



## RESEARCH PAPER

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## Growth performance of supa (*Sindora supa* Merr.) seedlings under various pre-treatments

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**Key words:** Supa (*Sindora supa* Merr.), Seed germination, Pre-sowing treatments, Completely randomized design (CRD)

<http://dx.doi.org/10.12692/ijb/21.1.244-248>

Article published on July 28, 2022

### Abstract

The study investigated the growth performance of *Sindora supa* Merr. seedlings under various pre-treatments as follows: hot soaking, cold soaking, mechanical scarification and control. The CRD (completely randomized design) was utilized in this study. Different pre-treatments had a substantial ( $P > 0.05$ ) impact on height, chlorophyll content, and % survival, but no significant changes were found in the number of leaves and diameter. The study showed about 76% of the seedlings survived under cold soaking compared with hot soaking (28%) and mechanical scarification (24%) respectively. Therefore, it is recommended that cold soaking treatment improves the growth performance of *Sindora supa* Merr.

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## Introduction

Supa (*Sindora supa Merr.*) is a species of the Fabaceae family and native to the Philippines, where it may be found in low- and medium-altitude forests, as well as limestone ridges, in the provinces of Quezon, Nueva Ecija, Camarines, and Albay in Luzon, and Mindoro in Mindoro (Energy Development Corporation, 2019). The wood is utilized for high-end furniture, veneer, high-end ornamental paneling, interior work, musical instruments, and flooring in the area. Locally, the wood oil is used as a lamp oil, in the manufacture of varnishes, paints, and transparent paper, and in the treatment of skin diseases (Ecosystems Research and Development Bureau, 2018).

A study conducted by Doody and O'Reilly (2008), and by Amoakoh *et al.* (2017), the growth performances of the seedlings obtained from the pretreatment seeds were considerably higher than those of the untreated control. Azad *et al.* (2011) reported that pre-sowing treatment, particularly hot water treatment, greatly boosted seedling development (including root, shoot, and total length) of *Acacia auriculiformis*, as well as the number of seedlings produced. It is possible that this is related to the differential in seed coat thickness.

According to Missanjo *et al.*, 2014, nicking (scarification) was shown to be the most effective method for increasing seedling growth in *Acacia polyacantha*, while immersion in hot water was the second most efficient method. The rapid growth of seedlings coming from nicked seeds was caused by the fact that seedlings coming from nicked seeds had the advantage of absorbing a large amount of water and initiating the photosynthesis process considerably more quickly than other seedlings. The findings are consistent with those of Tian *et al.*, who found that seed germination is the most critical step in the development of early seedling growth and establishment. The seeds that had been immersed in cold water for 48, 24 and 12 hours had the highest seedling height and vegetative growth (leaves) (El-Juhany *et al.*, 2009).

Supa (*Sindora supa Merr.*) seeds are enclosed in a hardcover, making them difficult to germinate

(Blogspot, 2009). Many studies have confirmed that pre-sowing treatments promote the growth of the hard seed coat and the size of the root (Hossain *et al.*, 2005). According to Gilani *et al.*, 2019 a combination of hot and cold-water treatments was most effective in increasing root weight and promoting growth. Due to the vulnerable status of *Sindora supa Merr.*, as determined by DAO 2017-11 and the International Union for Conservation of Nature's Red List of Threatened Species, it is necessary to evaluate which pre-treatments were most effective in improving the growth performance of *Sindora supa Merr.* in order to prevent this endemic and valuable tree species from becoming extinct and increase the survival rate in order to provide information for mass production of seedlings and avoidable waste of seedlings. Most of the study conducted was on endemic species and other species was concentrated on the germination rate, as to date, there is no information on the effect of pretreatment methods on seedling growth of *Sindora supa Merr.* in the nursery. To fill the knowledge gap, this study was undertaken to investigate the influence of pre-sowing treatments on the growth performance of *Sindora supa Merr.* seedlings in the nursery. The information gained from this study will be utilized to enhance nursery operations and seedling production efficiency.

## Materials and methods

The research took place in Vista Alegre, Bayombong, Nueva Vizcaya. The temperature is around 27°C, with a NE wind of 10 km/h and a humidity of 69 percent. The longitudes are 121.1439344 and the latitude is 16.4841392.

### Location of seeds collected

Supa (*Sindora supa Merr.*) mature seeds were obtained from the University of the Philippines Los Baños, which is located 64 kilometers southeast of Manila in the municipalities of Los Baños and Bay in the province of Laguna, with Latitude: 14.1667 and Longitude: 121.2391. The temperature ranges from 72 to 94 degrees Fahrenheit, with temperatures rarely falling below 68 degrees Fahrenheit or rising over 97 degrees Fahrenheit. Seeds were planted in seedbeds made up of 50% garden soil and 50% sandy soil.

Each seedling was placed into a plastic bag after 30 days. After a month of observation on seed germination, the seedlings of Supa (*Sindora supa Merr.*) were transplanted to polyethylene bag (6“X6“X10”). Data gathering for growth performance was made within 6 months (June 2021-November 2021) such as number of leaves, height using ruler, diameter using digital vernier caliper, chlorophyll content using leaf chlorophyll content meter and number of seedlings survived.

#### Seed treatments

The matured seeds of Supa were treated by mechanical scarification and soaking (hot and cold). The treatment details are shown in Table 1.

**Table 1.** Seed treatment and descriptions.

Seed Treatment	Description
T1-Control	Seeds were not scarified and were not subjected to soaking treatments.
T2-Hot soaking	Seeds were soaked in hot water (100 degree Celsius) until water settled to 6 degrees Celsius in an aluminum container within 24 hours. Seeds were sown after the soaking period.
T3-Cold soaking	Seeds were soaked in cold tap water (10 degree Celsius) until water settled to 6 degrees Celsius in an aluminum container within 24 hours. Seeds were sown after the soaking period.
T4-Mechanical scarification	The seed coat was mechanically scarified on one side of the seed using sandpaper then sown after scarification is done.

#### Experimental design

The experiment was laid out using a completely randomized design (CRD). There were four treatments and three replications. There were 25 seeds per plot sown for each treatment. A total of 300 seeds were sown in all plots in four treatments. For each treatment, healthy seeds were selected randomly. The spacing of the seeds was 5cm between rows and 5cm within rows.

After a month of observation on seed germination, the seedlings of Supa (*Sindora supa Merr.*) were transplanted to polyethylene bag (6“X 6 “X 10”) using the same experimental layout.

#### Layout plan of the study

1 T1R1	2 T3 R2	3 T2 R1	4 T4 R1
5 T1 R2	6 T1 R3	7 T2 R2	8 T2 R3
9 T3 R1	10 T4 R2	11 T3 R2	12 T4 R3

**Fig. 1.** Layout plan using completely randomized design (CRD) with four treatments, replicated three times.

Legend: T1-Control, T2-Hot soaking

T3-Cold soaking, T4- Mechanical scarification

#### Data collection and growth evaluation

The germinated seeds were watered once every day. The growth parameters of seedlings in terms of number of leaves, height, diameter, chlorophyll content and survival were recorded within 6 months. The number of leaves per plant was counted two weeks after sowing and the leaves was counted once week interval. Plant height was measured from the base of the plant at the soil level to the tip of the top most leaf first at two weeks after germination and final counting was done on its six months. The stem diameter of the plant was measured at the end of six months using digital caliper from five centimeters (5cm) above the collar of the shoot. The Soil Plant Analysis Development (SPAD) chlorophyll meter was used to measure the chlorophyll content of the leaves and this was done on ix months. For number of seedlings survived, the seedlings were counted at every week for six months period.

#### Statistical analysis

The growth parameters of seedlings in terms of number of leaves, height, diameter, chlorophyll content and survival were subjected to analysis the variance (ANOVA) to statistically verify the significant difference of the treatments and the variation among the treatment means were determined using the least significant difference (LSD) using statistical tool for agricultural research (STAR) software of International Rice Research Institute (IRRI, 2014).

#### Results and discussion

The application of different pre-treatments had no significant ( $P > 0.05$ ) impact on the number of leaves and diameter because the  $p$ -value of 0.34 and 0.45 were higher than 5% level of significance.

**Table 2.** Growth performance of Supa (*Sindora supa Merr.*).

Treatments	Number of leaves	Diameter (cm)	Height (cm)	Chlorophyll content (CCI)	Percent Survival (%)
T1-Control	24	3.47	20.06 <sup>a</sup>	24.49 <sup>a</sup>	40% <sup>b</sup>
T2-Hot Soaking	17	3.75	12.50 <sup>b</sup>	16.25 <sup>b</sup>	28% <sup>b</sup>
T3-Cold Soaking	19	3.75	17.79 <sup>ab</sup>	14.90 <sup>b</sup>	76% <sup>a</sup>
T4-Mechanical Scarification	20	4.07	19.09 <sup>a</sup>	17.27 <sup>b</sup>	24% <sup>b</sup>
<i>p</i> -value at 5%	0.34	0.45	0.04	0.02	0.00
Significant level	Not significant	Not Significant	Significant	Significant	Significant

There was a substantial difference in height increment across the four treatments of *Sindora supa Merr.* seedlings. According to Odoi 2021, the lowest height increase of seedlings was recorded from hot soaking treatment with 12.50cm, which is comparable with the results obtained in *Maesopsis eminii* seedlings, which similarly attained the lowest height of 5.30cm soaked in hot water for 24 hours.

In terms of chlorophyll content, there is a significant difference among the four treatments in which this can be attested that there was 76 percent seedlings survival followed by control treatment. In accordance with the findings, the high number of leaves may be linked to the high concentration of chlorophyll, which aids in the process of photosynthesis. Chlorophyll content is very vital in determining photosynthetic capacity and hence plant growth. Plants' chlorophyll concentration reduces when they are stressed, hence it is widely employed as a plant health indicator (Liang, Y., Urano, 2017). Chlorophyll (Chl) is a vital photosynthetic pigment in plants, influencing photosynthetic capability and hence plant development (Li *et al.*, 2018).

### Conclusion and recommendation

The study demonstrated the importance of pre-sowing treatments on height, percent survival and chlorophyll content which shows a significant difference among other four treatments. Cold soaking treatments is highly recommended to be use as pre-sowing treatments because in it shows a higher survival rate of seedlings compared to other treatments. The result can help to speed up the growth performance of *Sindora supa Merr.*

This can aid in the production of seedlings efficiency and enhance nursery operations for the use in reforestation and forestation efforts aimed at including such species in planting programs for *Sindora supa Merr.* conservation and preservation.

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