Variations of IAA Concentration to the Growth of Sengon Tissue Culture

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Abstract. Sengon (Paraserianthes falcataria) is a fast-growing plant that has high economic value. However, the presence of sengon in the wild every year begins to decline due to high demand for sengon wood. The availability of increasing sengon seeds, the propagation is carried out through tissue culture techniques. This study aims to determine the best Indole Acetic Acid (IAA) concentration on the growth of sengon explants. This study used an experimental method with treatment of IAA concentrations of 0 mg/L, 0.5 mg/L, 1 mg/L, 1.5 mg/L, and 2 mg/L. Each treatment was repeated three times and analyzed using one-way analysis. The results showed that the concentration of IAA 1 mg/L was the best treatment for the growth of roots length. The concentration of IAA 0.5 mg/L is the best treatment for plantlet height growth.

1. Introduction
Sengon (Paraserianthes falcataria) is a fast-growing plant, which is a type of plant that has relatively fast growth, a short harvest period, high productivity, and has a good impact as a production and conservation plant. Efforts to increase the production of sengon trees with superior quality made by tissue culture. The advantages of tissue culture methods with sengon seed explants, namely the seeds produced will have the same properties as the parent, the resulting seeds will be free of viruses, can produce large numbers of seeds that have uniform characteristics in a relatively short time, and in the planting process is not limited by place, time and season.

The success of plant propagation by tissue culture method, in general, is very dependent on the source of explants and the type of media. Sources of explants in tissue culture are parts of plants that are still actively dividing (meristem tissue), various types of explants that used are shoots, leaves, roots, seeds, buds, cotyledons, hypocotyls, fruits, and ovaries [1]. Growing media in tissue culture has a significant influence on the growth and development of explants and the seeds they produce. The media used usually consists of agar, mineral salts, vitamins, and growth regulators. Growth Regulatory Substances (ZPT) commonly used in tissue culture media are auxin and cytokinin. Auxin is a ZPT that have a role in inducing roots propagation in vitro, while cytokines have a role in the induction of explant shoots. According to Herawan et al. [2], 1 mg/L IAA treatment gave the best response to the growth of roots Cendana (Santalum album L.). Gultom et al. [3] stated that giving IAA 2 mg/L can accelerate the formation of shoots gaharu (A. malaccensis).

The sengon plant itself is not yet known to use the best IAA auxin against the growth of sengon explants. Therefore, research is needed to get the best IAA concentration on the growth of sengon explants. The purpose of this study was to determine the best concentration IAA on the growth of sengon explants by tissue culture techniques.
2. Method

2.1. Materials
The research conducted at the Silviculture Laboratory Faculty of Forestry, Tanjungpura University, with a research period of 2 months. The tools used are Erlenmeyer, laminar airflow cabinet, measuring cup, goblet, hot plate, culture bottle, autoclave, pH meter, tweezers, stirring spoon, hand sprayer, analytical balance, watch glass, bunsen, and calipers. The materials used in this study are MS media materials (macro, micronutrients, iron, sugar, Myo-inositol, and vitamins), sengon seeds, IAA solution, alcohol, agar powder, aquades, aluminum foil, filter paper, spiritus, label paper, liquid detergent, and Clorox.

2.2. Procedure
The research began with sterilizing the workspace, sterilizing equipment, making planting media, planting media sterilization, and planting material preparation. The variables observed in this study were root length and plantlet height. The method used is an experimental method using a non-factorial complete randomized design with IAA treatment of A1=0 mg/L, A2=0.5 mg/L, A3=1 mg/L, A4=1.5 mg/L, and A5=2 mg/L. Each treatment was repeated three repetitions and analyzed using one way ANOVA analysis.

3. Results and Discussions

3.1. Roots Length
The emergence of roots is the initial process of the growth of sengon explants and is an essential factor in the propagation using tissue culture methods. The results of the analysis variations of IAA concentration on roots length presented in Table 1.

| Treatment | DF  | Sum of squares | Mean Square | F      | Sig. 5% |
|-----------|-----|----------------|-------------|--------|---------|
| Error     | 10  | 292.01         | 29.20       |        |         |
| Total     | 14  | 1352.59        |             |        |         |

Based on the results of the analysis variant presented in Table 1, it can be seen that the treatment of IAA with several concentrations has a significant effect on the increase in roots length. From the results of the analysis of variant, it is necessary to do further tests, that is the test BNJ of IAA treatment because IAA has a real influence so that differences in each concentration are known. The recapitulation results of the BNJ test listed in Table 2.

| Treatment | Average |
|-----------|---------|
| A1        | 3.51 a  |
| A2        | 10.84 a |
| A3        | 22.99 b |
| A4        | 1.45 a  |
| A5        | 0.4 a   |

Noted : A1=0 mg/L; A2=0.5 mg/L; A3=1 mg/L; A4=1.5 mg/L; A5=2 mg/L
The recapitulation results in Table 2 show that the treatment of adding 0 mg/L (A1) was significantly different from 1 mg/L (A3), although the treatment of A1 was not significantly different from treatment 0.5 mg/L (A2), 1.5 mg/L (A4), and 2 mg/L (A5). This shows that treatment A3 or treatment giving 1 mg/L IAA is the best treatment for the increase in the length of the sengon roots.

Root length increase caused by the process of cell division at the root tip meristem, then followed by the process of cell lengthening and enlargement. According to Rukmana [4], auxin growth regulators stimulate growth which is very influential in the formation of roots and root length, thus causing plants to absorb more water and nutrients for plant growth. Giving ZPT in small amounts can stimulate the root length growth process. Because, in the body of explants, there are endogenous hormones that can stimulate the growth process even though the concentration of ZPT given is small. The result is consistent with the opinion of Gunawan [5], argues that endogenous growth regulators are factors to stimulate the growth process and explant morphogenesis, both forming callus, roots, shoots, and plantlets. It also can not be separated from the availability of nutrients in the media needed explants to grow in sufficient and balanced conditions. Growing media in tissue culture is also a considerable influence on the growth and development of explants and the resulting seeds.

Rahardja [6] also suggested that the response of explant growth in culture depends on the interaction and balance between endogenous growth regulators that exist in explants and exogenous growth regulators added to the media. According to Agustina [7], the emergence of roots is caused by the high level of auxin contained in explants (endogenous) so that even though exogenously added auxin with low concentrations will be able to form roots. Root formation is also inseparable from the process of active and differentiated tissue division and supported by the presence of organic and inorganic compounds contained in simple media. Lakitan [8], explained that a plant would grow well and be fertile if the nutrients needed are available in sufficient quantities and are in a suitable form so that plants can be absorbed.

3.2. Planlet Height
The results of the analysis variations of IAA concentration on planlet height presented in Table 3.

| DF | Sum of squares | Mean Square | F      | Sig. 5 % |
|----|----------------|-------------|--------|----------|
| Treatment | 4 | 2,197.56 | 549.39 | 8.40* | 3.48 |
| Error | 10 | 654.35 | 65.43 |        |        |
| Total | 14 | 2,851.90 |        |        |        |

Noted : * = significant effect

Based on the results of the analysis variant presented in Table 3, it can be seen that the treatment of IAA with several concentrations has a significant effect on the increase in planlet height. From the results of the analysis of variant, it is necessary to do further tests, that is the test BNJ of IAA treatment because IAA has a real influence so that differences in each concentration are known. The recapitulation results of the BNJ test listed in Table 4.

| Treatment | Average |
|-----------|---------|
| A1        | 5.12 a  |
| A2        | 37.01 b |
| A3        | 20.25 a |
| A4        | 9.54 a  |
| A5        | 5.3 a   |

Noted : A1=0 mg/L; A2=0.5 mg/L; A3=1 mg/L; A4=1.5 mg/L; A5=2 mg/L
The recapitulation results in Table 4 show that the treatment of adding 0 mg/L (A1) was significantly different from 0.5 mg/L (A2), although the treatment of 0 mg/L (A1) was not significantly different from treatment 1 mg/L (A3), 1.5 mg/L (A4), and 2 mg/L (A5). This shows that A2 treatment or 0.5 mg/L IAA treatment is the best treatment for plantlet height increase.

Provision of IAA can stimulate protein synthesis in plant tissue which can cause increased cell wall permeability, thereby stimulating cell division and elongation, which will affect the increase in plantlet height [9]. Elongation of the stem occurs because of the process of division, elongation, and enlargement of new cells that occur in the apical meristem and stem segments, which causes plants to grow taller.

Exogenous growth regulators are given to provide a balance against endogenous hormones in order to be able to influence physiological responses as stimulants of cell division and extension [10]. ZPT is a non-nutritional organic compound which in low concentrations can encourage, but if it is present in high concentrations, it can inhibit plant growth and development [11]. In general, the increase in plantlet height caused by two processes, namely cell division, and elongation in meristem tissue at the point of growth [12]. Both of these processes influenced by the hormones auxin and cytokinin. Relatively lower auxin concentrations can stimulate shoots growth [13].

4. Conclusion
The conclusion that can draw is the provision of IAA concentration of 1 mg / L is the best concentration to promote the growth of sengon root length. Giving IAA concentration of 0.5 mg / L is the best concentration to stimulate the growth of sengon plantlet height.

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