# Jos Oye

## IMPACT OF VARIOUS PRESOWING SEED TREATMENTS ON Teak (TECTONA GRANDIS L.f)

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# IMPACT OF VARIOUS PRESOWING SEED TREATMENTS ON Teak *(TECTONA GRANDIS* L.f)

**Abstract** - The world's most magnificent cylindrical deciduous tree, the teak (Tectona grandis), is well-known for its industrial uses. Since ancient times, teak has also been used in building projects. Its characteristic reddish-brown hue is the main cause of this. The most sought-after species in the furniture production sector is teak because of its fine-grained finish and leathery appearance. The current study examined the impact of various seed treatment techniques on teak germination at the Neotia University West Bengal agroforestry nursery. It includes data on the commercial cultivation of teak as well as the development and performance of *Tectona grandis* in four seed treatment techniques, namely. ($T_1$) For 48 hours, seeds were submerged in cold water. ($T_2$) For seventy-two hours, seeds were submerged in cold water, ($T_3$) For 10 minutes, seeds were immersed in 80% $H_2SO_4$, ($T_4$) Control. After five months, the performance of the seedlings was measured. The results revealed that the maximum germination percentage (40.83%), collar diameter (1.23 cm) and root length (35.35 cm) was found in $T_3$ (Seeds were soaked in (80%) $H_2SO_4$) while the highest seedling height (30.22 cm) was recorded in $T_2$ (Seeds were soaked in cold water for 72 hours) treatments. According to the study, a 10-minute conc. $H_2SO_4$ (80%) treatment for seed germination produces good results, breaks dormancy easily, and produces healthy seedlings.

Key words: seed treatment, germination percentage and growth.

## Introduction –

*Tectona grandis* was first formally described by Carl Linnaeus the Younger in his 1782 work Supplemental Plantarum (Cardoso, 2015). Teak occurs in natural forests between 9° to 26° N latitude and 73° to 104° E longitude, which includes southern and central Indiameter, Myanmar, Laos People's Democratic Republic and northern Thailand (White, 1991). A member of the Verbenaceae family, teak (*Tectona grandis*) is the most beautiful cylindrical deciduous tree in the world and is extensively used in industry worldwide. For the compliant tree, regional names include Brazil Teca, Indiameter Sagwan, Thekku, and Java-Teak in Germany. Teak wood is a luxurious species hardwood with physical properties, durability, and good esthetic (Sanwo, 1987). Teak wood has a medium specific gravity, strength and dimensional stability (Freitas, 1958), corrosion resistance and easy processing with good seasoning performance, and reputed for its excellent weathering and decay resistance (Baille`res and Durand 2000).

The inborn qualities of teak timber, fast growth rate with elasticity in seedling establishment mechanism makes it superior species in all aspects in many counties (Indra and Basha, 1999). Although Teak having good market value, but people do not interest in growing teak seedling in their own farm due to their low germination percentage. Jackson (1994) also stated that the drupes germinate very slowly and asymmetrical if they are untreated. Uncertainty germination provides low quality seedlings as well as degraded timber quality. So that the management cost of teak nursery increases. Several studies found that the Teak seeds have a low moisture content because of which they are inactive., (Adhikari *et al.*, 2021). But hydro-priming beforehand encourages water imbibition, which makes enzymes

active, moves them, and enables them to utilize food that has been kept. Therefore, it is a more challenging subject for each forester to find out the correct and easy pre seed treatment methodology for Teak seed germination, which help to reduce the failure percentage of seed plantation works. Many researcher climes that pre-sowing treatment of teak seed can enhance the seed germination percentage (Palani *et al.*, 1996, Billah *et al.*, 2015). Therefore, the goal of the study is to determine the best ways to break the dormancy of T. grandis seeds and to determine their germination length, germination percentage, and germination rate under the current conditions.

**Material and methods-** The Neotia University agroforestry nursery select for following teak germination study, which is located at Amira, Diamond Harbour road, West Bengal Pin 733368 (See Fig 1). Ranging between $22^0$.15'38"N to $88^0$.11'53"E.

Fig 1


Teak Mother Plant


Teak seedling after five months

Teak seeds were collected from 50 km (Falta, Sector Number 4 South 24 Phargna) from the university, during the cold season (December-January) 2023. The seeds were immersed in room temperature water to hasten the germination process for 12 hours (Njehoya *et al.* 2014). Subsequently, four treatments were created, each of which has 50 seeds.

$T_1$ = Seeds were soaked in cold water for 48 hours.

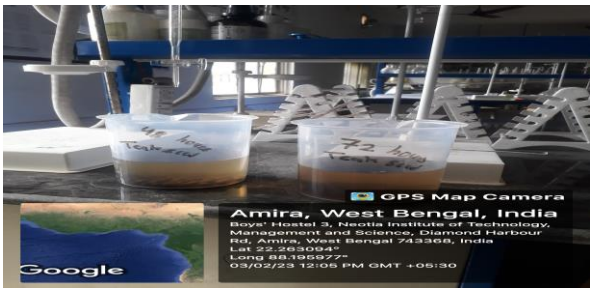
$T_2$ = Seeds were soaked in cold water for 72 hours.

$T_3$= Seeds were soaked in (80%) $H_2SO_4$ for 10 minutes.

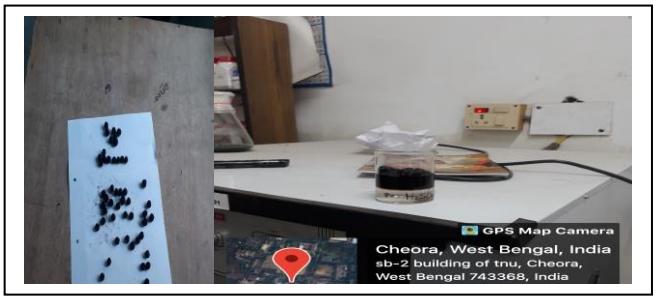
$T_4$= Control.

Which was replicated four times. Following seed treatment, the seeds were allowed to dry overnight at room temperature.

Fig 2




Water treatment for teak seeds




Teak seed treated with 80% $H_2SO_4$

From each seed treatment, five seeds per poly-packet (5 × 7 inch) were planted at a depth of 2 cm. (Cardoso *et al.* 2006) in rooting medium containing sand: soil: vermi-compost in the ratio of 1:1:1. Due to urbanization, some limitations occur for sunlight facilities in the agroforestry nursery areas during the research work. The pond water was used for irrigation purpose which was given after each and every 2 days. The germinants emerging at weekly interval up to four weeks.

$$\text{Germination \%} \quad \frac{\text{Number of germinated seeds}}{\text{Number of the total seed}} \times 100$$

The seedling height and collar diameter-meter was measured at 5$^{th}$ month of sowing. All reported results were manually clustered for treatment-wise under four replications focused on different observable criteria and analyzed using one-way analysis of variance (ANOVA) for complete randomized block design (CRD). Duncan's multiple range tests at a 5% level of probability was done to compare the means.

## Results and Discussion

### Effect of different treatment on seed germination

Teak is a king of timber and one of the superior species which is grow in various types of soils prior to planting of viable seeds into the germination bed treatment of seeds with appropriate mechanical, chemicals or biological means is needed to break the dormancy of seed germination. Because of the thick seed coat, the seed consumes water gradually resulting in sluggish germination and hence field emergence is always a problem in bitter gourd, even with the seed having high germinability (Asna *et al.*, 2020).

The results revealed that the seed germination percent was found very well in $T_3$ (40.83) followed by treatment $T_2$ (31.04), and $T_1$ (26.33) percent. The Teak seed germination list was found in control $T_4$ (25.42) percent. Hossain *et al.*, (2002) found similar results in their investigation. Numerous writers have maintained that many presowing techniques increase the germination rate and quicken the germination process. (Teketay, 1996; Alamgir and Hossain, 2005 and Azad *et al.*, 2010a, b). In general, the pericarp of the teak diameter spore is impervious to water and shields the seeds. It consists of a seed or spore together with any extra tissues that aid in dispersal. Additionally, the mesocarp and endocarp have a layer of thick-walled palisade cells that are covered in waxy cuticles on the outside, which results in seed dormancy (Diameters *et al.* 2009). The limiting variables include the seed's

physiological immaturity and the presence of chemical inhibitors in the pericarp (Georgin *et al*. 2014). Inhibitors can be broken down and the seed coat softened by soaking the seeds in intense sulfuric acid or other chemicals. The positive effect of sulfuric acid on seed germination observed in the present study has been also reported by Imani *et al.*, (2014). Similar improvements in teak drupe germination have also been documented by Manonmani (2003). Use of $H_2SO_4$ can enhance seed germination percentage also stated by (Khader and Chacko, 2000, Nourmohammadi *et al.* 2019).

## Effect of different treatment on growth parameter

The morphological growth of seedlings, including height, collar diameter, and root length, is displayed in table 1. Research revealed that the collar diameter and root length after fifth month was maximum found in (1.23 cm) and (35.35 cm) was found $T_3$ (soaked in 80% $H_2SO_4$ for 10 minutes) which was significantly higher than $T_2$ and $T_1$. The minimum collar diameter and root length was found in $T_4$ (Control) 0.58 cm and 27.58 cm respectively. It may be due to sulfuric acid treatment because concentrated sulfuric acid treatment can increase the germination and enhance the development of plumule and radical development which is the part of seed embryo.

**Table-1. Effect of seed hydro-priming durations on germination percentage.**

| Treatment | Germination % | 5th month | | |
|---|---|---|---|---|
| | | Collar diameter (cm) | Plant Height (cm) | Root Length (cm) |
| T1 | 26.33 | 0.68 | 25.78 | 29.39 |
| T2 | 31.04 | 1.12 | 30.33 | 31.37 |
| T3 | 40.83 | 1.23 | 29.03 | 35.35 |
| T4 | 25.42 | 0.58 | 24.72 | 27.58 |
| **F Value** | **4.06** | **5.63** | **5.01** | **5.13** |
| **P Value** | **0.03** | **0.012** | **0.018** | **0.016** |
| **SE(m)** | 3.50 | 0.14 | 1.18 | 1.14 |
| **C.D. at 5%** | 10.80 | 0.42 | 3.65 | 4.54 |
| **C.V. %** | 22.67 | 29.99 | 8.62 | 9.52 |

Sulfuric acid treatment helps to break this dormancy by weakening the seed coat and allowing water and oxygen to penetrate more easily. This, in turn, stimulates the growth of the radicle (primary root) and the subsequent development of fasciculate roots, faster than the other treatment. An increase in radicle length after seed treated with sulfuric acid was also stated by Imani (2014), Khaleghe *et al.*, (2009). The collar is the region where the stem and root of a seedling join. A larger collar diameter signifies a stronger root system, which is essential for anchoring the seedling and absorbing water and nutrients from the soil. Similar diameter was also reported by Vijayalakshmi and Jamaludheen, (2020), Hadedy *et al.*, (2024). Table 1. shows the significant difference in plant height. The Maximum plant height was governed by $T_2$ (30.33 cm) which was significantly higher than $T_3$ (29.03 cm) and $T_1$ (25.78 cm). The Minimum height was achieved by $T_4$ (24.72 cm). It may be due to an

increase in cell elongation and cell division of meristematic tissues. The effect of cold-water treatment on cell elongation was also reported by Dezfuliet al. (2008), Kahn *et al.*, (2006).

**Conclusion-** The result of this study shows that pre sowing treatment of teak seed provides significant impact on growth and development of seedling. Teak (*Tectona grandis*) is commercially very popular in the industrial sector. The above study revealed that plant height after five month was found maximum in 72 hours' cold-water treatment, while advanced germination, root growth, and collar diameter was found in ($T_3$) seeds were soaked in (80%) $H_2SO_4$ for 10 minutes treatments followed by 72 hours and 48 hour's cold-water treatments.



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