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Rooting performance of almon (*Shorea almon* Foxw.) serial cutting using alpha naphthalene acetic acid (ANAA) rooting hormone

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Key words: Alpha naphthalene acetic acid, Levels of concentration, Almon, Rooting performance, Serial cutting

Abstract

This study focused on conserving the declining almon species by investigating treatments for root quality and performance. The study was conducted at the Clonal Facility, Department of Environment and Natural Resources (DENR) Region IX Upper Pulacan, Labangan, Zamboanga Del Sur. ANAA hormone concentrations of 0ppm, 1000ppm, 2000ppm, and 3000ppm were applied to assess root quality, using a Randomized Complete Block Design. 120 serial cuttings of *S. almon* were distributed across 4 treatments in 3 replications (10 cuttings x 4 treatments x 3 replicates). Over a two-month monitoring period, growth parameters, including root number and length, were observed. Results indicated that treatment 0 (control) produced the highest number and length of roots with (Pr (> F) values of 0.3609 and 0.1063, respectively. The study concluded that there is no significant difference among the treatments, suggesting that the control exhibited the most favorable rooting performance in terms of root number and length. Further exploration of ANAA concentrations or alternative rooting hormones is recommended. Experimentation around the effective 1000 ppm level could help identify an optimal range for enhanced rooting.

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Introduction

Shorea almon Foxw. is a native species found in Basey, Samar, and is listed as vulnerable by the IUCN Red List, DAO 2017-11 and the DAO 2007–01. Its habitat is found in Borneo and the Philippines. Almon is valued for its wood, which is used to make plywood and other items. It is recognized for its ribbon figure, mild hardness, and lightweight nature. But because of logging and agricultural encroachment, its population has drastically decreased (NRMC, 1986: Julia *et al.*, 2014). Almon, a member of the Dipterocarpaceae family, is often referred to as Light Red Meranti or White Lauan. It may reach heights of 50–70 meters and a diameter of about 160 centimeters. Its broad-spreading crown and straight trunk let it to flourish in direct sunlight. It may be cultivated using cuttings and seeds, which allows it to adapt to a variety of well-drained soils.

Almon trees are often found with Apitong and White Lauan in different parts of the Philippines, such as Mindanao (which includes Surigao, Agusan, Bukidnon, Davao, Misamis, Lanao, Zamboanga, and Basilan) and Luzon (which includes Quezon, Camarines, Albay, Sorsogon, Negros, Samar, and Leyte). The best hormone concentrations, such as indolebutyric acid, have been shown in a number of studies to support root development in fruit crops via air-layering and cutting. IBA and NAA are two common synthetic hormones used to promote root growth. The goal of this study was to determine the optimal hormone concentrations (0 ppm, 1000 ppm, 2000 ppm, and 3000 ppm of ANAA) for root quality and performance. This information could help future researchers and institutions like WMSU, DENR, and LGU make informed judgments about their operations.

Materials and methods

Description of the study area

This investigative study was conducted within the premises of the Clonal Facility operating under the of care the Department of Environment and Natural Resources (DENR). Endowed with a tropical climate marked by a minimum temperature threshold of 18 °C (64 °F) and noteworthy annual precipitation, the site is strategically situated at an elevation ranging between 203 to 207 meters above sea level. The temporal scope of the research initiative spanned a duration of two months, initiating on November 28, 2023, and concluding on January 28, 2024.

Research design and sampling

The experiment was laid out using a Randomized Complete Block Design. The total number of serial cuttings of *S. almon* used in the experiment was 120 for 4 treatments in 3 replications (10 cuttings × 4 treatment × 3 replicates). The researcher investigated the rooting performance of the Almon tree by using synthetic rooting substances such as the Alpha Naphthalene Acetic Acid (ANAA). For the experiment, the researcher chose 120 stem cuttings from a total of 150. This ensures that each population sample had an equal chance of being chosen.

Data collection methods and procedures

The Ecosystem Research and Development Bureau (ERDB) provided the following instructions on how to clone trees.

Setting up the rooting chamber

A rooting chamber, covered with plastic sheet and constructed from a wooden box or concrete, needs to be ready in advance. The size varied based on how many cuttings are to be produced. Fill the chamber with a rooting media comprised of sterilized mixture of fine sand and coco coir dust. The propagation methodology adopted entailed the application of the misting method since they had an installed nozzles or mist sprayers attached to a water pipeline effectively executed within the well-equipped rooting chamber situated in the clonal facility. The misting happens every 3-4 hours and equivalent to 3-4 times of spray in a day to control the humidity of the chamber.

Harvesting stem cuttings

Young vertical shoots from a well-established hedge garden, ensuring each cutting has at least two nodes and a pair of leaves must be gathered. Placed the collected stem cuttings in a sizable plastic bag or container with a small quantity of water.

Cutting preparation

To reduce transpiration, the leaves were trimmed off.

Sterilizing the cuttings

The cuttings were immersed in a fungicide solution (Dithane M-45 Neotec) for 30-60 minutes.

Treating the cuttings

A 1 liter tap water was used to dilute the root hormone of Alpha Naphthalene Acetic Acid (ANAA) at various levels of concentration. Using a syringe, the 1000ppm (1ml), 2000ppm (2ml) and 3000ppm (3ml) was measured. After diluting the hormone, the basal part of the cuttings was scraped and soaked them in an ANAA rooting hormone solution at a specific concentration for one hour.

Planting

The treated cuttings were placed immediately into the rooting chamber.

Humidity maintenance

The chamber maintained high humidity at 80% RH and a temperature of 25-30 °C within the chamber was maintained by activating the misting system every three to four hours.

Rooting period

Fast-growing species typically root within 2-6 weeks, while dipterocarps like Almon and certain premium species may take 3 to 4 months.

Data treatment and analysis

The data was run through Statistical Tool for Agricultural Research (STAR). A one-way ANOVA was used to determine the significant difference of the length of roots produced under the various treatments.

Results and discussion

Number of roots

The graph in Fig. 1 showed the effects of Alpha Naphthalene Acetic Acid (ANAA) of the serial cutting of *S. almon* in terms of average number of roots. The data revealed that T_1 (0 ppm) had produced the highest number of roots with an average of (1.1), and the lowest number of roots produced was found in T_4 (3000 ppm) with an average of (0.2), respectively.

The count of roots per treatment for Almon cuttings after a two-month period revealed that the control treatment (T1) had the highest mean number, recording 0.8333 (0 ppm), followed by T3 (2000 ppm) with a mean of 0.6333. Conversely, both T2 (1000 ppm) and Treatment 4 (3000 ppm) had exhibited a lower but equal mean average of 0.5000. Rooting of cuttings would not be due to hormone treatment but interaction of factors in the stem and the environmental condition may also be considered. Hartmann *et al.* (1983) reminded that auxin treatment is not an absolute guarantee for root formation. They further emphasized that physiological as well as environmental conditions of the stocks play an important role in the process.

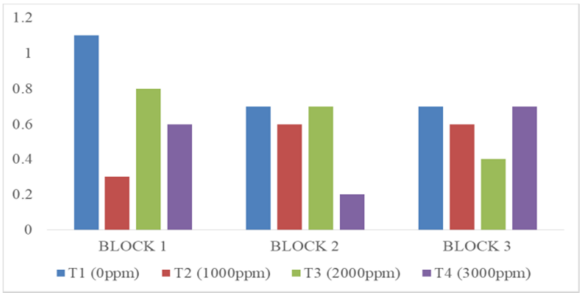

Fig. 1. Effect of different levels of concentration of ANAA rooting hormone on the average number of roots of *S. almon* serial cuttings

The Analysis of Variance (ANOVA) for the mean data of the number of roots after a two-month period observed that no significant difference exists between the samples, columns, and their interactions, as indicated by a P-value exceeding 0.05. Thus, the results revealed that the effect of different levels of concentration of ANAA rooting hormone on the average number of roots of *S. almon* serial cuttings were statistically insignificant (P-value of 0.3609). Based on the data presented, the application of hormone can improve the number of roots and prolonging the period of collection of data can improve the number of roots.

Length of roots

The average of the effects of the ANAA treatment under misting propagation technique on the length of roots in the serial cuttings of *S. almon* was shown graphically in Fig. 2. This investigation presented which the highest average length of roots produced was T_1 (0 ppm) and the

lowest was T_4 (3000 ppm), with an average of 1.515 and 0.225, respectively.

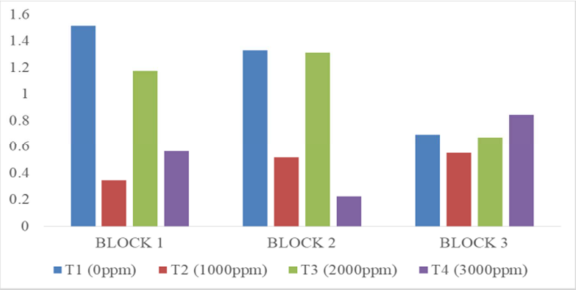

Fig. 2. Effect of different levels of concentration of ANAA rooting hormone on the average length of roots of *S. almon* serial cuttings

The count of roots per treatment for Almon cuttings after a two-month period. Analysis revealed that the control treatment T1 (0 ppm) had the highest mean number of 1.18, followed by T3 (2000 ppm) with a mean of 1.05, T2 (1000 ppm) with a mean of 0.54 and Treatment 4 (3000 ppm) exhibited a lower mean average of 0.47.). The production of roots in the control group may be caused by endogenous auxin, which might influence the formation of the cutting roots. Ascough *et al.* (2011.) reported that adventitious rooting was best in the control group compared to NAA and IAA treatment.

The Analysis of Variance (ANOVA) for the mean data of the number of roots after a two-month period. It was observed that no significant difference exists between the samples, columns, and their interactions, as indicated by a *p*-value exceeding 0.05. Thus, the results revealed that the effect of different levels of concentration of ANAA rooting hormone on the average length of roots of *S. almon* serial cuttings were statistically insignificant (*p*-value of 0.1063).

Conclusion

1. The study found no statistically significant differences in the number of *Shorea almon* roots at various ANAA concentrations. The p-values for both the quantity of roots (0.3609) and root length (0.1063) exceeded the 5% significance level, indicating a lack of statistical significance in these parameters across the varied concentrations of ANAA;
2. T1 control treatment recorded the highest mean counts for the number of roots with a mean count of (0.8333) among the different ANAA root hormone concentration levels. T3 (2000 ppm) followed with a mean count of 0.6333, while both T2 (1000 ppm) and T4 (0 ppm) exhibited the lowest mean count of 0.5000;
3. T1 control treatment displayed the highest mean counts for the length of roots (1.18) among the different ANAA root hormone concentration levels. T3 (2000 ppm) followed with a mean count of 1.05, while T2 (1000 ppm) had a mean of 0.54, and T4 (0 ppm) yielded the lowest mean count of 0.47. This suggested that T1 exhibited the most favorable rooting performance among all the treatments applied, particularly in terms of root length.

Recommendation(s)

1. Given that the control treatment (T1) showed the highest yield in terms of both the number and length of roots, further exploration of different concentrations of ANAA or other rooting hormones might be beneficial. Experimenting with concentrations around the effective 1000 ppm level could help identify an optimal range for enhanced rooting.
2. While ANAA concentrations were investigated, it is advisable to explore other growth factors that might influence root development. Factors such as temperature, humidity, and substrate composition could be examined to better understand their effect on rooting performance.
3. To enhance the robustness of the findings, it is recommended to replicate the study. Conducting the experiment across multiple cycles and under varying environmental conditions can help validate the observed trends and ensure the reliability of the results.
4. Investigate alternative vegetative propagation techniques beyond misting, such as air layering or different cutting methods. This can provide a comprehensive understanding of the most effective methods for propagating *Shorea almon*.

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