Assessment of Seed Germination and Seedling Growth of *Moringa oleifera* under Greenhouse Condition

**1Abdulrashid I., 2Umar A. F., and 2Ahmad M. R.**
1Department of Forestry and Wildlife Management, Bayero University Kano
2Department of Forestry, Fisheries and Wildlife, Kano University of Science and Technology Wudil,
Corresponding Author: inuwaabdulrashid@gmail.com

**Abstract:** This experiment was conducted to assess the seed germination and seedling growth of *Moringa oleifera* seed given three treatments under greenhouse condition at The Departmental Nursery in Kano University of Science and Technology, Wudil. Completely randomized design was used and the tool for the analysis of data was ANOVA. Seeds were treated with hot water, cold water and acid. The result indicated that the lowest percentage germination was 0% for seed treated with acid and the highest percentage was 78% for the control. For the seedling height the treatments were statistically different and there were no any significant difference among the treatments for average number of leave. It was concluded that control and cold water treatments may improve rapid and uniform seedling germination and plant development in greenhouse conditions for *Moringa oleifera* seeds.

**Key words:** Seed, Germination, Seedling, Growth, and Seed Treatment.

**INTRODUCTION**

*Moringa oleifera* is a multipurpose tree that has promising nutrition and economic resources for developing countries. It is one of the most widely distributed and naturalized species of the monogenetic family moringaceae (Nadkarni, 1976 Ramachandrain et al., 1980). It includes 13 species of trees and shrubs distributed in sub – himalayan ranges from India, Sri Lanka, Northeastern and southwest Africa, Madagascar and Arabia. Today, it has become naturalized in many locations in the tropics and is widely cultivated in Africa, Thailand, Singapore, West Indies, Sri Lanka, India, Mexico, Malaysia and Philippines (Fahay, 2005). Its leaves are rich in protein, vitamins and minerals. They are becoming widely used in projects fighting against malnutrition. Moringa production is also a means of generating income, developing the food processing industries and finding new business (Radovich, 2008).

The plant is native to India (Paul, 2008) Arabia and possibly Africa and East America, Sri Lanka, Mexico, Malabar, Malaysia and Philippines, Islands. It is also grown mainly in semi – arid, tropical and sub-tropical areas, corresponding in the United State. While, it grows best in dry and sandy-soil. It tolerates poor soil, including coastal areas. It is a fast-growing and drought resistant tree that is native to the southern foothills of the Himalayas in North Western India.

Moringa is grown in home garden and as living fence in Thailand, where it is commonly grown for its leaves, which are used in soup. It is also actively cultivated by the world vegetable centers. In Taiwan, a center for vegetable research with a mission to reduce poverty and malnutrition in developing countries through improve production in Africa, Cambodia, Nepal, Indonesia, Malaysia, Mexico, Central America, Sri Lanka and South America. (Rajangan 2001).

Many researchers have shown that Moringa is very essential and is grown widely in Africa. It is used occasionally for medical purpose or for food. The Hausa’s from Niger and Nigeria that eat the leaves as a vegetable are the only ones who have been growing for decades and selling Moringa products. The plants are known worldwide for their nutritional and medical values.

Almost every part of the plant has nutritional value. The seeds can be roasted and eaten in Malaysia, also as flocculent to purify dirty or cloudy drinking water (it is pounded into small fragments, wrapped in some sort of cloth, and then place into water jar or container. It is also a source of nondrying oil (Benoil) used in arts and for lubricating watches and other delicate machinery. The oil is clean, sweet, odorless, never becoming rancid, consequently, is edible and useful in the manufacture of perfume, and hair dressings.

Its leaves and young branches are relished by livestock. Folia is eaten as green, in salad, vegetable, curries as pickles for seasoning, boiling, fried and soup. Moringa flowers also produce a good honey. The wood is light, but provides a fairy good fuel for cooking. It has a density of 0.5 – 0.7. The bark contains a gum that is used as a seasoning and a treatment for some stomach ailment and bladder ailment.
The plant is nitrogen fixing tree, but its fruits, flowers and leaves all contain 5 – 10% protein on average. All of these parts are eaten widely as vegetable, producing excellent food for both human and animals. The objectives of the research was therefore to assess the germination rate of Moringa oleifera seeds given three treatments under a controlled condition.

MATERIALS AND METHODS
The site selected for this experiment was the Departmental Nursery of Kano University of Science and Technology Wudil. The materials used to conduct the experiment were river sand, manure, polypots, local greenhouse, Moringa seeds, hot water, cold water, acid, mercury-in-glass thermometer, beaker, Petridishes, tissue paper, permanent marker and masking tape.

The soil was prepared in the ratio of 3:1 river sand and manure respectively. Watering was done once in a day early in the morning in order to avoid excessive loss of water through evaporation. The mixture of river sand and manure was watered for three days before sowing the seeds. The seeds were sown at 1cm depth and 0.5cm width. Each polypot contained one seed which means no thinning was carried out. The experiment lasted for six weeks and there were four treatments. The first treatment was treated with acid for 5 minutes. The second treatment was soaked in hot water of (35°C) overnight. The third one was also soaked in cold water of 100ml volume at a temperature of 29°C overnight. The last one which was the control was not treated with anything. The first three treatments were placed in a greenhouse and each of them contained 20 replications making 120 replications including the control. The temperature in the greenhouse was 34°C measured with mercury in glass thermometer and the seeds were sown and observed and the seedlings were measured and recorded in order to determine the height of the seedlings. The instrument used for measuring the height was a ruler.

Data Collection
The seeds were sown and observed every day to record the germination. After one week, each seedling was measured to determine its total height and the data were recorded weekly for a period of 8 weeks.

Tool of Analysis
The design used was completely randomized design (C.R.D) and this is because according to Little (1978) this design is only used in the experiment in which there is only one source of variation. The data collected were subjected to analysis of variance (ANOVA) to compute the treatment, total, error sum of squares and the f-calculated. Therefore, the value of f-calculated was used to compare with the value of f-tabulated to determine whether there is significant difference or not among the means of the four treatments in the experiment.

RESULT AND DISCUSSION

Table 1: Germination percentages (%) of Moringa seeds

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Germination Rate</th>
<th>Height (cm)</th>
<th>Collar Diameter (cm)</th>
<th>Number of leaves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Cold Water</td>
<td>15.0a</td>
<td>11.2a</td>
<td>0.5a</td>
<td>3.9a</td>
</tr>
<tr>
<td>Hot Water</td>
<td>7.0b</td>
<td>4.5b</td>
<td>0.3ab</td>
<td>3.2ab</td>
</tr>
<tr>
<td>Control</td>
<td>78.0c</td>
<td>8.7c</td>
<td>0.4ab</td>
<td>3.4ab</td>
</tr>
</tbody>
</table>

Means followed by the same letter in the same column are not significantly different (p ≤ 0.05).

Seed Germination and Early Seedling Development
Seed germination is initiated through rapid water uptake, followed by the activation of metabolic mechanisms leading to the first visual signs of germination known as the protrusion of the radical (Quintin, 2009). Thus, water plays a fundamental role in understanding seed biology, particularly germination and plant development. The principal factors influencing seed germination are temperature, water, oxygen and light. Temperature is the most important; as it affects both the germination percentage and germination rate [Quintin, 2009]. At 25 days after sowing, control (78%) and cold water (15%) showed the highest germination percentages, while seeds treated with hot water (7%) and acid (0%) occupied the least position. The highest germination percentage of 78.1% is in agreement with the results obtained by [Baye and Mapongmetsem, 2014; Yerima et al., 2016] in the sudano-sahelian zone of Cameroon, where 69.6% and 68% of seeds had germinated. The average percentages of germination of this plant in
India, West Africa and other zones of Cameroon, were all above those obtained in this study. Different pretreatments and differences in the agro ecological zones are likely responsible. Although, some scientific results show that soaking is an option for improving the Moringa seed germination, other reports consider it unnecessary [Padilla et al., 2012].

Seed priming improves germination and stand establishment and induces tolerance against adverse conditions like abiotic stress, especially during emergence and early seedling growth [Nouman et al., 2012]. The results demonstrate that acid treatments negatively influences the germination process as well as the post germination behavior which probably affects the establishment in the field. This could be due to the fact that seeds soaked for a long time, can undergo putrefaction due to fungi attack [Padilla et al., 2012]. The results obtained in this study when soaking duration is in conformity with those of the latter investigators. When the germination percentage was analyzed, the control (untreated seeds) attained 78.0%. This confirms that seeds of this plant achieve high germination in spite of pre-germination treatments [Quintin, 2009]. Watering of the germination bags every day by rain until field capacity was attained could be another factor influencing germination. Padilla et al., (2012) stated that the excess of humidity may provoke germination losses and diminishing of the root growth and the aerial part of some tree species like Moringa. Average heights of seedlings for cold water (11.3 cm), hot water (4.5 cm) and control (8.7 cm) were significantly different. Average numbers of leaves were all statistically similar; this is in contrast with the results of [Baye and Mapongmetsem, 2014] but in line with those of [Njehoya et al. 2014].

CONCLUSION AND RECOMMENDATION

Based on the findings of the experiment, the result obtained has shown that Moringa oleifera seed does not require any treatment if it is not stored for a long period of time under natural condition. This is because the seed does not contain any dormancy when it is new. In terms of percentage germination of the seed, control has the highest followed by the treatment treated with cold water, and hot water. Thus, to obtain the highest germination, the seed has to be sown without given any treatment to it.

REFERENCES


Otesile and Bakarr

Proceedings of 6th NSCB Biodiversity Conference; Uniuyo 2018 (180 - 182 pp)