, Myristicaceae. It is an evergreen, monoecious or dioecious, medium-sized to large tree up to 25-40m tall. The species occurs in upland and wet evergreen forest and semi-deciduous forest with more than 1600mm rainfall (Orwa et al., 2009). It is especially abundant in old fallows and secondary forest as its rate of natural recruitment after disturbance of the forest is high. In southern Africa, it occurs in riverine and swamp forest, but in West Africa, it does not occur in swamps (Keay, 1987). The plant is commonly called ‘Akomi’ in Yoruba, ‘Oje or Aakwa-mili’ or ‘Egwunond’ in Igbo, ‘calabo’ in Spanish and ‘Akujandi’ in Hausa (Rahama, 2011).

According to Mapongmentsem (2007), a yellow to reddish brown fat, called ‘kombo butter’ or ‘Angola tallow’ is extracted from the seed and is important in west and central Africa for soap making and as illuminant. It is not edible. The seeds somewhat resemble those of nutmeg (Myristica fragrans Houtt) and are burnt as candle. The wood is highly valued as fuel and is used to make split planks, known as ‘calabot’ or caraboard’ in the coastal zone of Cameroon (Orwa et al., 2009). Because it is easy to work with, it is used to make shingles, both for roofing and covering the sides of native houses, and planks for doors and window frames. The long straight bole makes it suitable for making canoes. Since the World War II, the wood has become an important timber for plywood core stock, veneer, mouldings, interior trim, interior joinery, furniture components and paper pulp.

Pycnanthus angolensis is a tree species of importance in ethnomedicine, threatened by extinction due to over-utilisation. According Mapongmetsem (2007) Pycnanthus angolensis cannot tolerate drought while other reports indicate that it is often found on poor soils. In this regard, this paper seeks to determine the effects of different water sources and soil type on seed germination of P. angolensis.

MATERIALS AND METHODS

The study was carried out in the Department of Biology, Osun State College of Education, Ila Orangun. One hundred and twenty (120) seeds were collected from the fully riped fruits of Pycnanthus angolensis, removed the seeds from the fruits.

Sampling techniques

Collection of water types

Four different types of water sources were collected at Ila-Orangun, Osun State of Nigeria. The rain water was collected directly from the roof during raining season in the year 2016, the stream water from Osin river flowing along 1004 area, bore-hole water from Ila water corporation, and the well water from a deep well at Babalola area, Ila-Orangun, all bottled differently and well labeled.

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Collection of seed sample and seed pretreatment
Immediately on the collection of the fruit sample, the fruits were soaked in cold (or normal temperature) water, because of the rapid dehydration of the fruit (Pycnanthus angolensis). The fruits were then carefully opened with a sharp, clean knife to remove the seeds. They were soaked into the prepared water types in clean bowls containing thirty (30) seeds per water type for 24hours (one day).

Soil collection, preparation and Design
Three different soil samples were collected in the area of Ila-Orangun; loamy, sandy, and clay. 120 bags of polythene were collected, weighed and bagged at 500g each. After pretreated seeds were then planted following the distribution of the seeds; 10 RWL, 10RWS, 10RWC, 10WWL, 10WWS, 10WWC, 10BWL, 10BWS, 10BWC, 10SWL, 10SWS, 10SC, making up 12 treatments. The experiment was set up in 4×3 factorial in Completely Randomization Design. Where 4= Different water source, 3= soil types. Watering was done every other day because the plant cannot tolerate drought (Mapongmetsem, 2007).

RESULTS
Emergence of Radicle (ER)
Early Emergence of Radicle (E.R) 4.60 (days) was observed in Well water loamy (WWL), followed by stream water sandy (SWS) 4.70 days, 4.80 days in rain water loamy (RWL) while late E.R 24.10 (days) was observed in borehole water clay (BWC) Stream water loamy (SWL), borehole water loamy (BWL) and well water sandy (WWS) did not germinate at all (Table1)

Root Length (RL)
The highest mean value 2.44cm for root length was observed in borehole water clay (BWC), while the lowest 0.20cm was seen in rain water sandy (RWS). After the emergence of radicle, well water loamy (WWL) died, while stream water loamy (SWL), borehole water loamy (BWL), and well water sandy (WWS) did not germinate. However, the root length was able to measure because of the nature of the plant which is an epigeal (Wikipedia, 2016) that epigeal germination is a botanical term indicating that the germination of a plant takes place above the ground. (Table1).

Shoot Height (SH)
In the mean value of the shoot height, borehole water clay (BWC) was observed to be the highest with the value of 6.52cm, while rain water sandy (RWS) was the lowest with the value of 0.20cm (Table1)

Number of Leaves (NL)
Borehole water clay (BWC) was also observed to have the highest mean value in the number of leaves with the value of 3.70, while rain water sandy (RWS) has the lowest number of leaves in the mean value of the experiment with the value of 0.30 (Table1)

Number of Nodes (NN)
In borehole water clay (BWC), it was observed that there is the highest number of nodes in the seedling of Pycnanthus angolensis with its mean value 4.20, and the lowest in rain water loamy (R WL) with the mean value of 0.60 (Table1)

Percentage Survival (PS)
The highest P.S (50%) was observed in BWC, lowest P.S. (10%) in RWL, RWS, RWC, SWS. Rate of the percentage survival of the seed of Pycnanthus angolensis was affected greatly and not supported by rain water seeds in loamy, sandy, clay soil and stream water seeds in sandy soil (Table1)

DISCUSSION
The experiment shown in the growth assessment parameters is observed that the adverse effect of water types is in well water and also affected by loamy soil. The experiment shows that borehole water aids the growth and germination of the plant and also aided by clay soil. Early emergence of radicle was supported by well water loamy (WWL). This may be traced to effect of water type. This is similar toWellWaterGuide.net, (2017) which reported that well water (water from the ground) contained high substances like iron, zinc, chromium and other particles that speed up germination while late E.R in (BWC) could be due to poor aeration from sticky and closed particles of clay soil. Borehole water clay (BWC) supported the root length, the shoot height, number of leaves, number of nodes, and the percentage survival. This could be traced to the ability of clay soil to retain water for longer time and that soils rich in fine clay particles are called ‘heavy soils’ and, although hard to manage, but potentially very fertile. Clay soil can retain water for a long period of time and this helps germination of the seed of the plant.

In this work, clay soil is the best which aids the proper germination of the plant. Pycnanthus angolensis did not thrive well in loamy soil and this is contrary to Lerner, (2000) who reported that loamy soil is considered ideal for gardening and Agricultural uses because it retains nutrients well and retains water while still allowing excess water to drain away. Rain water did not support root length, shoot height, number of leaves, number of nodes, percentage survival of the plant both in sandy and clay soils,
stream water in sandy soil while Stream water loamy (SWL), well water sandy (WWS), well water loamy (WWL), and borehole water loamy (BWL) failed to germinate.

CONCLUSION
The result shows that early germination of the seed was in borehole water and stream water which were both in clay soil sample whereby both emergence of radical were seen on the 44th day of planting, and the late germination was in rainwater also in clay soil sample which the emergence of radical was seen on the 59th day of planting, while stream water loamy (SWL), well water sandy (WWS), well water loamy (WWL), and borehole water loamy (BWL) all failed totally to survive. The lowest percentage survival was in stream water sandy (SWS), rain water loamy (RWL), rain water sandy (RWS) and rain water clay (RWC), while the highest percentage survival was in borehole water clay (BWC).

The experiment shows that well water has deficiency in the survival and germination of the seed plant of *Pycnanthus angolensis*, while borehole water aided the survival and rapid germination of the seed plant. It is therefore concluded that the best water source in pretreatment of seed sample of *Pycnanthus angolensis* is borehole water, and best aided by clay soil. It is therefore recommended that the plant *Pycnanthus angolensis* should be planted on clay soil for proper growth.

<table>
<thead>
<tr>
<th>Growth Parameters</th>
<th>Emergence of Radicle E. R (day)</th>
<th>Root Length R. L (cm)</th>
<th>Shoot Height S. H (cm)</th>
<th>Number of Leaves (N.L)</th>
<th>Number of Nodes (N.L)</th>
<th>Percentage Survival (P.S)</th>
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<tbody>
<tr>
<td>RWL</td>
<td>4.80</td>
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<td>RWC</td>
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<td>SWS</td>
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<tr>
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<td>14.60</td>
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<td>BWS</td>
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<td>BWC</td>
<td>24.10</td>
<td>2.44</td>
<td>6.52</td>
<td>3.70</td>
<td>4.20</td>
<td>50%</td>
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REFERENCES