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American Journal of Agriculture and Forestry
2022; 10(5): 156-159
http://www.sciencepublishinggroup.com/j/ajaf
doi: 10.11648/j.ajaf.20221005.11
ISSN: 2330-8583 (Print); ISSN: 2330-8591 (Online)

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To cite this article:
Sharda Dubey, Gaurav Kumar Padwar, Ramesh Sahu, Arun Kumar Shukla. *Moringa oleifera* [L.] Seed Quality Assessment as Impacted by Pre-Treatments of Sowing. *American Journal of Agriculture and Forestry*. Vol. 10, No. 5, 2022, pp. 156-159.
doi: 10.11648/j.ajaf.20221005.11

Received: July 30, 2022; **Accepted**: August 15, 2022; **Published**: September 5, 2022

Abstract: The Moringaceae family includes a fast-growing, evergreen species of *Moringa oleifera* commonly known as Shajan (nutrients dynamite) that is widespread throughout India. Studies on "*Moringa oleifera* L. seed quality assessment as impacted by pre-treatments of sowing" was carried out in Bilaspur, Chhattisgarh. The purpose of this study was to use 4 month old seeds soaking of *Moringa oleifera* to increase the germination percentage of the seeds, the germination period, get vigour seedlings, and improve growth that was defined by the best quality. *Moringa oleifera*/ which also examined the seed's morphology, pre-sowing treatment, germination patterns, moisture content, viability, seedling vigour index, volume index, and growth performance. The average seed length, breadth, weight per 100 seeds, moisture content per 100 seeds, and viability per 100 seeds were 16.33 mm, 7.45 mm, 28.98 g, 30%, and 92%, respectively. Significant changes for the aforementioned seed parameters were noted (CD = 0.05). When we treated the seeds, we discovered that Thiourea 5% produces the greatest results when compared to Thiourea 1% and 10%.. The Germination percent (GP), Germination value (GV), Mean germination time (MGT), Seedling vigor index (SVI), Plant height (cm), Collar diameter (mm), Volume Index, sturdiness quotient (SQ) and Root length was recorded were significant (p = 0.05).

Keywords: *Moringa oleifera*, Germination Percentage, Germination Value, Mean Germination Time, Moisture Content, Viability, Seedling Vigor Index

1. Introduction

Moringa oleifera is an evergreen, fast growing tree which is sometimes called as "Tree of Life" or "Miracle Tree or Drumstick or Sahajan belongs to the family Moringaceae [12]. A very common tree widely grown across India. The annual production of Moringa is about 2.20 to 2.40 million tonnes of tender fruits comes from an area of about 38,000 ha land leading to the productivity of around 63 tonnes per ha [2]. *Moringa oleifera* is an useful tree that every parts of the tree is useful as nutritional, Medicinal and it is also a good cattle fodder too, Apart from its high-quality nutritional value, it is rich in bioactive compounds such as phenolic compounds, stilbenes, curcuminoids, lignans, glucosinolates, carotenoids, tocopherols and phytosterols, among others coming from different parts [5]. The tree having small leaves, white flowers and seed pods which are long, slender and triangular in shape resembling drumsticks so this tree is also known as Drumsticks in English [11] The leaves, flowers and Pods are usually used as green vegetable and cattle fodder. It contain large amount of Iron so it increase strength and power. It is also helpful in the treatment of blood deficiency. They possess miraculous Health Benefits. Bark and Roots are also used as traditional medicines [10].

Seed testing was realized more than 100 years ago for assured planting values [15]. Germination is defined as the emergence and development from the seed embryo, of those essential structures, for the kind of seed in question, indicates its ability to produce a normal plant under favourable conditions. A germination test determines the percentage of

seeds that are alive in any seed lot. The level of germination in association with seed vigor provides a very good estimate of the potential field performance [4]. Seed testing is required to assess the seed quality attributes of the seed lots which have to be offered for sale. These quality attributes are seed moisture content, germination and vigour, physical and genetic purity, freedom from seed borne diseases and insect infestation. In India, seed testing is done mainly for moisture, germination and physical purity of seeds [8].

Seeds of many tree species germinate readily when subjected to favorable conditions of moisture and temperature. But most of the species exhibit delayed germination due to some degree of seed dormancy. Rapid, uniform, early and complete germination are the pre-requisites for raising seedlings on large scale for any plantation programme [14]. Seeds which are viable but in state of some dormancy, can be induced to germinate by various artificial pre-treatments to obtain high germination rate in short time. The pre-treatment of the seeds vary not only in the species but also with provenances, seed collection year, local nursery conditions and length and conditions of storage [13]. The seeds of most tree species are with soft outer cover, the embryo of such seeds can be awaken rapidly when exposed to warm moist environment and there is no need of any pre-treatment of these seeds before sowing [7]. Dormancy and the genotypic effects are the main reasons of variation in seed germination [6].

2. Materials and Methods

2.1. Study Area

The study of "*Moringa oleifera* L. seed quality assessment as impacted by pre-treatments of sowing" was carried out in Bilaspur Chhattisgarh, situated in 22.12° North and 82.13° east, soil type of the site is sandy to loam. The average temperature of the area is 29.5°C, annual rainfall is about 58 cm. The seeds were collected randomly from the growing site of Bilaspur, Chhattisgarh, during the month of April- May. Experiments were carried out using mature fresh Seeds. Seeds were planted on the nursery raise bed. The *Moringa* seed is shown in A, 100 seeds are shown in B, and the tallest plant is shown in C.

(A)

(B)

(C)

Figure 1. *Tallest Seedling of Moringa after 3 months.*

Seed germination was recorded daily to a minimum of 28 days or until there was no further germination. The weeding, cleaning and watering of raise bed were done manually when needed till the completion of the experiment. A was considered germinated when plumed protruded one mm above the soil surface. The raised beds were arranged RBD design with three replications. Experiments were carried out using mature four month old Seeds. Seeds were planted on the nursery raise bed.

2.2. Seed Pre-Sowing Treatment

Pre-sowing treatment studies was carried out in nursery. The sample of three hundred seeds per treatment (three replications of 100 seeds of each treatment) was taken for study in nursery, 8 pre-sowing treatments were employed, as mentation below:

T1-Seeds without any treatment (control), T2- Seeds soaked in normal water for 12 hours, T3 - Seeds soaked in Thiourea 1% for 12 hours, T4 Seeds soaking in Thiourea 5% for 12 hours, T5- Seeds soaking in Thiourea 10% for 12 hours, T6- Seeds soaking in KNO_3 1% for 12 hours, T7- Seeds soaking in KNO_3 5% for 12 hours, T8-Seeds soaking in KNO_3 10% for 12 hours.

After each pre-treatment the seeds were sown in nursery raised beds for germination test in the nursery and the following parameters were recorded as given below:

Seed weight (g), Seed size (mm), Seed viability (%), Seed moisture content (%), Germination percent (GP), Germination value (GV), Mean germination time (MGT),

Seedling vigor index (SVI), Plant height (cm), Collar diameter (mm), Root- Shoot ratio, Volume Index, sturdiness quotient (SQ) and Root length.

3. Result and Discussion

The present investigations on "*Moringa oleifera* L. seed quality assessment as impacted by pre-treatments of sowing" were carried out to study the extent of pre-treatments of *Moringa oleifera* seeds. The results obtained from the present study are presented Figure 2 and Table 1.

The mean values of morphological parameters of seeds are presented in Figure 2. The length of seed recorded mean value of 16.33 mm, and width of the seed were recorded 7.45 mm, and mean value of seed weight were recorded 28.98 g and seed viability was recorded 92% and seen color was recorded mature fruit black to brown. Our findings are well in conformity with the findings of Arun, K. P. et al. [3] who reported the seed weight of 30 g, and viability 95%. Seed parameters were significant (p = 0.05).

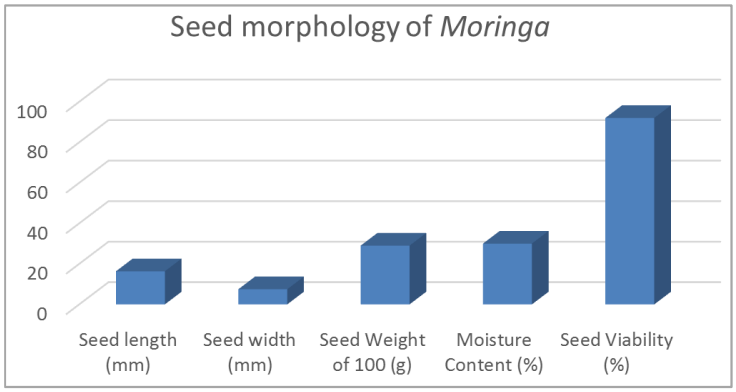

Figure 2. *Seed morphology of Moringa oleifera.*

Effect of pre-treatment on seed germination and seedling growth performance of *Moringa oleifera*

Data pertaining to the pre-treatment of seeds of *Moringa oleifera* with respective pre-treatments have been furnished in the table 1. Seeds of *Moringa oleifera* were pretreated with different pre-treatments viz. soaking seeds in Thiourea 1%, 5% and 10% for 12 hours, soaking seeds in KNO_3 1%, 5% and 10% for 12 hours, soaking seeds in normal water for 12 hours and control (no pre-treatment) to observe their effects on germination percentage, germination value, mean germination time. Germination potential of all seeds differed significantly due to pre-treatments.

Table 1. *Effect of pre-treatment on seed germination and seedling growth performance of Moringa oleifera.*

Name of Treatments	Germination percentage (%)	Germination value	Mean germination time (days)	Plant height	Collar Diameter	Root Length	Root Shoot ratio	sturdiness quotient (SQ)	Volume Index	Seedling vigor Index
Water	77.00^{bc}	8.34^{a}	17.55^{cde}	92.11^{b}	5.64^{d}	8.53^{d}	0.093	16.33^{a}	2929.98^{f}	7092.47^{b}
Control	67.77^{e}	5.15^{c}	18.55^{bcd}	82.22^{d}	6.56^{c}	9.37c	0.114	12.53^{c}	3538.22^{d}	5572.05^{g}
Thiourea 1%	75.33^{c}	7.24^{ab}	19.52^{b}	85.33^{cd}	6.04^{cd}	10.43^{b}	0.122	14.13^{b}	3112.97^{e}	6427.91^{e}
Thiourea 5%	81.67^{a}	7.57^{a}	21.39^{a}	103.45^{a}	8.49^{a}	12.75^{a}	0.123	12.18^{c}	7456.69^{a}	8448.76^{a}
Thiourea 10%	79.33^{ab}	8.48^{a}	16.85^{de}	86.34^{c}	7.36^{b}	8.62^{d}	0.100	11.73^{d}	4677.00^{c}	6849.35^{c}
KnO_3 1%	78.67^{b}	8.47^{a}	19.01^{bc}	83.59^{cd}	7.48^{b}	7.55^{e}	0.090	11.18d	4676.89^{c}	6576.03^{d}
KnO_3 5%	79.33^{ab}	7.47^{a}	17.86^{bcd}	82.13^{d}	7.58^{b}	7.97^{e}	0.097	10.84e	4718.89^{b}	6515.37^{d}
KnO_3 10%	71.67^{d}	5.99^{bc}	15.89^{e}	85.47^{cd}	7.42^{b}	9.54^{c}	0.112	11.52^{d}	4705.67^{b}	6125.63^{f}
Mean	76.34	7.33	18.32	87.61	7.07	9.34	0.106	12.55	4477.04	6700.95
CV (%)	2.044	11.14	5.49	2.43	4.88	2.75	1.11	2.34	11.48	12.98
CD (p=0.05)	2.733	1.43	1.76	3.74	0.605	0.452	NS	2.17	5.45	6.55

Thiourea 5% produced the highest recorded germination percentage of 81.67%, the lowest performance was recorded 67.77% in control treatment, Our findings are quite consistent with those of Hala, H. et al. [9] and the mean germination percentage was recorded at 76.34%. Thiourea 10% 8.48 had the highest reported germination value, which was followed by KNO_3 1% 8.47. 5.15, a control value, was shown to be the lowest germination value. The average across all treatments is 7.33. Thiourea at 5% had the highest mean germination time 21.39, while KNO_3 at 10% had the lowest 18.89, and the mean germination time for pre-treatments was 18.32. After three months of seeding, the plant measured 103.45 cm in height, with the lowest KNO_3 concentration measuring 82.13 percent and the mean plant height measuring 87.61%. Thiourea 5% and lowest Thiourea 1% 6.04 and 8.49 mm collar diameter. Root length of Thiourae 5% is highest 12.75 cm and KNO_3 1 percent is lowest 7.55 cm, and a mean value of 9.34 cm for all treatments were reported for the length of the roots. Volume Index of Thiourea 5% was recorded 7456.69 and lowest by 2929.98 in water treatments and mean of the volume index is recorded 4477.04. Seedling vigor Index was highest recorded in Thiourea 5% 8448.76 and lowest in Control treatment

which is 5572.05 and mean value is 6700.95. Sturdiness quotient (SQ) was highest recorded in Water treatments which is 16.33 and lowest 10.84 in KNO_3 5% and mean performance of Sturdiness quotient (SQ) is 12.55. Our findings are quite consistent with those of [1]. The Germination percent (GP), Germination value (GV), Mean germination time (MGT), Seedling vigor index (SVI), Plant height (cm), Collar diameter (mm), Volume Index, sturdiness quotient (SQ) and Root length was recorded were significant (p= 0.05).

4. Conclusion

Studies on "*Moringa oleifera* L. seed quality assessment as impacted by pre-treatments of sowing" was carried out 4 month old seeds of *Moringa oleifera*, I evaluate the germination behaviour, moisture content, viability, seedling vigour index, volume index, and seedling growth performance of *Moringa oleifera* using the characteristics listed above. Morphological data, such as average seed length, width, weight per 100 seeds, moisture content, and viability, were noted. 28.98 g, 7.45 mm, 16.33 mm, 30%, and 92 percent Significant changes for the aforementioned seed parameters were noted (CD=0.05). As we treated the seed, we discovered Compared to Thiourea 1% and 10%, Thiourea 5% produces the best results.

Authors' Contribution

Sharda Dubey: Conceptualization, Writing review and editing, Graphical presentation, Data Analysis Gaurav Kumar Padwar: Formal Analysis, Visualization editing and Ramesh Sahu: References, Editing, and Visualization.

Conflict of Interest

The authors declare no conflict of interests.

Consent to Publish

All authors agree to publish the paper.

Acknowledgements

Authors are thankful to the Department of the Forestry, Faculty of Natural Resources, Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh India, providing necessary laboratory facilities. Author, Sharda Dubey, is also grateful to parents and friends helped me a lot.

References

[1] Ahmad, T. A., Ahmad, F. K., Rasul, K. S., Aziz, R. R., Omer, D. A., Tahir, N. A. R., & Mohammed, A. A. (2020). Effect of some Plant Extracts and Media Culture on Seed Germination and Seedling Growth of *Moringa oleifera*. *Journal of Plant Production*, *11* (7), 669-674.

[2] Aransiola, E. F., Ehinmitola, E. O., Adebimpe, A. I., Shittu, T. D., & Solomon, B. O. (2019). Prospects of biodiesel feedstock as an effective eco-fuel source and their challenges. *Advances in Eco-Fuels for a Sustainable Environment*, 53-87.

[3] Arun, K. P., Sujatha, K., Geetharani, P., Renganayaki, P. R., & Sundareswaran, S. (2021). Standardization of quick viability and test weight protocol for *Moringa oleifera* L. Var. PKM. *Pharma Innovation Journal* 10 (10): 2547-2549.

[4] Bewley, J. D. (1997). Seed germination and dormancy. *The plant cell*, 9 (7), 1055.

[5] Coppin, J. (2008). A study of the nutritional and medicinal values of *Moringa oleifera* leaves from sub-Saharan Africa: Ghana, Rwanda, Senegal and Zambia (Doctoral dissertation, Rutgers University-Graduate School-New Brunswick).

[6] Doran, J. C. and Gunn, B. V. 1986. Treatments to promote seed germination in Australian *Acacia* Spp. in Developing Countries. Proceedings of ACIAR No. 16, *Queens land,* pp. 57 -63.

[7] FAO. 1985. A Guide to Forest Seed Handling: with special reference to tropics. FAO forestry paper No. 20/2. FAO, Rome, pp. 379.

[8] Halmer, P. (2000). Commercial seed treatment technology. Seed Technology and Its Biological Basis. Sheffield Academic Press, Sheffield, England, 257-286.

[9] Hala, H., El-Noor, A., & Ewais, N. A. (2017). Effect of *Moringa oleifera* leaf extract (MLE) on pepper seed germination, seedlings improvement, growth, fruit yield and its quality. *Middle East J Agric Res*, *6*, 448-63.

[10] Meireles, D., Gomes, J., Lopes, L., Hinzmann, M., & Machado, J. (2020). A review of properties, nutritional and pharmaceutical applications of *Moringa oleifera* integrative approach on conventional and traditional Asian medicine. *Advances in Traditional Medicine,* 20 (4), 495-515.

[11] Patel, S., Thakur, A. S., Chandy, A., & Manigauha, A. (2010). *Moringa oleifera* a review of their medicinal and economic importance to the health and nation. Drug invention today, 2 (7), 339-342.

[12] Patnaik, N. (1993). The Garden of Life. An Introduction to the healing plants of India, New York.

[13] Phartyal, S. S., Thapliyal, R. C., Koedam, N., & Godefroid, S. (2002). Ex situ conservation of rare and valuable forest tree species through seed-gene bank. *Current Science*, 1351-1357.

[14] Rodriguez, M. V., Barrero, J. M., Corbineau, F., Gubler, F., & Benech-Arnold, R. L. (2015). Dormancy in cereals (not too much, not so little): about the mechanisms behind this trait. *Seed Science Research*, 25 (2), 99-119.

[15] Shiferaw, B. A., Kebede, T. A., & You, L. (2008). Technology adoption under seed access constraints and the economic impacts of improved pigeonpea varieties in Tanzania. *Agricultural Economics*, 39 (3), 309-323.