Effects of Pre-treatment on Germination of the Seeds of *Plukenetia conophora*

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Effects of Pre-treatment on Germination of the Seeds of *Plukenetia conophora*.

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Abstract

In this study, nursery experiments were conducted to evaluate the effects of pre-germination treatment on *Plukenetia conophora* seeds with the aim of determining the most appropriate method of obtaining optimum and uniform germination of seeds of this species. The factors considered included seed treatments with hot water at 90°C for three minutes, soaking in cold water for three hours, soaking in diluted H\(_2\)SO\(_4\) at 70% concentration for 3 minutes and mechanical scarification. Seeds subjected to mechanical scarification recorded the highest germination percentage. At 3WAP, AC3 subjected to mechanical scarification had the highest number of germination (80.0%). No germination was recorded on seeds treated with hot water for 3 minutes. Analysis of variance (ANOVA) showed that there was significant difference among the treatment at 5% probability level.
Introduction

Plukenetia conophora (African Walnut) belong to the family Euphorbiaceae (GRIN, 2010) and is a perennial climber found in the moist forest zones of sub-Saharan Africa (Oke, 1995). It is cultivated principally for its nuts that are cooked and consumed as snacks, along with boiled corn (Oke, 1995; Victor, 2003; Edem et al., 2009). Plukenetia conophora has been described as a semi-wild plant found naturally in the wild and may be extensively encountered in rural dwellings and on farmlands where they are protected (Okigbo, 1991). The seeds are available in June-September when other fruits are scarce, and people cherish eating the succulent seeds (Egharevba et al., 2005). The plant normally flowers between 1.5 to 2 years after planting. The importance of Plukenetia conophora as an indigenous fruit climber is enormous as it is a multipurpose crop. Its habitat is usually under large trees, the fruits are greenish with four round seeds in each fruit. The seed testa is hard, and the cotyledons are white in colour. (Ehiagbanare, 2007).

In West Africa, especially in Nigeria and Sierra-leone, the fruits is a source of income to the rural dwellers thereby improving their economy (Okafor, 1991; Udeala et.al, 1984). The leaves, bark, and fruit of Plukenetia conophora are used medicinally, and their uses include masticatory, giddiness, thrush, antihelminthic, toothache, syphillis, dysentery, and as an antidote to snakebite (Odugbemi and Akinsulire, 2008). In the Southern Nigeria ethnomedicine, African walnut is used as a male fertility agent and in the treatment of dysentery (Ajaiyeoba and Fadar 2006). The methanolic and ethylacetate extracts of Plukenetia conophora leaves have been shown to possess good antibacterial activities (Ajaiyeoba and Fadar 2006). Oke and Fafunso (1995) reported on the high nutrient potentials of the nut. The fruit yields fats and oils (conophor oil) which is of domestic and industrial importance for soap making, vanish and paints. Investigations by Okafor and Okorie (1990) revealed that the macerated leaves and roots are used for medicinal preparations for asthma and hypertension traditionally. Conophor nut contains 48-50% dry weight of oil, which in liquid form is golden yellow in colour, with taste and odour resembling those of linseed oil.

Proximate fruit composition of conophor nuts shows that it contains: water – 52%, protein – 29.09%, lipid (fat) – 48.9%, carbohydrate – 12.58%, fibre – 6.34%, ash – 3.09%. mineral composition: calcium – 42.06%, iron – 1.55%, magnesium – 57.27%, phosphorus – 465.95%. (Enujigha and Ayodele-oni, 2003). There have been reports on the high nutrient potentials of conophora nuts/seeds (Ogunsua and Adebona, 1983) and also on the impact of traditional processing on the nutrient and sensory qualities of the nut (Adesioye, 1991). However, a bitter taste is usually observed upon drinking water immediately after eating conophor nut. This has been attributed to the presence of alkaloids and some other anti-nutritional factors, (Adesioye, 1991). The existence of these anti-nutritional factors affects the nutritional value and digestibility, and has been a major limitation in the utilization of many of these unconventional protein-rich and high caloric seeds.

Materials and Methods

Eight accessions of Plukenetia conophora was collected across from five States in Nigeria. The states are Enugu, Imo, Abia, Kogi and Edo. The seeds were subjected to different pre -germination treatments made up of Mechanical scarification, Soaking in cold water for 3 hours, soaking in Acid (dilutedH₂SO₄ ) for 3 minutes, Soaking in hot water for 3 minutes and Control. The control and treatments were replicated three times with 9 seeds per treatment. For acid scarification, the seeds were immersed in diluted H₂SO₄ for 3 minutes, they were stirred and thereafter washed with several distilled water before being sown. Mechanical scarification was carried out by sandpapering (at the micropyle end and round the circumference) after which scarified seeds were sown. For hot water treatment, the seeds were immersed in hot water (100°C) and left for 3 minutes. Treated seeds were allowed to cool at room temperature before they were sown for germination. Cold water treatment was done by soaking the seed in cold water for 3 hours. All seeds were sown in perforated plastic germination trays for germination. The experiment was carried out as a 5x8 factorial in a completely randomized design (CRD), replicated three (3) times. The factor A was the treatment types while factor B was Plukenetia conophora accessions.

Data collected were subjected to analysis of variance (ANOVA), using the GenStat Discovery Edition 3 (GenStat, 2007).

Results and Discussion

Table 1 showed the percentage germination of Plukenetia conophora accessions to different seed treatment. The result showed that at 2WAP, the accession was not significant but treatment effect and the interaction was significant (P<0.01). The result showed that control was significantly different from other treatments and thus had better germination percentage at 2WAP. AC1, 5, 7, and 8 had 60% germination in this treatment at 2WAP but AC6 had 6.7% germination at the same time. Soaking in hot water for 3 minutes result in zero germination, an indication that it may be a good treatment. At 3WAP, accession, treatment and their interaction effect was significant. AC3 had the best germination at 3WAP (53%) while AC8 had the lowest (25.3%). Soaking the seed of Plukenetia conophora in cold water for 3 hours had (50%) percentage germination while soaking in hot water for 3 minutes only resulted in zero germination of the seeds. The result also showed that mechanically scarifying AC3 results in 80% of the seed germinating.
Conclusion and Recommendations

Plukenetia conophora is one of the major perennial climber that are fast becoming extinct in our local forest, because they are difficult to propagate. This is particularly due to lack of adequate knowledge on their seed handling and nursery techniques as some of them bear seeds that peculiarly dominant, thus requiring pre-treatment to break dominancy. This paper investigated the effects of seed treatment on germination of Plukenetia conophora. The result indicated that there were significant differences in the treatments applied for this study. The percentage germination can be increased by pre-treating the seeds before planting, thereby reducing the germination time. However to enhance and ensure optimum and uniform germination of Plukenetia conophora seeds, mechanical scarification will yield desirable germination within a period of 9 days. Farmer should subject their seeds to mechanical scarification before planting to hasten the germination rate and produce satisfactory results.

References


Tables

Table1: Seedling emergence of Plukenetia conophora seeds as affected by different treatments.

<table>
<thead>
<tr>
<th>Accessions</th>
<th>2WAP Treatment</th>
<th>3WAP Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1  2  3  4  5  Mean 1  2  3  4  5</td>
<td></td>
</tr>
<tr>
<td>AC1</td>
<td>20.0 20.0 40.0 0.0 26.7 21.3 46.7 66.7 33.3 0.0 46.7 38.7</td>
<td></td>
</tr>
<tr>
<td>AC2</td>
<td>6.7 40.0 20.0 0.0 26.7 18.7 60.0 60.0 60.0 0.0 20.0 40.0</td>
<td></td>
</tr>
<tr>
<td>AC3</td>
<td>6.7 6.7 6.7 0.0 40.0 12.0 80.0 73.3 66.7 0.0 53.3 52.0</td>
<td></td>
</tr>
<tr>
<td>AC4</td>
<td>6.7 6.7 13.3 0.0 26.7 10.7 46.7 46.7 46.7 0.0 53.3 45.3</td>
<td></td>
</tr>
<tr>
<td>AC5</td>
<td>20.0 0.0 26.6 0.0 6.7 10.7 73.7 60.0 20.0 0.0 40.0 33.3</td>
<td></td>
</tr>
<tr>
<td>AC6</td>
<td>6.7 20.0 6.7 0.0 60.0 18.7 53.3 6.7 53.3 0.0 6.7 28.0</td>
<td></td>
</tr>
<tr>
<td>AC7</td>
<td>46.7 0.0 20.0 0.0 60.0 25.3 26.7 40.0 73.3 0.0 6.7 34.7</td>
<td></td>
</tr>
<tr>
<td>AC8</td>
<td>20.0 3.0 6.7 0.0 60.0 24.0 24.0 20.0 46.0 0.0 3.3 25.3</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>16.7 15.8 17.5 0.0 60.0 46.7 50.0 50.0 0.0 32.5</td>
<td></td>
</tr>
</tbody>
</table>

LSD 0.005 accession=12.00ns Treatment=9.47*** Accession and treatment =26.83 ***

Key: 1 = Mechanical scarification, 2= Soaking in cold water for 3 hour, 3= soaking in 70% H2SO4 for 3 minutes, 4= Soaking in hot water for 3 minutes, 5= Control (top soil).