



Influence of different Pre-sowing treatments on Germination potential of Bakul (*Mimusops elengi* L.)

A.N.Dey¹, N. Bhowmick*², A. Chakraborty², K. Dey² and A. Ghosh³

¹Department of Forestry

²Department of Pomology and Post-harvest Technology

³Department of Agricultural Statistics

Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar – 736165, West Bengal

* Corresponding author's Email: nileshbhowmick@gmail.com

ABSTRACT

An experiment was carried out in the Department of Forestry, Uttar Banga Krishi Viswavidyalaya, Cooch Behar to study the influence of different pre-sowing treatments on seed germination of bakul (*Mimusops elengi* L.), an evergreen tree species belonging to family Sapotaceae. The present experiment was focused on the pre-sowing treatments for breaking dormancy of this species which hindered germination by the presence of a hard seed coat comprising of nine treatments and three replications following randomized block design. Among the different pre-sowing treatments, 0.5% thiourea and 1% potassium nitrate recorded maximum germination percentage (85%). Least mean germination time (30.96 days) was also found in seeds treated with 0.5% thiourea.

Keywords: Seed dormancy, Thiourea, KNO₃, Germination percentage

Received 17.01.2021

Revised 15.03.2021

Accepted 31.03.2021

INTRODUCTION

Organization of government and non-government has been focusing the local or indigenous plant species which are eco-friendly and environmentally safe in nature since last decade. This endeavour has increased the potentiality to search the local, indigenous and underutilized species which are high demand and multiple uses. Among the number of different species, Bakul (*Mimusops elengi* L.), commonly known as Maulsari, is an evergreen tree belonging to the family of Sapotaceae. It occurs in moist evergreen forests of Western Ghats, dry evergreen forests of the Eastern Ghats, also in Andamans, Myanmar and Sri Lanka [5]. It is native to India but is commonly planted as an ornamental tree throughout the tropics [4]. It is also grown as avenue tree throughout the greater parts of India. In West Bengal it is widely planted in roadside, parks and garden as avenue tree for its fragrant flowers and elegant looks due to its round spherical crown.

The tree has a long history of being used in traditional medicine. The bark extract is administered orally to cure gum and teeth diseases, stomachic and cardiogenic, biliousness as an anthelmintic [18]. Bark extract showed moderate inhibitory activity against HIV type I protease and non-significant activity against herpes simplex virus type I [15]. Flower extract is given orally to adults to cure oleaginous blood diseases, heart diseases, leucorrhoea, menorrhagia and bowel disorders, and also is used as antidiuretic, antipyretic. The young twigs are used for cleaning teeth. The bark, flowers, fruits and seeds are astringent, cooling, anthelmintic and febrifuge [20]. Ripe fruits are edible and given orally to pregnant women to promote delivery and sometimes used as an abortifacient [10, 11]. The wood is very hard and used for general construction work, house building material, furniture, cabinet works, tools bridges, carts, boats, musical instruments and walking sticks [21]. Seed kernel yields 16-25% of fatty oil and used for lighting purposes [16]. In certain parts of West Bengal, the bark is used either by itself or mixing with *Terminalia tomentosa* for dyeing purposes [19].

Despite the long history of medicinal uses and high global and domestic demands for the preparation of various drug formulation and other multiple uses, the information regarding the seed germination of this species varies from region to region because of the hard seed coat, low germination and have shorter period of viability of seeds though the seed production potential varies from medium to heavy on the basis of climatic condition. Application of pre-sowing treatments are necessary to improve seed germination by subjecting the various treatments like soaking in cold water, acid scarification, use of

chemicals and growth regulators etc. Several studies conducted on various pre-treatments on seed germination of this species by different workers [14, 17, 2, 3]. The present paper is an attempt to examine the influence of different pre-sowing treatments for enhancing the seed germination of this important plant.

MATERIAL AND METHODS

The experiment was conducted in the Central Forest Nursery, Department of Forestry, Uttar Banga Krishi Viswavidyalaya, Pundibari during 2017-18 and 2018-19. After observing the physiological maturity of fruits, Fresh mature fruits were collected from the campus and nearby areas of the university. The fruits were processed for de-pulping manually to extract seeds. The seeds were then washed in running tap water and dried in shade at ambient room temperature for 2 days. The experiment was laid out in randomized block design with 9 pre-sowing treatments and four replications with 100 seeds per replication. The treatments were, namely: T₁ - control (no treatment); T₂ - soaking in cold water for 24 hours; T₃ - soaking in 0.5% thiourea for 24 hours; T₄ - soaking in 1% thiourea for 24 hours; T₅ - soaking in 3% thiourea for 24 hours; T₆ - soaking in 0.5% KNO₃ for 24 hours; T₇ - soaking in 1% KNO₃ for 24 hours; T₈ - soaking in 3% KNO₃ for 24 hours and T₉ - soaking in cowdung slurry for 24 hours. The seeds were sown with 10 seeds per line in nursery bed comprising well pulverized soil along with FYM and sand in the ratio of 1:1:1. Observation on seed germination was recorded from the date of the sowing upto 42 days and the following parameters were recorded as mentioned. Germination percentage (%) = (Number of seeds germinated/Total number of seeds sown) X 100. Germination value (GV) was determined as per method of Czabator [6] and calculated by the formula $GV = (\text{Final value of daily germination speed} \times \text{Peak value of germination speed})$. Germination energy was determined by taking per cent of seeds which germinated upto 30 days [9]. Mean germination time in days (MGT) = $\Sigma(nt)/\text{number of seeds sown}$ where n = number of seeds newly germinating at time, t days from sowing. Un-germinated seeds at the end of the test period were given values of n +1, where n = number of days in the test [8]. Rate of germination 50 (RG₅₀) is the reciprocal of the time taken for 50% of seed germination. Oneway ANOVA for each parameter was performed using OPSTAT software. Mean separation for different treatment under different parameters were performed using Critical Different (CD) test (P≤0.05). Angular data transformation was done following the method of Gomez and Gomez [13].

RESULT AND DISCUSSIONS

The data (pooled) regarding the germination percentage, germination value, germination energy, mean germination time and RG₅₀ was presented in Table 1. The results of ANOVA showed that the differences in germination percentage, germination value, germination energy, mean germination time and RG₅₀ were statistically significant under different treatments (P≤0.05). Among the different treatments, seeds treated with both, 0.5% thiourea (T₃) and 1% KNO₃ (T₇) exhibited significantly maximum germination (85%) followed by 1% thiourea (T₄) treatment (81%) over T₁ - control (69%). Seeds soaked in 3% KNO₃ (T₈) and cow dung slurry (T₉) recorded the same value of germination (79%) while 78% germination was exhibited in cold water treatment (T₂). Highest (80.75%) germination energy was recorded in 1% KNO₃ treated (T₇) seed followed by (T₃) 0.5% thiourea (80%) where as minimum (66%) was observed in (T₁) control. Maximum germination value (4.35) was obtained in T₃ (soaking in 0.5% thiourea) followed by T₇ (4.26) in soaking of 1% KNO₃ where as lowest germination value (2.80) was obtained in T₁ (control). Least mean germination time (30.96 days) was recorded in T₃ (soaking in 0.5% thiourea) followed by T₇ (31.90 days) while most mean germination time (33.67 days) was observed in control. Seeds treated with cold water (T₂), soaking in 0.5% thiourea (T₃), soaking in 1% thiourea (T₄) and soaking of 3% KNO₃ (T₈) were optimum with RG₅₀ of (0.035) slightly higher than other treatments lower RG₅₀ (0.033) was recorded in T₅ (soaking in 3% thiourea).

Promotion of germination by using thiourea might be due to acidification and loosening of the cell wall which eroded the seed coat and improved the permeability. Potassium nitrate raised the ambient oxygen levels by making less oxygen available for citric acid cycle. It also maintained hormonal balance and reduced seed growth inhibitors such as abscisic acid and decreased C6/C1 ratio of CO and changing metabolic pathway which caused breaking of physiological seed dormancy present in the seed and enhanced germination percentage [1, 3, 7]. Treating the seeds with cold water and cow dung slurry might have soften the hard seed coat [14] but the percentage of seed germination could not achieved to the highest level like other treatments. Germination energy is an indicator of speed of germination and it is believed that the seeds which germinate rapidly and vigorously under favourable conditions are likely to be having the capacity of producing vigorous seedlings under unfavourable field condition also [14]. Reduction of mean germination time by using thiourea might be due to acidification and loosening of the cell wall which eroded the seed coat and improved the permeability, resulting less mean germination

time. Potassium nitrate neutralized or nullified the inhibition by creating a balance between hormonal ratios in seed and reducing the growth preventing materials, like ABA, which relieved dormancy and reduced mean germination [1, 10, 11].

Table 1: Effect of different pre-sowing treatments on germination of *Mimusopselengi* L. seeds (Pooled data)

Treatments	Germination percentage (%)	Germination energy (%)	Germination value	Mean germination time (Days)	RG ₅₀
T ₁ - Control	69.00 (56.17)	66.00 (54.33)	2.80	33.67	0.034
T ₂ - Cold water soaking for 24 hours	78.00 (62.03)	74.38 (59.66)	3.63	32.01	0.035
T ₃ - Soaking in 0.5% Thiourea for 24 hours	85.00 (67.21)	80.00 (63.44)	4.35	30.96	0.035
T ₄ - Soaking in 1% Thiourea for 24 hours	81.00 (64.16)	77.50 (61.68)	3.78	32.03	0.035
T ₅ - Soaking in 3% Thiourea for 24 hours	77.50 (61.68)	74.38 (59.66)	3.55	33.00	0.033
T ₆ - Soaking in 0.5% KNO ₃ for 24 hours	72.00 (58.10)	70.00 (56.79)	3.09	33.55	0.034
T ₇ - Soaking in 1% KNO ₃ for 24 hours	85.00 (67.21)	80.75 (64.12)	4.26	31.90	0.034
T ₈ - Soaking in 3% KNO ₃ for 24 hours	79.00 (62.72)	75.75 (60.68)	3.68	32.19	0.035
T ₉ - Soaking in cow dung slurry for 24 hours	79.00 (62.72)	76.88 (61.47)	3.68	32.54	0.034
S.Em(±)	1.078	1.129	0.134	0.236	0.000
CD (0.05)	3.164	3.315	0.392	0.693	0.001

*Values in the parenthesis are arc-sine transformed values.

CONCLUSION

In the present study, seeds of *Mimusopselengi* treated with 0.5% thiourea and 1% KNO₃ resulted in higher germination percentage, germination value and germination energy when compared with control. Therefore these pre-sowing treatments may be recommended for experiment or seedling production programme of this important forest trees for future multiplication and propagation.

REFERENCES

1. Ali, T., Hossein, P., Asghar, F. & Chahkooi, S.Z. (2010). The effect of different treatments on improving seed germination characteristics in medicinal species of *Descurainiasophia* and *Plantagoovata*. *African Journal of Biotechnology*.9: 6588-6593.
2. Bahar, N. (2016). Effect of fruit maturation on germination and vigour of Bakul (*Mimusopselengi* Linn) seeds. *Indian Forester*.142 (9):858-861.
3. Bhan, S. & Sharma, N.C. (2011). Effect of seed stratification and chemical treatments on seed germination and subsequent seedling growth of wild apricot (*Prunus armeniaca*L.). *Research Journal of Agricultural Science*.2: 13-16.
4. Burkill, H.M. (2000). The useful plants of West Tropical Africa, 2nd edition, volume - 5, Families S-Z, Addenda, Royal Botanic Garden, Kew Richmond, United Kingdom.
5. Chacko, K., Pandalai, R.C., Seethalakshmi, K. K., Mohanan, C., Mathew, G. & Sasidharan, N. (2002). *Manual of Forest Trees, Bamboos and Ratans in Kerala*. KFRI Publication. KFRI, Peechi.
6. Czabator, F. (1962). Germination value: an index combining speed and completeness of pine seed germination. *Forest Science*.8:386-396.
7. Dey, A. N. (2011). Provenance variation in seed and seedling characteristics of *Gmelina arborea* Linn (Roxb.). Ph. D. Thesis, H.N.B. Garhwal University, Srinagar (Garhwal), Uttarakhand.
8. Dey, K., Ghosh, A., Dey, A.N., Bhowmick, N. & Bauri, F.K. (2016). Studies on seed germination and seedling behaviour of Indian hog-plum (*Spondias pinnata*) in response to different pre-sowing treatments. *Seed Science & Technology*.44(3): 1-5.
9. FAO (1985). A Guide to Forest Tree Seed Handling. FAO Forestry Paper No. 20/2. Food and Agricultural Organizations, Rome, pp379.
10. Gami, B. 2007. Evaluation of pharmacognostic and antihemorrhoidal properties of *Mimusopselengi* Linn. Ph.D. Thesis. Veer Narmad South Gujarat University, Gujarat.
11. Gami, B., Parabia, M. & Kothari, I.L. (2010). Pretreatment effects on germination of *Mimusopselengi* L. *Seed technology*.32(2): 138-144.

12. Ganaie, A.K., Aslam, S. & Nawchoo, A.I. (2011). No chilling obligation for germination in seeds of *Arnebiabenthamii*: A critically endangered alpine medicinal plant of north-west Himalayas. *International Journal of Biodiversity Conservation*.3: 155-159.
13. Gomez, K.A. & Gomez, A.A. (1983). *Statistical Procedures for Agricultural Research*, John Wiley and Sons, New York, USA.
14. Hegde, R., Sridhar, K.B., Barun, K., Srinath, P.B. & Suresha, N.L. (2009). Effect of ecofriendly seed treatments on germination of *Mimusopselegi* L. *Indian Journal of Forestry*.12(1): 69-70.
15. Hitesh, K.D., Deepika, G., Bharat, P., Sahil, K. & Shashpal (2011). *In vitro* anthelmintic activity on aqueous and ethanol extracts of *Mimusopselegi* L. bark. *Pharmacologyonline*.3:740-746.
16. Mandal, B & Maity, C.R. (1991). Studies of the oil of *Mimusopselegi* seed. *Acta Alimentaria Budapest*.20(2): 103-107.
17. Nayagam, J.R. & Varghese, K.I. (2015). Germination pattern and root trainer performance of *Mimusopselegi* L. *South Asian Journal of Experimental Biology*.5(3): 94-100.
18. Rajkumara, S., Pandiselvi, A. & Sandhiya, G. (2012). Isolation of chemical constituents from *Mimusopselegi* bark and evaluation of anti-inflammatory activity. *International Journal of Phytopharm Research*.3(1):9-15.
19. Ranjana, B., Saikia, C.N. & Das, K.K. (2004). Extraction and identification of colour components from characteristics on wool. *Indian Journal of Fibre and Textile Research*.29(4):470-476.
20. Shah, P.J., Gandhi, M.S., Shah, M.B., Goswami, S.S. & Santani, D. (2003). Study of *Mimusopselegi*, bark in experimental gastric ulcers. *Ethnopharmacology*.89:305-311
21. Troup, R.S. (1921). *The Silviculture of Indian Trees*; Vol. II, Leguminosae – Verbenaceae. Clarendon Press, Oxford, U. K. p 637 – 638.

S

CITATION OF THIS ARTICLE

A.N.Dey, N. Bhowmick, A. Chakraborty, K. Dey and A. Ghosh. Influence of different Pre-sowing treatments on Germination potential of Bakul (*Mimuso pselegi* L.). *Bull. Env. Pharmacol. Life Sci.*, Vol 10[5] April 2021: 163-166.