



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2025): 5.20
www.agronomyjournals.com
2025; 8(8): 110-114
Received: 21-06-2025
Accepted: 25-07-2025

Kirti Markam

Department of Forest Biology and
Tree Improvement, Mahatma
Gandhi Udyanikee Evam Vanikee
Vishwavidyalaya, Sankara, Patan,
Durg, Chhattisgarh, India

Damini Sharma

Assistant Professor of Department
of Forest Biology and Tree
Improvement, Mahatma Gandhi
Udyanikee Evam Vanikee
Vishwavidyalaya, Sankara, Patan,
Durg, Chhattisgarh, India

Amit Dixit

Professor of Department of
Vegetable Science, Mahatma
Gandhi Udyanikee Evam Vanikee
Vishwavidyalaya, Sankara, Patan,
Durg, Chhattisgarh, India

Dharampal Nag

Department of Farm Forestry,
Sant Gahira Guru
Vishwavidhyalaya, Sarguja,
Ambikapur, Chhattisgarh, India

Neha Minj

Post Graduate in Masters Forestry,
Indira Gandhi Krishi
Vishwavidyalaya, Raipur,
Chhattisgarh, India

Corresponding Author:

Kirti Markam

Department of Forest Biology and
Tree Improvement, Mahatma
Gandhi Udyanikee Evam Vanikee
Vishwavidyalaya, Sankara, Patan,
Durg, Chhattisgarh, India

Assessment of effect of different pre sowing treatment on seed of *Terminalia chebula* Retz

Kirti Markam, Damini Sharma, Amit Dixit, Dharampal Nag and Neha Minj

DOI: <https://www.doi.org/10.33545/2618060X.2025.v8.i8b.3597>

Abstract

Terminalia chebula Retz., commonly known as Harar or Black Myrobalan, is a medicinally significant tree species valued for its therapeutic and commercial applications. However, its natural regeneration is severely limited due to hard seed coats, poor kernel development, and physical dormancy, resulting in low germination rates. This study was conducted to assess the effect of various pre-sowing treatments on seed germination behavior of *T. chebula*. Six treatments were tested: control (T0), soaking in cold water for 24 hours (T1) and 48 hours (T2), soaking in cow dung slurry for 24 hours (T3), mechanical scarification (T4), and seed pelleting (T5). The experiment, laid out in a Completely Randomized Design (CRD) with three replications of 16 seeds each, was carried out in the Mohla-Manpur-Ambagarh Chowki district of Chhattisgarh, India. Results indicated significant differences among treatments in terms of days to seedling emergence, germination percentage, mean daily germination, peak value, and germination value. Mechanical scarification (T4) was the most effective treatment, resulting in the highest germination percentage (72.91%), shortest emergence time (17.33 days), and highest germination value (0.30). Soaking seeds in cold water for 48 hours (T2) also showed promising results. The study concludes that mechanical scarification is the most effective and practical pre-sowing treatment to enhance germination performance in *T. chebula*, aiding in its propagation and conservation.

Keywords: Pre sowing treatment, dormancy, seed germination, natural regeneration

Introduction

Terminalia chebula Retz., is generally referred to as Harar, and in English, as Black Myrobalans it is native to South East Asia and India and is a member of the Combretaceae family. Its commercial name is chebolic myrobalans. Dark brown bark exfoliates in irregular woody scales and distinguishes this tree, which develops to be 10-15 meters tall. Pubescent leaves are ovate, oblong, and obtuse at the apex, with a rounded base. It thrives well in the temperature range of 32°C to 45°C and rainfall of 900 mm to 2500 mm. It withstands fire and has good power of recovery from burning. It coppices fairly well. Flowers are greenish-white, bisexual and fragrant in terminal spikes from April to August. Entomophiles open pollination is the usual mechanism of mating in most of the species belonging to the genus *Terminalia* including *Terminalia chebula* (Singh *et al.*, 2003) [19]. *Terminalia chebula*, is a worldwide used ethnomedicinal plant. It is a rich source of hydrolyzable tannins such as chebolic acid, chebulagic acid, gallic acid, corrilagin and alkaloids which are extensively utilized in the development of non-toxic therapeutic herbal drugs. Fruits are greenish-yellow, ovoid, and ripen between November and March. The stone is very thick, bone grooved with gum capillaries on the wall. The 250 species that make up the genus *Terminalia* are mostly found in tropical regions of the world. One of the multifunctional and therapeutic agroforestry tree species. Along with the fruits of *Terminalia bellirica* and *Embllica officinalis*, this fruit is a key ingredient in "Triphala," which is used in ayurvedic remedies, and "chayvanprash," which is used as a dietary supplement and tonic. The species produces the main tannin that is valuable to the market. A significant source of tannin (25-32%) is *T. chebula*. The unripe fruit is used to cure diarrhea and dysentery since it is astringent and aperient in nature. Dry fruits that have been finely ground are used as a dentifrice, while coarsely ground fruits are smoked in a pipe to relieve asthma. Ash combined with butter

makes a wonderful sore salve, and fruit is given in conjunction with other medications to treat snakebite (Hukkeri *et al.*, 2010) [9]. *Terminalia chebula* fruit is revered by other traditional healers and is regarded as the "king of medicines" by Tibetans and ayurvedic apothecaries (Saleem *et al.*, 2002) [16].

The first stage of a plant's life cycle, known as seed germination, starts when a dry, dormant seed absorbs water and is finished when the radicle emerges from the seed coat. According to Chandra *et al.* (2024), seed germination is a complicated process that incorporates several signals and is impacted by both internal and external variables. Imbibition, in which the seed takes water, is the first step in the complex biological process of germination. Enzymes are then triggered to transform starches into sugars, giving the embryo the essential resources it needs (Tiwari *et al.*, 2024). The radicle's enlargement, which signals the beginning of growth, is the first sign of germination. The size of the seed determines how long it takes for seedlings to appear. Larger seeds may stretch their epicotyl to the surface and germinate at deeper depths because they have larger nutritional stores. However, smaller seeds usually develop closer to the surface and emerge more quickly. Despite their many applications, chebula trees are endangered, which is the primary reason for the sharp decline in their numbers across the globe. Chebula seeds have a low germination rate in the field because of their hard endocarp, thick endocarp shell, and poor kernel development (Troup, 1921) [22]. Another aspect is seed dormancy, which inhibits seed germination even when favourable germination conditions, such as soil moisture and temperature, are provided.

Materials and Methods

Study site

During the months of April to June 2025, experiments have been conducted in area of Mohla-Mapur-Ambagarh Chowki District. The district was located between 20.59°N, 80.75°E. The Mohla-Manpur-Ambagarh Chowki district in Chhattisgarh, India, covers an area of 2145.29 square kilometers. Summers (April to June) are particularly hot, with temperatures potentially reaching 48 °C (100°F). The monsoon season brings significant rainfall, and the district is also prone to droughts and harsh summers.

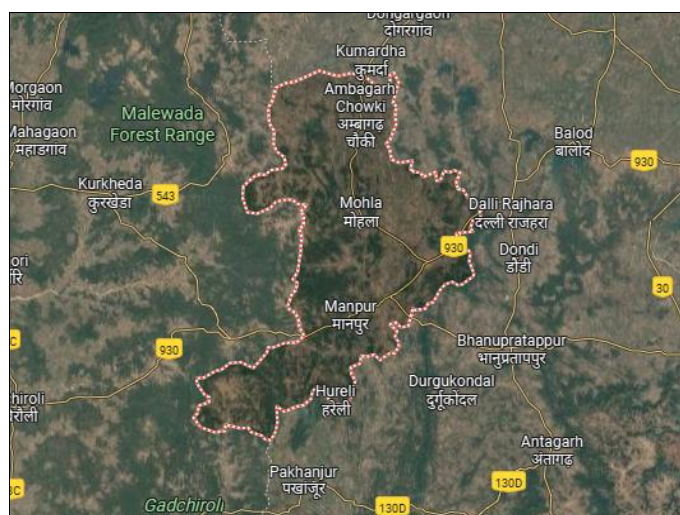


Fig 1: Geographical location of Mohla-Manpur-A.Chowki, Chhattisgarh.

Seed collection area

Seeds were collected from the forest stands of Balod district

locally, Chhattisgarh. The seeds were collected in the month of January and February 2025.

Pre-sowing treatments

Seeds of *Terminalia chebula* were treated to six different pre-sowing treatments to assess the germination behaviour of seeds in different treatments. Table 1 lists the specifics of six different treatments.

Table 1: Different methods of pre-sowing treatments

Notation	Treatment
T0	Control
T1	Soaked in cold water for 24 hours
T2	Soaked in cold water for 48 hours
T3	Soaked in cow dung slurry for 24 hour
T4	Mechanical Scarification
T5	Seed Pelleting

Experimental Design

The germination test was set up in a complete randomized design (CRD). Three replications were used for each of the six treatments, which included a control. For each replication, 16 seeds were planted in poly bags at the nursery (one seed per Poly bag) to examine the impact of pre-sowing interventions on *Terminalia chebula* seed germination. For the experiment, 48 seeds from each treatment were sampled and sowed in polybags. To investigate the germination behavior of *Terminalia chebula* seeds, the following observation was made. Daily observations of germination following seed sowing in the nursery. The seedling emergence count was determined when the seedling appeared after being sown. Both the number of days and the number of seedlings that had completely emerged above the soil surface were noted.

Germination percent

Germination of seeds in each treatment was recorded daily up to 90 days. The seeds were considered as germinated when the cotyledonary leaves emerged out of the soil. From the daily germination count, percent seed germination was recorded.

Germination percentage = $(\text{Number of seeds germinated} \times 100) / (\text{Number of seeds sown})$

Mean daily germination (%) = $(\text{Cumulative percent germination}) / (\text{Total number of days})$

Peak value (PV) = Maximum mean daily germination reached at any stage of the germination period.

Germination value = Mean daily germination X peak value



Fig 2: Stored fruit and depulped fruit of *Terminalia chebula*.

Results and Discussion

The goal of the present study was to see how different pre-sowing treatments affected seed germination of *Terminalia chebula*.

No. of days to Seedling Emergence

The control treatment benefits from pre-sowing treatments. Mechanically treated seeds (Breaking of Seed coat through stone, T4) took fewer days (18.27 DAS) to produce seedlings than T2, which was soaked in cold water for 48 hours and

germinated in 22.27 DAS. Another treatment T1 soaked in cold water for 24 hours germinated in 33.07 DAS and T3 was submerged seed into cow dung slurry for 24 hours, and the seeds germinated in 29.33 DAS. The germination of seeds occurred in seed pelleting (T5) is 35.13 DAS and 47.13 DAS under the control treatment (T0) (Table 2). In *Hippophae rhamnoides* and *Cassia angustifolia*, respectively, Olmez (2011) and Bhuse *et al.* (2001) documented the impact of pre-treatments on reducing the number of days till seedling emergence.

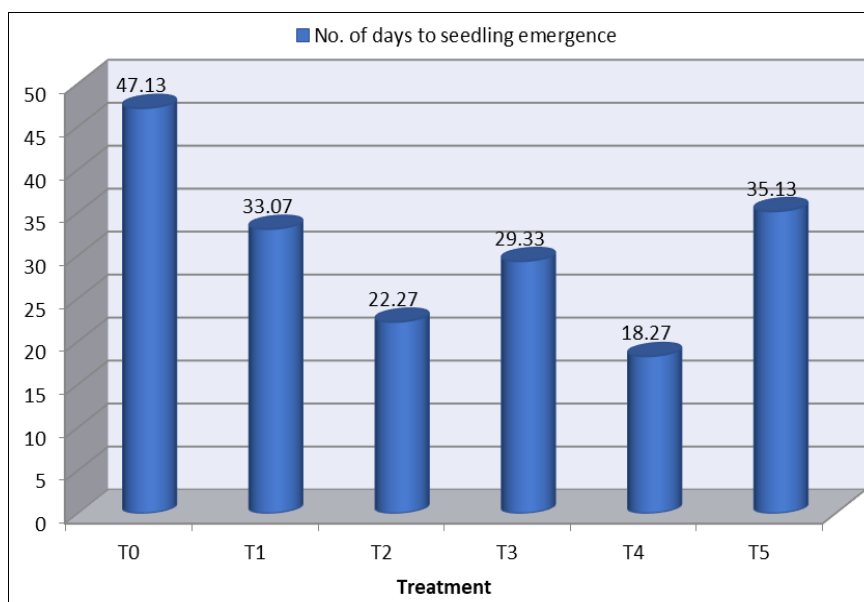


Fig 3: Effect of different pre-sowing treatments on no of days to seedling emergence of *Terminalia chebula*

Germination percentage

The treatments that showed the greatest germination percentage (72.91%) were T4, which involved mechanically shattering the seed coat through stone and spreading the seed; T2 involved soaked in cold water for 48 hours (62.5%); and T3 involved soaked in cow dung slurry for 24 hours (52.08%). Conversely, the germination rate was the lowest (20.83%) for the control treatment (T0). However, T1 and T5 germination rate was 41.66% and 35.41% (Table 2). Kumar *et al.* (2024) found that *Terminalia chebula* seeds had the highest germination rate (66.7%) when subjected to a 48-hour cold-water soak, with the germination rate rising to 73% when the seeds were de-pulped prior to soaking.

Mean Daily Germination

The highest (0.38) Mean daily germination was observed in seeds that were mechanically treated (Breaking of Seed coat through stone-T4) followed by T2 - soaked in cold water for 48 hours (0.33) followed by T3 - soaked in cow dung slurry for 24 hours (0.27), followed by T1 - soaked in cold water for 24 hours (0.22) and T5 - seed pelleting with clay powder as filler material and gum arabic as binding material (0.18), while the lowest (0.11) was observed in control treatment. Additionally, Kumar, V. (2016) discovered that seeds (*Terminalia bellerica*) that had their pulp removed and soaked in water for 24 hours had the highest mean daily germination.

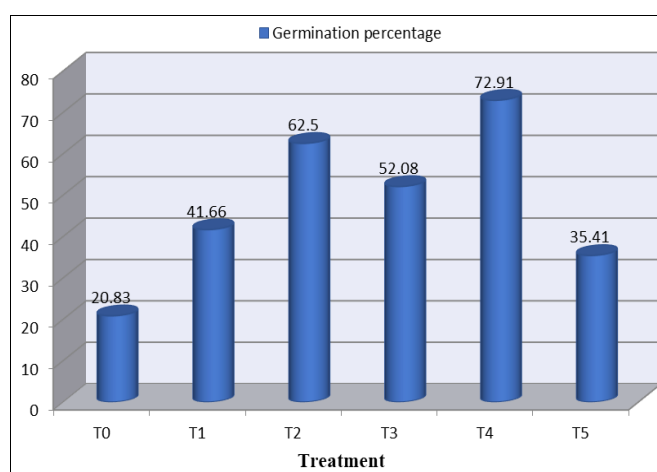


Fig 4: Effect of different pre-sowing treatments on germination percentage (%) of *Terminalia chebula*

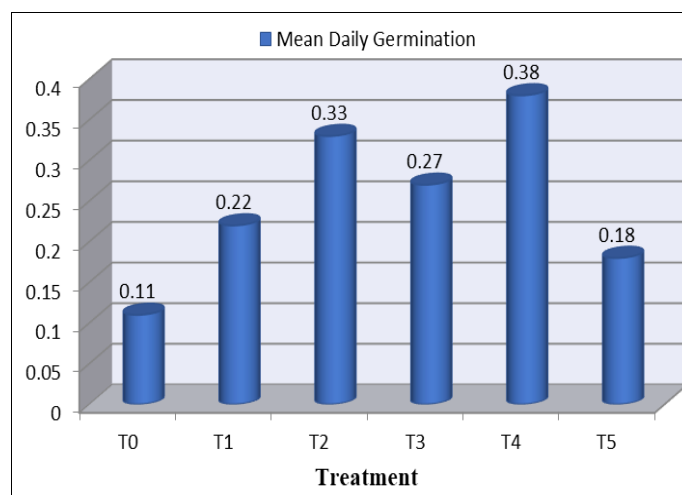


Fig 5: Effect of different pre-sowing treatments on mean daily germination of *Terminalia chebula*

Peak value

The peak value was significantly varied due to various pre-sowing treatments. The highest (0.8) peak value was observed in Seeds that is mechanically treated (T4 - Breaking of Seed coat through stone) followed by T2 - soaked in cold water for 48 hours (0.7) while the minimum (0.2) was observed in the control treatment. According to Kumar, V. (2016), seeds (*Terminalia bellerica*) that had their pulp removed and soaked in water for 24 hours had the greatest peak germination value (1.63).

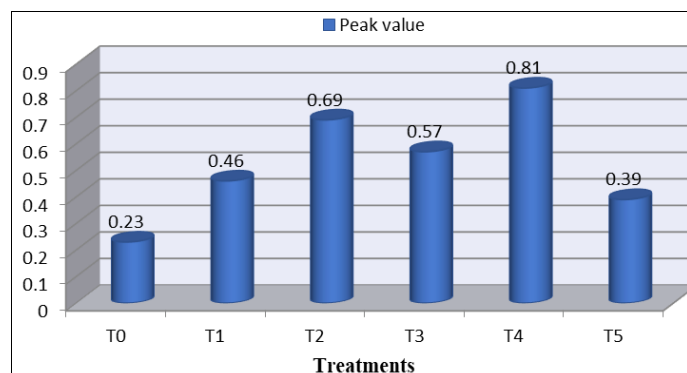


Fig 6: Effect of different pre-sowing treatments on peak value of *Terminalia chebula*

Germination value

The highest (0.31) germination value was observed in seeds that were mechanically treated (T4 - Breaking of seed coat through stone) followed by T2 - soaked in cold water for 48 hours (0.23) while the lowest (0.02) was observed in control. The fruit that was depulped and immersed in cold water for 48 hours had the maximum germination value (4.41), whereas the controlled seeds in *Terminalia chebula* had the lowest, according to Hossain *et al.* (2005)^[7].

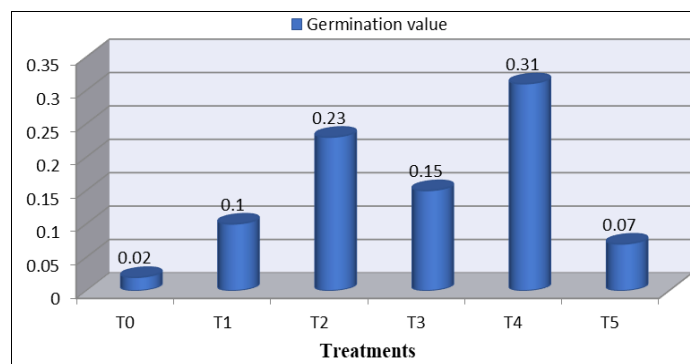


Fig 7: Effect of different pre-sowing treatments on germination value of *Terminalia chebula*

Table 2: Effect of different pre-sowing treatments on seed germination behavior of *Terminalia chebula*

Treatments	No of days to seedling emergence	Germination percentage	Mean daily germination	Peak value	Germination value
T0	47.13	20.83	0.11	0.23	0.02
T1	33.07	41.66	0.22	0.46	0.1
T2	22.27	62.5	0.33	0.69	0.23
T3	29.33	52.08	0.27	0.57	0.15
T4	18.27	72.91	0.38	0.81	0.30
T5	35.13	35.41	0.18	0.39	0.07
F - Test	S	S	S	S	S

Note: S= significant at 0.5%.

Conclusion

Pre-sowing treatments are essential for increasing germination percentages in species with inherently poor germination rates, whether as a result of hard seed coats or dormancy. For any given species, the goal of nursery operations is to produce as many high-quality seedlings as possible while requiring the least amount of money, time, and labor. *Terminalia chebula* seeds, notably, are notorious for their stiff seed coats, which contribute to lengthy germination times and decreased success rates in nurseries. Therefore, compared to traditional nursery sowing methods, the investigation of several pre-sowing treatments in this study offers very useful benefits. The mechanical scarification technique (T4), which entails shattering the seed coat by hand, was shown to be a substantially more effective approach among those tested for *T. chebula*. The mean daily germination, peak value, and total germination value were all optimized as a result of this treatment, which also produced faster germination and a much greater germination percentage. When compared to the untreated control, soaking seeds in cold water for 48 hours (T2) after mechanical scarification also shown significant improvements in germination characteristics.

References

1. Anand B, Devagiri GM, Maruti G, Vasudev HS, Khaple AK. Effects of pre-sowing seed treatments on germination and seedling growth performance of *Melia dubia* CAV: an important multipurpose tree. *Int J Life Sci.* 2012;1(3):59-63.
2. Alam MA, Rahman MH, Rahim MA, Hossain MM,

Saifullah M, Jewel KNA. Enhancing seed germination and seedling growth of chebula myrobalan (*Terminalia chebula* Retz.) by appropriate soaking and sowing time after collection of fruits. *Bangladesh J Agric.* 2021;45-54.

3. Barak RS, Lichtenberger TM, Wellman-Houde A, Kramer AT, Larkin DJ. Cracking the case: seed traits and phylogeny predict time to germination in prairie restoration species. *Ecol Evol.* 2018;8(11):5551-62.
4. Bargah AS, Sharma D, Kumar R, Nag R, Pradhan R. Enhancing Germination of Forest Tree Seeds in Chhattisgarh through PGR-Based Treatments: A Review. *J Adv Biol Biotechnol.* 2025;28(7):851-63.
5. Benjamin A, Dilip S, Ranibala G, Chanu NB. Effect of seed size, pre-sowing treatments and potting mixture on seedlings growth character and biomass production under nursery conditions of *Terminalia chebula* Retz. *IJCS.* 2019;7(4):1502-7.
6. Chauhan S, Bhatt BP, Todaria NP. Germination behaviour of *Terminalia* species as influenced by temperature, light and seed maturity in Garhwal Himalaya. *J Plant Biol-New Delhi.* 2002;29(2):203-8.
7. Hossain MA, Arefin MK, Khan BM, Rahman MA. Effects of seed treatments on germination and seedling growth attributes of Horitaki (*Terminalia chebula* Retz.) in the nursery. *Res J Agric Biol Sci.* 2005;1(2):135-41.
8. Hossain MA, Uddin MS, Rahman MM, Shukor NAA. Enhancing seed germination and seedling growth attributes of a medicinal tree species *Terminalia chebula* through

- depulping of fruits and soaking the seeds in water. J Food, Agric Environ. 2013;11(3&4):2573-8.
9. Hukkeri VI, Joshi MP, Deshpande MN, Nagare SK, Korgaonkar AM. Phyto-pharmacological review of *Terminalia chebula* Retz. Nat Prod Indian J. 2010;6:24-8.
 10. Khobragade DN, Patel P. Effect of pretreatment on seed germination and seedling growth of *Terminalia chebula* retz. Int J Appl Univ Res. 2022;4:2395-0269.
 11. Kusuma NH, Selvi DT, Umarani R, Eevera T, Janaki P, Vigneshwari R. Unraveling the mystery: Decoding seed characteristics and germination challenges in *Terminalia chebula* Retz. Trees, For People. 2024;100692.
 12. Maitry A, Patil G, Dubey P, Sharma D. Estimation of enzymatic activities under various forest tree species as index of mine soil genesis in chronosequence limestone mine spoils. Int J Adv Biochem Res. 2025;9(2):666-75.
 13. Palani M, Dasthagir MG, Kumaran K, Jerlin R. Effect of pre-sowing treatment on growth attributes of *Albizia lebbbeck* (L) Benth. Ann For. 1996;4(1):85-8.
 14. Rathinamoorthy R, Thilagavathi G. *Terminalia chebula* - Review on Pharmacological and Biochemical Studies. Int J PharmTech Res. 2014;6:0974-4300.
 15. Saleem M, Sood KK, Gupta SK, Raina NS, Gupta LM. Effect of seed collection time and pre-treatment on germination, identification and vegetative propagation of superior germplasm of *Terminalia chebula* Retz. - A multipurpose agro forestry tree. Range Manag Agro For. 2013;34(2):162-70.
 16. Saleem A, Husheem M, Härkönen P, Pihlaja K. Inhibition of cancer cell growth by crude extract and the phenolics of *Terminalia chebula* retz. fruit. J Ethnopharmacol. 2002;81(3):327-36.
 17. Sharma M, Tripathi P, Singh VP. Hepatoprotective and toxicological evaluation of hepatomed, an ayurvedic drug. Indian J Exp Biol. 1995;33:34-7.
 18. Shil S, Prajapati RK. Effect of pre-sowing treatments on seed germination of Harad (*Terminalia chebula* Retz.) in the nursery condition. Pharma Innov J. 2021;10(10):2344-8.
 19. Singh DRR, Dhir KK, Vij SP, Nayyas H, Singh K. Study of genetic improvement techniques of *Terminalia chebula* Retz. An important medicinal tree species of India. Indian For. 2003;129(2):154-68.
 20. Singh S, Bhatia AK, Sharma K, Sharma D. A review on *Terminalia chebula* Retz. (Harar) - an important multipurpose tree. Int J Econ Plants. 2020;7:049-52.
 21. Singh S, Sharma K, Bhatia AK. Effect of pre-sowing seed treatment, type of seed beds and time of sowing on *Terminalia chebula* in its natural forest. Int J Farm Sci. 2021;11(3):76-82.
 22. Troup RS. Silviculture of Indian trees. Oxford University Press; 1921. 2:511-4.