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Effects of Atonik Application on the Growth of Kepok Banana (*Musa × paradisiaca* L.) Plantlets under In Vitro Drought Stress

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Abstract

Kepok banana (*Musa × paradisiaca* L.) is a local banana cultivar with considerable potential for cultivation; however, its productivity is often constrained by drought stress. Tissue culture provides an effective approach for producing uniform and disease-free planting materials, although plantlet growth may be adversely affected under water-deficit conditions. The application of Atonik, a plant growth regulator, has been proposed to improve plant growth under abiotic stress. This study aimed to evaluate the effects of Atonik concentration and immersion duration on the growth of Kepok banana plantlets under in vitro drought stress conditions induced by polyethylene glycol (PEG) 6000. The experiment was arranged in a factorial Completely Randomized Design (CRD) consisting of two factors. The first factor was Atonik concentration (0-, 3-, and 6-mL L^{-1}), while the second factor was immersion duration (0, 10, and 20 min). The treatments were combined into nine treatment combinations with three replications, resulting in 27 experimental units. Growth responses were evaluated based on plantlet height, root length, and chlorophyll content. Data were analyzed using analysis of variance (ANOVA), followed by Tukey's HSD test at the 5% significance level. The results showed that the interaction between Atonik concentration and immersion duration significantly affected plantlet height. The highest plantlet height was recorded in treatment K1P3 (0 mL L^{-1} Atonik with a 20-min immersion duration), while treatment K2P2 (3 mL L^{-1} Atonik with a 10-min immersion duration) also exhibited favorable growth performance. However, Atonik application did not significantly affect root length or chlorophyll content under PEG-induced drought stress conditions. Overall, the effectiveness of Atonik in improving the growth and physiological characteristics of Kepok banana plantlets under in vitro drought stress conditions was limited and depended on the growth parameter evaluated.

Keywords: Atonik; Drought Stress; In Vitro Culture; Kepok Banana; PEG 6000

1. Introduction

Banana (*Musa* spp.) is one of the most important fruit crops worldwide and is extensively cultivated throughout tropical and subtropical regions due to its high nutritional value and economic importance (1). Sustainable banana production requires the availability of high-quality planting materials that are genetically uniform, vigorous, and free from pathogens. Plant tissue culture has become an effective approach for the rapid mass propagation of superior banana planting materials. In addition to its propagation function, tissue culture provides a controlled environment for evaluating plant responses to various biotic and abiotic stresses (2,3).

Among abiotic stresses, drought is one of the major environmental constraints limiting plant growth and productivity. Drought stress reduces water availability, disrupts cellular homeostasis, impairs photosynthesis, and inhibits plant growth and development (4). Water deficit conditions also stimulate the excessive production of reactive oxygen species (ROS), resulting in oxidative damage to cellular structures and metabolic disturbances (5). In vitro simulation

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of drought stress is commonly achieved using polyethylene glycol (PEG), an osmotic agent that lowers water potential without entering plant cells. PEG-induced drought stress has been widely used to evaluate plant tolerance mechanisms under controlled conditions. For example, (6) reported that the application of 20% PEG 6000 significantly affected chlorophyll content and stomatal index in *Dendrobium* sp. plantlets cultured in vitro.

Atonik is a plant growth regulator containing sodium para-nitrophenolate (PNP), sodium ortho-nitrophenolate (ONP), and sodium 5-nitroguaiacolate (5NG), which are known to stimulate physiological and metabolic processes associated with plant growth (7). Previous studies have demonstrated the potential of Atonik to enhance plant growth under various environmental conditions. In banana, (8) reported that Atonik application significantly improved the in vitro growth of Raja Bulu banana (*Musa × paradisiaca* L.) plantlets, particularly in terms of plantlet height and root length. However, information regarding the effectiveness of Atonik in promoting the growth of Kepok banana plantlets under PEG-induced drought stress conditions remains limited.

Therefore, this study was conducted to evaluate the effects of different Atonik concentrations and immersion durations on the growth responses of Kepok banana (*Musa × paradisiaca* L.) plantlets cultured under in vitro drought stress conditions. The findings are expected to contribute to the development of strategies for improving banana plantlet performance under water-deficit conditions.

2. Materials and Methods

2.1. Plant Materials and Culture Conditions

The study utilized Kepok banana (*Musa × paradisiaca* L.) plantlets as the experimental material. Drought stress was induced using 20% polyethylene glycol (PEG) 6000 incorporated into Murashige and Skoog (MS) culture medium supplemented with sucrose and agar. Atonik solution was applied as a plant growth regulator. Additional chemicals included ethanol (70% and 96%), potassium hydroxide (KOH), hydrochloric acid (HCl), acetone, commercial bleach, and sterile distilled water.

The equipment used in this study included a laminar air flow cabinet (ESCO), autoclave, analytical balance, pH meter, spectrophotometer, micropipettes, culture vessels, glassware, and standard tissue culture instruments such as forceps, scalpels, and scissors.

2.2. Experimental Design

The experiment was arranged in a factorial Completely Randomized Design (CRD) consisting of two factors. The first factor was Atonik concentration: 0-, 3-, and 6-mL L^{-1}. The second factor was immersion duration: 0, 10, and 20 min. The two factors were combined into nine treatment combinations, each replicated three times, resulting in a total of 27 experimental units. All treatments were applied to Kepok banana (*Musa × paradisiaca* L.) plantlets cultured under PEG-induced drought stress conditions.

2.3. Sterilization of Equipment and Workspace

All glassware, culture vessels, and tissue culture instruments were sterilized in an autoclave at 121°C for 15 min. A laminar air flow (LAF) cabinet was sterilized with 70% ethanol and exposed to ultraviolet light for 15 min before use. All inoculation procedures were conducted aseptically inside the LAF cabinet.

2.4. Preparation of Culture Medium

Murashige and Skoog (MS) medium was prepared by dissolving 4.43 g L^{-1} MS basal salts and 30 g L^{-1} sucrose in distilled water. The medium pH was adjusted to 5.7 using 1 N KOH or 1 N HCl, followed by the addition of 7 g L^{-1} agar. The medium was dispensed into culture bottles (20 mL per bottle) and sterilized at 121°C for 15 min before use.

2.5. Preparation of Polyethylene Glycol (PEG) Medium

A 20% (w/v) PEG 6000 solution was prepared by dissolving PEG 6000 in sterile distilled water and adjusting the volume to 100 mL. The solution was sterilized through a 0.22 µm membrane filter under aseptic conditions and subsequently added to sterilized Murashige and Skoog (MS) medium to induce drought stress. The prepared medium was incubated at room temperature for seven days to confirm the absence of microbial contamination before use.

2.6. Preparation of Atonik Solution

Working solutions of Atonik were prepared at concentrations of 0-, 3-, and 6-mL L^{-1} using sterile distilled water. The solutions were mixed thoroughly to ensure homogeneity prior to treatment application.

2.6.1. Plantlet Preparation

Healthy Kepok banana (*Musa × paradisiaca* L.) plantlets of uniform size were selected and prepared under aseptic conditions. Prior to treatment application, plantlets were rinsed with sterile distilled water to remove residual medium and maintain uniform experimental conditions.

2.6.2. Planting of Kepok Banana Plantlets (Musa × paradisiaca L.*)*

Plantlets were immersed in the designated Atonik solutions for 0, 10, or 20 min according to the treatment combinations. Following immersion, each plantlet was transferred aseptically into a culture bottle containing MS medium supplemented with 20% PEG 6000. Each treatment consisted of three replications, with one plantlet cultured per bottle. The cultures were maintained under controlled growth-room conditions until data collection.

2.6.3. Growth Parameters

Growth responses were evaluated three weeks after planting. The measured parameters included plantlet height, root length, and chlorophyll content.

Plantlet Height (cm)

Plantlet height was measured using a ruler from the base of the plantlet to the apical growing point without removing the plantlets from the culture bottles (13).

Root Length (cm)

Root length was determined by measuring the longest root developed on each plantlet at the end of the experimental period (13).

Chlorophyll Content

Chlorophyll content was determined using the spectrophotometric method described by (9). Approximately 0.1 g of leaf tissue was homogenized in 10 mL of 80% (v/v) acetone and filtered through Whatman No. 1 filter paper. The absorbance of the extract was measured at 663 and 646 nm using a spectrophotometer. Chlorophyll concentrations were calculated using the following equations:

$$\text{Chlorophyll a} = 12.25(A663) - 2.79(A646)$$

$$\text{Chlorophyll b} = 21.50(A646) - 5.10(A663)$$

$$\text{Total chlorophyll} = 7.15(A663) + 18.71(A646)$$

where A663 and A646 represent absorbance values measured at 663 and 646 nm, respectively.

2.7. Statistical Analysis

Data were subjected to analysis of variance (ANOVA) using a factorial Completely Randomized Design (CRD). When significant differences among treatments were detected, means were separated using Tukey's Honestly Significant Difference (HSD) test at the 5% significance level.

3. Results

3.1. Planlet Height

Plantlet height is one of the important growth parameters used to evaluate the response of Kepok banana (*Musa × paradisiaca* L.) plantlets to Atonik application under in vitro drought stress conditions. Variations in plantlet height among treatments reflect differences in growth performance under PEG-induced water-deficit stress. The average plantlet height measured at 21 days after treatment is presented in Figure 1.

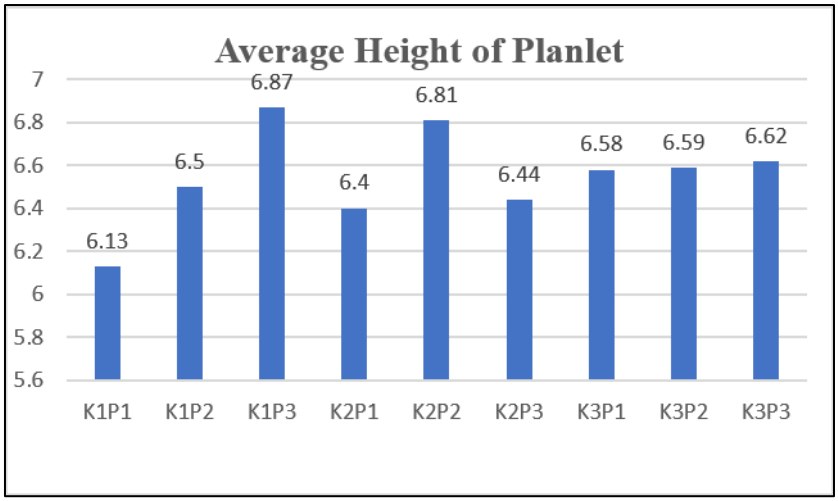

Figure 1 Average plantlet height (cm) of Kepok banana (*Musa × paradisiaca* L.) plantlets at 21 days after treatment under in vitro drought stress conditions. K1, K2, and K3 represent Atonik concentrations of 0-, 3-, and 6-mL L^{-1}, respectively, whereas P1, P2, and P3 represent immersion durations of 0, 10, and 20 min, respectively

As shown in Figure 1, plantlet height ranged from 6.13 to 6.87 cm among treatment combinations. The highest mean plantlet height was observed in treatment K1P3 (0 mL L^{-1} Atonik with a 20-min immersion duration), reaching 6.87 cm, whereas the lowest mean height was recorded in treatment K1P1 (0 mL L^{-1} Atonik with no immersion), with a value of 6.13 cm. Plantlets treated with 3 mL L^{-1} Atonik and a 10-min immersion duration (K2P2) also exhibited relatively high growth, with an average height of 6.81 cm. These results indicate that plantlet height varied among treatment combinations under drought stress conditions. Statistical analysis was subsequently performed to determine the significance of the observed differences.

Plantlet height varied among treatment combinations, with values ranging from 6.13 to 6.87 cm (Figure 1). To evaluate the significance of these differences, the data were further analyzed using Tukey's HSD test at the 5% significance level. The results are presented in Table 1.

Table 1 Effects of Atonik Concentration and Immersion Duration on Plantlet Height of Kepok Banana (*Musa × paradisiaca* L.) at 21 Days After Treatment

Atonik Concentration (mL L^{-1})	**Immersion Duration (min)**			**Mean**
	0	10	20	
0	6.12 ± 0.07^{a}	6.50 ± 0.07^{ab}	6.87 ± 0.07^{b}	6.49^{a}
3	6.43 ± 0.07^{ab}	6.81 ± 0.07^{b}	6.44 ± 0.13^{ab}	6.56^{a}
6	6.58 ± 0.10^{ab}	6.58 ± 0.18^{ab}	6.62 ± 0.07^{ab}	6.59^{a}
Mean	6.37	6.63	6.64	

Note: Values are presented as mean ± standard error (SE). Means followed by different superscript letters within the same column are significantly different according to Tukey's HSD test at $p \leq 0.05$.

According to Tukey's HSD test (Table 1), significant differences in plantlet height were observed among several treatment combinations. The highest mean plantlet height was obtained in treatment K1P3 (6.87 ± 0.07 cm), which was statistically similar to K2P2 (6.81 ± 0.07 cm) but significantly higher than K1P1 (6.12 ± 0.07 cm). These results indicate that both Atonik concentration and immersion duration contributed to variations in plantlet height under PEG-induced drought stress conditions.

The interaction between Atonik concentration and immersion duration on the height of Kepok banana (*Musa × paradisiaca* L.) plantlets at 21 days after treatment is illustrated in Figure 2. The interaction plot was used to visualize the growth response of plantlets under different combinations of Atonik concentrations and immersion durations.

Figure 2 shows the interaction between Atonik concentration and immersion duration on the mean plantlet height of Kepok banana (*Musa × paradisiaca* L.). At the 0-min immersion duration, plantlet height exhibited a gradual increase as the Atonik concentration increased from 0 to 6 mL L^{-1}.

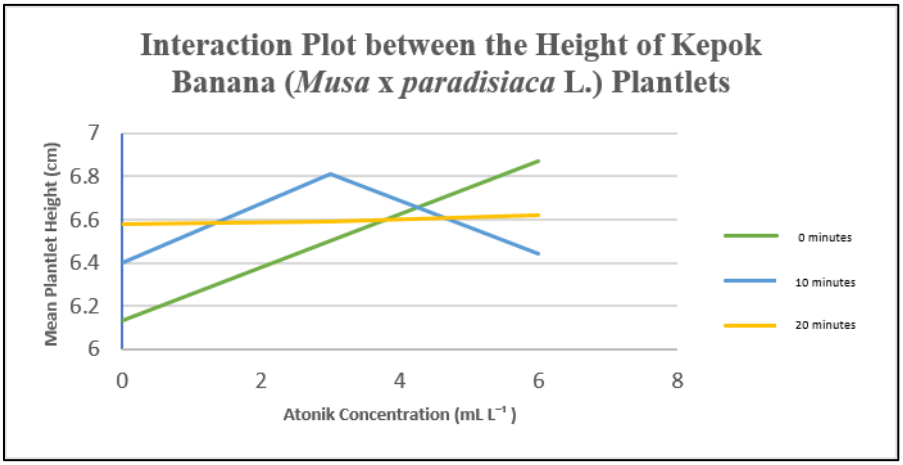

Figure 2 Interaction between Atonik Concentration and Immersion Duration on Plantlet Height of Kepok Banana (*Musa × paradisiaca* L.) at 21 Days After Treatment

To visually illustrate the effects of Atonik application on plantlet growth under in vitro drought stress conditions, representative Kepok banana (*Musa × paradisiaca* L.) plantlets from different treatment combinations were photographed at the end of the experimental period. The morphological appearance of the plantlets is presented in Figure 3.

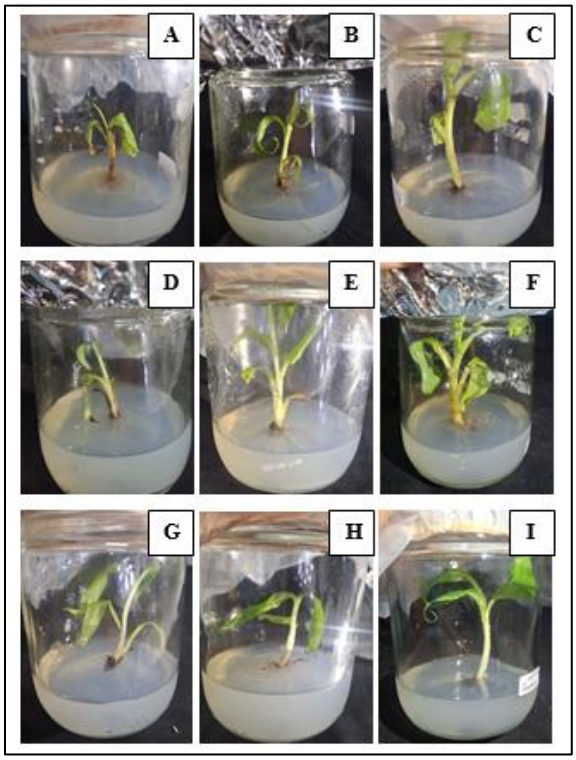

Figure 3 Morphological Appearance of Kepok Banana (*Musa × paradisiaca* L.) Plantlets at 21 Days After Treatment under In Vitro Drought Stress Conditions. (A–I) correspond to treatments K1P1, K1P2, K1P3, K2P1, K2P2, K2P3, K3P1, K3P2, and K3P3, respectively

Figure 3 illustrates the morphological appearance of Kepok banana (*Musa × paradisiaca* L.) plantlets at 21 days after treatment under in vitro drought stress conditions. Visual differences in plantlet growth were observed among

treatment combinations, particularly in plantlet height and overall plant vigor. Plantlets subjected to treatments K1P3 (0 mL L^{-1} Atonik with a 20-min immersion duration) and K2P2 (3 mL L^{-1} Atonik with a 10-min immersion duration) appeared taller and exhibited more vigorous growth than several other treatment combinations. These observations were consistent with the plantlet height measurements presented in Figure 1 and Table 1.

3.2. Root Length

The effects of Atonik concentration and immersion duration on the root length of Kepok banana (*Musa × paradisiaca* L.) plantlets at 21 days after treatment are presented in Table 2. Mean comparisons among treatments were performed using Tukey's HSD test at the 5% significance level.

Table 2 Effects of Atonik Concentration and Immersion Duration on Root Length of Kepok Banana (*Musa × paradisiaca* L.) Plantlets at 21 Days After Treatment

Atonik Concentration (mL L^{-1})	**Immersion Duration (min)**			**Mean**
	0	10	20	
0	1.30 ± 0.06	1.40 ± 0.06	1.37 ± 0.12	1.36[a]
3	1.00 ± 0.06	0.90 ± 0.06	1.03 ± 0.12	0.98[b]
6	1.00 ± 0.06	0.90 ± 0.06	0.97 ± 0.09	0.96[b]
Mean	1.10	1.07	1.12	

Note: Values are presented as mean ± standard error. Means within the same column followed by different superscript letters are significantly different according to Tukey's HSD test at $p \leq 0.05$.

Based on Table 2, the mean root length of Kepok banana (*Musa × paradisiaca* L.) plantlets at 21 days after treatment was significantly affected by Atonik concentration. According to Tukey's HSD test at the 5% significance level, the control treatment (0 mL L^{-1} Atonik) produced the longest roots, with a mean root length of 1.36 cm. In contrast, treatments receiving 3- and 6-mL L^{-1} Atonik resulted in significantly shorter roots, with mean values of 0.98 and 0.96 cm, respectively. However, no significant difference was observed between the 3- and 6-mL L^{-1} treatments, indicating that increasing Atonik concentration did not enhance root length under in vitro drought stress conditions.

To further illustrate the interaction between Atonik concentration and immersion duration on root development, the mean root length of Kepok banana (*Musa × paradisiaca* L.) plantlets under different treatment combinations is presented in Figure 4.

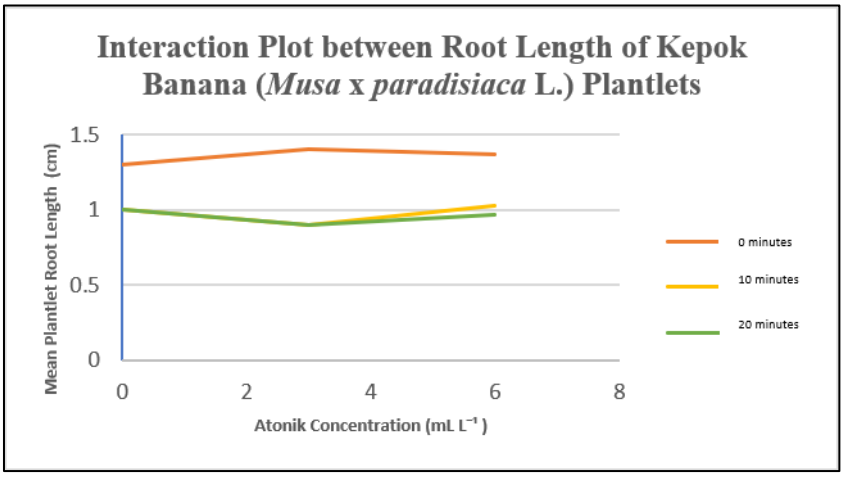

Figure 4 Interaction Effect of Atonik Concentration and Immersion Duration on Root Length of Kepok Banana (*Musa × paradisiaca* L.) Plantlets at 21 Days After Treatment

Figure 4 shows that root length responses varied among treatment combinations. The longest roots were generally observed in plantlets that did not receive Atonik treatment (0 mL L^{-1}), whereas plantlets treated with 3- and 6-mL L^{-1} Atonik tended to produce shorter roots. Root length remained relatively similar between the two Atonik concentrations

across immersion durations, indicating that increasing Atonik concentration did not promote root elongation under PEG-induced drought stress conditions.

3.3. Chlorophyll Content

3.3.1. Chlorophyll a Content

Chlorophyll a content was measured to evaluate the physiological response of Kepok banana (*Musa × paradisiaca* L.) plantlets to Atonik application under in vitro drought stress conditions. The effects of Atonik concentration and immersion duration on chlorophyll a content at 21 days after treatment are presented in Table 3.

Table 3 Chlorophyll a Content of Kepok Banana (*Musa × paradisiaca* L.) Plantlets as Affected by Atonik Concentration and Immersion Duration at 21 Days After Treatment

Atonik Concentration (mL L^{-1})	**Immersion Duration (min)**			**Mean**
	0	10	20	
0	1.84 ± 0.68	2.42 ± 0.14	1.97 ± 0.22	2.08
3	1.88 ± 0.20	1.50 ± 0.16	2.04 ± 0.24	1.81
6	1.31 ± 0.13	1.82 ± 0.28	1.82 ± 0.55	1.65
Mean	1.68	1.91	1.94	

Note: Values are presented as mean ± standard error (SE).

As shown in Table 3, chlorophyll a content varied among treatment combinations. The highest mean chlorophyll a content was observed in treatment K1P2 (0 mL L^{-1} Atonik with a 10-min immersion duration), reaching 2.42 ± 0.14 mg L^{-1}, whereas the lowest value was recorded in treatment K3P1 (6 mL L^{-1} Atonik with no immersion), with a value of 1.31 ± 0.13 mg L^{-1}. Based on the mean values across Atonik concentrations, the control treatment (0 mL L^{-1}) produced the highest chlorophyll a content (2.08 mg L^{-1}), followed by 3 mL L^{-1} (1.81 mg L^{-1}) and 6 mL L^{-1} (1.65 mg L^{-1}). These results indicate a tendency for chlorophyll a content to decrease with increasing Atonik concentration under PEG-induced drought stress conditions.

3.3.2. Chlorophyll B Content

The chlorophyll b content of Kepok banana (*Musa × paradisiaca* L.) plantlets at 21 days after treatment under in vitro drought stress conditions is presented in Table 4.

Table 4 Effects of Atonik Concentration and Immersion Duration on Chlorophyll b Content of Kepok Banana (*Musa × paradisiaca* L.) Plantlets at 21 Days After Treatment

Atonik Concentration (mL L^{-1})	**Immersion Duration (min)**			**Mean**
	0	10	20	
0	8.67 ± 0.26	9.00 ± 0.15	8.47 ± 0.30	8.71
3	8.43 ± 0.20	7.90 ± 0.17	8.67 ± 0.20	8.33
6	7.73 ± 0.15	8.33 ± 0.30	8.20 ± 0.53	8.09
Mean	8.28	8.41	8.44	

Note: Values are presented as mean ± standard error (SE).

As shown in Table 4, chlorophyll b content varied among treatment combinations. The highest chlorophyll b content was recorded in treatment K1P2 (0 mL L^{-1} Atonik with a 10-min immersion duration), reaching 9.00 ± 0.15 mg L^{-1}, whereas the lowest value was observed in treatment K3P1 (6 mL L^{-1} Atonik with no immersion), with a value of 7.73 ± 0.15 mg L^{-1}. Based on the mean values across Atonik concentrations, chlorophyll b content tended to decrease as Atonik concentration increased, with mean values of 8.71, 8.33, and 8.09 mg L^{-1} for 0-, 3-, and 6-mL L^{-1} Atonik, respectively.

3.3.3. Total Chlorophyll Content

The total chlorophyll content of Kepok banana (*Musa × paradisiaca* L.) plantlets at 21 days after treatment under in vitro drought stress conditions is presented in Table 5.

Table 5 Total Chlorophyll Content of Kepok Banana (*Musa × paradisiaca* L.) Plantlets as Affected by Atonik Concentration and Immersion Duration at 21 Days After Treatment

Atonik Concentration (mL L^{-1})	**Immersion Duration (min)**			**Mean**
	0	10	20	
0	10.77 ± 0.52	11.40 ± 0.21	10.57 ± 0.45	10.91
3	10.53 ± 0.38	9.67 ± 0.29	10.77 ± 0.38	10.32
6	9.40 ± 0.21	10.23 ± 0.50	10.10 ± 0.82	9.91
Mean	10.23	10.43	10.48	

Note: Values are presented as mean ± standard error (SE).

As shown in Table 5, total chlorophyll content varied among treatment combinations. The highest total chlorophyll content was observed in treatment K1P2 (0 mL L^{-1} Atonik with a 10-min immersion duration), reaching 11.40 ± 0.21 mg L^{-1}, whereas the lowest value was recorded in treatment K3P1 (6 mL L^{-1} Atonik with no immersion), with a value of 9.40 ± 0.21 mg L^{-1}. Based on the mean values across Atonik concentrations, the control treatment exhibited the highest total chlorophyll content (10.91 mg L^{-1}), followed by 3 mL L^{-1} (10.32 mg L^{-1}) and 6 mL L^{-1} Atonik (9.91 mg L^{-1}). Overall, total chlorophyll content tended to decrease with increasing Atonik concentration under PEG-induced drought stress conditions.

4. Discussion

Drought stress is one of the most critical abiotic factors limiting plant growth and productivity worldwide. Under water-deficit conditions, plants experience reduced water uptake, stomatal closure, impaired photosynthesis, and metabolic disturbances that ultimately suppress growth and development (4,10). In addition, drought stress promotes the accumulation of reactive oxygen species (ROS), leading to oxidative damage to cellular structures and degradation of photosynthetic pigments. In the present study, polyethylene glycol (PEG) 6000 was used to simulate drought stress under in vitro conditions and to evaluate the growth responses of Kepok banana (*Musa × paradisiaca* L.) plantlets to Atonik application.

The interaction between Atonik concentration and immersion duration influenced plantlet height, with treatments K1P3 (0 mL L^{-1} Atonik and 20 min immersion) and K2P2 (3 mL L^{-1} Atonik and 10 min immersion) producing the greatest plantlet height. These results suggest that moderate Atonik application may support shoot growth under drought stress conditions. Atonik contains nitrophenolate compounds that stimulate cell division, cell elongation, and metabolic activity, thereby promoting vegetative growth (7).

In contrast to plantlet height, Atonik application did not enhance root length under PEG-induced drought stress. The longest roots were observed in the control treatment, whereas plantlets treated with 3- and 6-mL L^{-1} Atonik exhibited shorter roots. These findings indicate that the concentrations used in this study were not effective in promoting root elongation under drought stress conditions. Root growth is regulated by complex interactions between endogenous hormones and environmental factors. Although nitrophenolate-based biostimulants such as Atonik have been reported to stimulate plant metabolic activity and growth processes (7), their effectiveness may vary depending on concentration and stress intensity. Furthermore, the strong osmotic effect of PEG can reduce water uptake, limit cell expansion, and impair root development under drought stress conditions (4).

Similarly, chlorophyll a, chlorophyll b, and total chlorophyll contents were not improved by Atonik treatment. In general, chlorophyll content tended to decline as Atonik concentration increased. The highest chlorophyll values were consistently recorded in the control treatment, while lower values were observed in plantlets treated with 3- and 6-mL L^{-1} Atonik. This reduction may be attributed to drought-induced physiological stress. Water deficit conditions reduce cellular water content, impair enzyme activity involved in chlorophyll biosynthesis, and promote the accumulation of reactive oxygen species (ROS), leading to oxidative damage and chlorophyll degradation (4; 10). Consequently, the beneficial effects of Atonik on plant metabolism may have been insufficient to counteract the adverse effects of PEG-

induced drought stress. Comparable results were reported by (11), who found that Atonik application did not significantly increase chlorophyll content in garlic. Likewise, (12) reported that the highest chlorophyll content was obtained in the control treatment without Atonik application.

Overall, the results indicate that the effectiveness of Atonik under in vitro drought stress conditions was limited and depended on the parameter evaluated. While certain treatment combinations improved plantlet height, Atonik application did not enhance root growth or chlorophyll content. These findings suggest that the response of Kepok banana plantlets to Atonik is strongly influenced by the concentration applied and the severity of drought stress induced by PEG 6000.

5. Conclusions

The present study demonstrated that the growth response of Kepok banana (*Musa × paradisiaca* L.) plantlets under in vitro drought stress conditions varied according to the combination of Atonik concentration and immersion duration. The interaction between these factors significantly influenced plantlet height, with treatment K1P3 (0 mL L^{-1} Atonik and 20 min immersion) producing the highest plantlet height, while treatment K2P2 (3 mL L^{-1} Atonik and 10 min immersion) also exhibited favorable growth performance. However, Atonik application did not enhance root length or chlorophyll content under PEG-induced drought stress conditions. Overall, the application of Atonik had a limited effect on the growth and physiological characteristics of Kepok banana plantlets cultured under drought stress conditions.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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