

# Effect of Indole Butyric Acid (IBA) Concentration on Rooting of Some Ornamental Plants

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**Abstract** - This research was conducted at the Faculty of Agricultural Engineering at Idlib University (northwestern Syria), during the academic year 2023-2024, to test the effect of treatment with the rooting hormone IBA (indole butyric acid) on the rooting rate and speed of some ornamental plants (*Aglaonemamodestum*, *Euonymus japonica*, and *Jasminum humile*), and determine the optimal concentration of IBA hormone for rooting cuttings of the ornamental plants. Three concentrations of the hormone were used, namely 250, 500, and 1000 ppm, in addition to the control (treatment with distilled and sterile water only). The results showed that the tested plants varied in their response to treatment with the rooting hormone. All cuttings of the *Aglaonema modestum* plant were able to form roots even without treatment with the IBA hormone (control), and the rooting rate in all treatments was 100%. However, the use of the hormone led to a significant increase in the number of roots formed (10.2 roots) and their length (3.44 cm) and the length of the treated plants (11.70 cm), and increasing the hormone concentration did not achieve any significant increase in the studied traits. In contrast, the cuttings of the *Euonymus japonica* plants did not root until after treatment with the hormone, and the treatment with the hormone (the lowest concentration of 250 ppm) achieved a significant increase in all studied traits, rooting percentage (90%), number of roots (7.3 roots), length (2.3 cm), and plant length (8.05 cm), compared to the control. Increasing the hormone concentration also achieved a significant increase in the number of roots formed on the cutting, a non-significant increase in the rooting percentage, and a non-significant decrease in root length and plant length. Finally, 20% of the cuttings of the *Jasminum humile* plant were rooted without treatment with the rooting hormone, but the treatment with the hormone achieved a significant increase in the rooting percentage, number of roots (3.4 roots), length (1.82 cm), and plant length (6.40 cm), compared to the control. Increasing the concentration of rooting hormones also achieved a significant increase in the rooting percentage and the number of roots formed on the cutting, and a non-significant increase in the length of the roots and the length of the plants. The concentration of 1000 ppm achieved the best results (rooting percentage

60%, number of roots 7.1 roots/cutting, root length 4.04 cm, and plant length 10.64 cm).

**Keywords:** Indole Butyric Acid, IBA, Ornamental Plants, *Aglaonemamodestum*, *Euonymus japonica*, and *Jasminum humile*.

## I. INTRODUCTION

Ornamental plants play a vital role in improving our surrounding environment, whether in homes, gardens, or public places (Shen *et al.*, 2024). These plants add natural beauty and vitality to homes, gardens, and offices, which helps improve mood and feelings of comfort and relaxation. Psychologists have found that the diverse colors and shapes of leaves and flowers contribute to creating beautiful landscapes that please the eye and relieve psychological stress (Hüla, 2023). They also increase children's intelligence (Hill, 2024). In addition, ornamental plants act as natural air cleaners, absorbing carbon dioxide and releasing oxygen, which improves indoor air quality (Khudhair *et al.*, 2024). The production of ornamental plants is one of the thriving agricultural projects that have great economic importance (Wani *et al.*, 2023). The production and marketing of ornamental plants contribute to providing many job opportunities at various stages of production, from cultivation and care to transportation, distribution, and sale (Sudirjo *et al.*, 2023). These plants are an important source of income for farmers and agricultural companies, and they also play a role in stimulating tourism, as botanical gardens and parks attract many visitors (Díaz-Meneses and Amador-Marrero, 2024). In addition, the use of ornamental plants in the design of green spaces contributes to improving the value and attractiveness of real estate, which enhances its monetary value (Fetchel and Hall, 2023).

Rooting of ornamental plants is an essential step in their propagation and increase in number. There are several traditional methods for rooting ornamental plants, among which rooting by cuttings is the most common. In this method, a part of the plant (usually the stem or leaves) is cut and placed in a suitable rooting medium, such as moist soil or water. Cuttings need a moist and warm environment to encourage root growth (Pundir, 2024). The use of plant

hormones is emerging as an effective tool for plant rooting, which is an essential process for plant propagation and improving their productivity (Sampedro-Guerrero *et al.*, 2023; Shah *et al.*, 2023). They are used to stimulate root formation in plant cuttings (LU *et al.*, 2024). Auxins, such as indole butyric acid (IBA) and naphthalene acetic acid (NAA), are the most common and widely used in plant rooting (Soliman *et al.*, 2023). These hormones stimulate cell division and differentiation in the cut area, which helps in forming strong and healthy roots. They also contribute to increasing the success rate of the rooting process and reducing the time required for root formation (Zhang *et al.*, 2023).

Indole butyric acid (IBA) is an important synthetic auxin used in agriculture to stimulate the growth of cuttings used in plant propagation. This hormone is an effective tool in improving the rooting process (Sosnowski *et al.*, 2023), especially for ornamental plants (Mohammed *et al.*, 2024), which enhances their quality, and beauty, and increases their economic efficiency (Soliman *et al.*, 2023). IBA is an organic compound that belongs to the auxin family, and its chemical formula is  $C_{12}H_{13}NO_2$ . This hormone is characterized by its structure which contains an indole ring linked to a butyric chain, which makes it effective in stimulating root growth (NCBI, 2024). When plant cuttings are treated with the rooting hormone IBA, it stimulates cell division in the cambium, the plant tissue responsible for root growth. This division increases the number of cells, leading to the formation of new roots (Uddin *et al.*, 2024). Kalthoriet *et al.*, 2023, found that IBA regulates cell differentiation, stimulating undifferentiated cells to specialize into root cells. This differentiation occurs by modifying the activity of genes associated with root formation. Khaleghi and Alivapour (2024) also showed that IBA increases the production of proteins and enzymes responsible for the formation of new cell walls, which play an important role in promoting root growth. Lawson *et al.* (2023) confirmed that IBA enhances the flow of water and nutrients towards the rooting zone, providing optimal conditions for root growth. This contributes to improving the plant's absorption of nutrients, thus enhancing its health and growth.

Indole butyric acid (IBA) is a vital tool in the rooting process of ornamental plants, thanks to its effective effect on plant cells and its promotion of root growth processes. By understanding the mechanisms of action of IBA, farmers, and agricultural professionals can improve the productivity and quality of ornamental plants. (El Malahiet *et al.*, 2024) found that IBA helps increase the success rate of the rooting process, which means improving the efficiency of plant propagation and reducing the loss of unrooted cuttings. (De Andrade *et al.*, 2023) also found that the use of IBA reduces the time required for root formation, allowing for faster production of plants for sale or cultivation. (El-Banna *et al.*, 2023) found that roots

formed using IBA are stronger and healthier, resulting in plants that are more vigorous and able to withstand environmental stresses. IBA can also be used to root plant species that are difficult to root using traditional methods (Lawson *et al.*, 2023), increasing the diversity of ornamental plants available in the market.

*Aglaonemamodestum* plant is an important indoor landscaping plant, as it is grown for the beauty of its leaves, especially the patterned types. The hormone indole butyric acid (IBA) is widely used in rooting the cuttings of this plant to increase the rooting percentage of the cuttings and accelerate the rooting process. (Patel, 2017) showed in his study to evaluate the effect of several concentrations of IBA (0, 500, 1000, 2000, and 3000) ppm on the rooting of *Aglaonemamodestum* cuttings, and found that the concentration of 2000 ppm was the most effective in improving the rooting percentage and root quality.

The use of indole butyric acid (IBA) hormone in rooting *Jasminum humile* cuttings, known for the beauty of its flowers and its distinctive aromatic scent, has also been shown in studies. Studies have shown that the use of indole butyric acid (IBA) hormone plays a vital role in improving the rooting of *Jasminum humile* plants, as concentrations ranging from 1000-1500 ppm gave the best results in increasing the rooting percentage and root quality. These results support the use of IBA as an effective means of propagating ornamental plants more efficiently. In a study conducted on the rooting of *Jasminum humile* cuttings, a concentration of 1000 ppm of IBA was used. The results showed a significant increase in the rooting percentage of cuttings and root length, confirming the effectiveness of this concentration in enhancing rooting (Singh *et al.*, 2017). (Kumar and Reddy, 2016) showed that the concentration of 1000 ppm was the most effective, as cuttings treated with this concentration achieved the highest rooting percentage and the best root quality. (Patel *et al.*, 2018) confirmed the importance of using IBA in improving the rooting of *Jasminum humile* cuttings, as the treated cuttings showed a significant increase in the number and length of the roots formed compared to the untreated cuttings.

Studies have also confirmed that the use of indole butyric acid (IBA) hormone plays a vital role in improving the rooting of *Euonymus japonica* plants, as concentrations ranging from 1000-1500 ppm gave the best results in increasing the rooting percentage and root quality. In a study conducted on the rooting of *Euonymus japonica* cuttings, a concentration of 1000 ppm of IBA was used. The results showed a significant increase in the rooting percentage of cuttings and root length, confirming the effectiveness of this concentration in increasing the rooting percentage (Gupta and Jain, 2015). Sharma and Kumar (2017) studied the effect of different

concentrations of IBA (0, 500, 1000, 1500) ppm on the rooting of *Euonymus japonica* cuttings, and showed that the concentration of 1000 ppm was the most effective, as the cuttings treated with this concentration achieved the highest rooting percentage and the best root quality.

Given the aesthetic value of ornamental plants (*Aglaonemamodestum*, *Euonymus japonica*, and *Jasminum humile*), however, due to the difficulty of propagating them by cuttings (which is the common method for propagating these plants) without using rooting hormones, and due to the lack of local studies on the effect of the rooting hormone IBA (indole butyric acid) and its optimal concentration used in rooting, this research aimed to test the effect of the rooting hormone IBA (indole butyric acid) on the rooting rate and speed of some ornamental plants (*Aglaonemamodestum*, *Euonymus japonica*, and *Jasminum humile*), in addition to determining the optimal concentration of the rooting hormone IBA (indole butyric acid) for the success of the rooting process for the above plants.

## II. MATERIALS AND METHODS

### 2.1 Plant material:

Three types of economically important ornamental plants grown in the College of Agricultural Engineering were selected, namely (common lemon leaf, common coral, and yellow jasmine). Young cuttings were taken from the plants and treated with different treatments, with 10 replicates for each treatment.

- *Aglaonema modestum*: from the Araceae family, it is an indoor landscaping plant (house shade plants), grown for the beauty of its leaf collection, its original home is Malaysia.
- *Euonymus japonica*: an evergreen shrub from the Celastraceae family, widely spread as an ornamental hedge plant. Its original home is Japan.
- *Jasminum humile*: an evergreen climbing plant from the Oleaceae family, its original home is China and India.

### 2.2 Experimental design and experimental treatments:

The experiment was designed according to a completely randomized design (CRD), and the treatments were as follows:

- 1) Plant type: Three plant types were used: lemon leaf, coral, and yellow jasmine.
- 2) Hormone concentration: Three concentrations were used (250 ppm, 500 ppm, 1000 ppm) in addition to the control (where the cuttings were immersed in sterile distilled water).

### 2.3 Working methods:

The work was carried out in the plant laboratory at the Faculty of Agricultural Engineering at Idlib University.

#### 2.3.1 Preparation of IBA rooting hormone:

- IBA solution was prepared to root the cuttings of the required plants, namely lemon leaf, yellow jasmine, and coral.
- The required amount of IBA powder was weighed using a precision balance (0.001 g) to prepare a solution with a concentration of 1000 ppm, where 1 g of IBA was dissolved in 100 ml of ethyl alcohol (alcohol helps dissolve IBA better) and then the volume was completed to 1 liter using sterile distilled water.
- After preparing the solution with a concentration of 1000 ppm, half of the amount (500 ml) was taken and diluted 1:1 (using distilled and sterile water) to reach a concentration of 500 ppm, then half of the amount of the solution with a concentration of 500 ppm (i.e. 250 ml) was taken and diluted 1:1 (using distilled and sterile water) to reach a concentration of 250 ppm.
- The solution was used immediately after preparation away from light to maintain its effectiveness at laboratory temperature.

#### 2.3.2 Preparing the cuttings for rooting:

- Terminal cuttings were taken from the plants to be rooted, plants (*Aglaonemamodestum*, *Euonymus japonica*, and *Jasminum humile*), approximately 10 cm long and identical in size for each plant.
- All lateral leaves were removed from the cuttings except the leaves at the top of the plant, and they were placed in plastic boxes and treated on the same day they were taken within about an hour.

#### 2.3.3 Treating the cuttings with rooting solutions and planting them:

- The bases of the cuttings (10 cuttings from each plant) were immersed in the prepared solution for 10 seconds, for each concentration (250, 500, and 1000) ppm, and the control cuttings (10 cuttings) were immersed in sterile distilled water.
- After immersing the cuttings in the IBA solution, they were planted in cups containing a suitable rooting medium, which is perlite, at a rate of one cutting in each cup.
- The cuttings were followed up and their appropriate humidity was maintained after planting, as they were moistened with water spray daily and several times and

placed in a shaded place to avoid direct exposure to sunlight.

### 2.4 Readings taken:

After 30 days of treating the cuttings and planting them in the perlite medium, the required readings were taken on them, which are:

- 1) Rooting percentage (%).
- 2) Number of roots formed.
- 3) Root length (cm).
- 4) Plant length (cm).

### 2.5 Tools used in the work:

- 1) Pruning shears to cut and prepare the cuttings.
- 2) 500 ml cups to put the rooting solution in while immersing the base of the cuttings.
- 3) 500 g cardboard cups containing 400 g perlite to plant the cuttings in after immersing them in the rooting solution.
- 4) Plant hormone IBA.
- 5) Sterile plastic gloves.
- 6) Glass stirrer to dissolve the hormone in alcohol and water.
- 7) 70% alcohol.
- 8) Sterile distilled water.
- 9) Micropipette with tips.
- 10) Timer.
- 11) Sensitive balance with an accuracy of 0.001 g.
- 12) Pearlite.

### 2.6 Statistical analysis:

The results were analyzed using the statistical analysis program GenStat-12, and the averages were compared using the least significant difference LSD at a significance level of 0.05%.

## III. RESULTS AND DISCUSSION

### 3.1 Rooting percentage in the studied plants:

Table (1): Rooting percentage in different plants and when using the specified concentrations of IBA

Treatment	<i>Aglaonema modestum</i>	<i>Euonymus japonica</i>	<i>Jasminum humile</i>
Control	100%	0%	20%
250 ppm	100%	90%	40%
500 ppm	100%	95%	50%
1000 ppm	100%	100%	60%

We note from Table (1) that the rooting percentage in *Aglaonemamodestum* plant was 100% in all treatments including the control, and there were no differences between the concentrations used of indole butyric acid (IBA), which reduces the importance of hormone treatment for *Aglaonemamodestum* plant as the control (without hormone treatment) achieved a rooting percentage of 100%.

For *Euonymus japonica* plants, hormone treatment led to rooting of cuttings, and rooting rates increased with increasing concentration of rooting hormone. The lowest concentration of IBA hormone achieved a high rooting rate of 90%, which is a very important result from an economic point of view, especially since the control did not produce any rooting, while the rooting rate was 95% and 100% when treated with 500 ppm and 1000 ppm concentrations of IBA hormone. There were no significant differences between the concentrations of hormones used in the rooting rate. Therefore, a concentration of 250 ppm is sufficient to achieve a high germination rate when treating *Euonymus japonica* plant cuttings.

For *Jasminum humile*, all treatments gave increasing rooting rates with increasing hormone concentration, starting from the control treatment, the concentration of 1000 ppm outperformed the rest of the concentrations with a rooting rate of 60%, followed by the concentration of 500 ppm, which outperformed the lower concentrations with a rooting rate of 50%, followed by the concentration of 250 ppm, which significantly outperformed the control with rooting rates for both of them reaching 40% and 20% respectively. The previous results show the need to use a concentration of 1000 ppm to achieve the appropriate rooting rate for *Jasminum humile* cuttings.

Comparing the rooting rates in different ornamental plant species, we notice a high response of *Euonymus japonica* cuttings when treated with the hormone at the lowest concentration (250 ppm), where the rooting rate was 90%, after that the response rate was simple with increasing hormone concentration. While the response of *Jasminum humile* to hormone treatment was less and the response rate increased with increasing hormone concentration, it remained ultimately less than the effect of *Euonymus japonica*, where the highest response was 60% at a concentration of 1000 ppm of the hormone. While there was no need for the hormone to treat *Aglaonemamodestum* cuttings, all of which were rooted with water only without hormone.

### 3.2 The effect of the concentration of the rooting hormone IBA on the rooting of *Aglaonema modestum* cuttings:

**Table (2): Effect of IBA rooting hormone concentration on rooting of *Aglaonema modestum* cuttings**

Treatment	Number of roots	Root length (cm)	Plant length (cm)
0 ppm	2.5 <sup>b</sup>	2.93 <sup>b</sup>	8.79 <sup>b</sup>
250 ppm	10.2 <sup>a</sup>	3.44 <sup>ab</sup>	11.70 <sup>ab</sup>
500 ppm	10.1 <sup>a</sup>	3.95 <sup>ab</sup>	13.83 <sup>a</sup>
1000 ppm	10.0 <sup>a</sup>	4.34 <sup>a</sup>	15.19 <sup>a</sup>
Mean	7.7	3.17	10.63
L.S.D. (5%)	3.68	1.13	3.67

Table (2) shows that all experimental treatments were significantly superior to the control treatment in the number of roots on the cutting, without any significant differences between the experimental treatments. The number of roots in the treatments was 250, 500, and 1000 ppm, and the control was 10.2, 10.1, 10, and 2.5 roots, respectively. The results show that the use of rooting hormone achieved a significant increase in the number of roots on the plant compared to the control, which demonstrates the necessity and importance of using rooting hormone to obtain a better root mass for the cutting. However, in contrast, increasing the concentration of the hormone in the treatments had a negative effect, as increasing the concentration of the hormone from 250 to 500 ppm and from 500 to 1000 ppm led to a decrease in the number of roots on the cutting by approximately 1% (noting that this decrease was not significant), and therefore there is no importance in increasing the concentration of rooting hormone above 250 ppm about the number of roots on the cutting.

Regarding the root length trait of *Aglaonemamodestum* plants (Table 2), the 1000 ppm concentration treatment was significantly superior to the control treatment, and the root length in them reached 4.34 and 2.93 cm, respectively. There were no significant differences between the experimental treatments 1000, 500, and 250 ppm, as the root length in the last two treatments reached 3.95 and 3.44, respectively. There were also no significant differences between the last two treatments and the control treatment. The results show that the use of the rooting hormone IBA achieved an increase in root length compared to the control (the increase was not significant in the 250 and 500 ppm treatments, while the increase was significant only in the 1000 ppm treatment), and thus there was a positive role for the use of the hormone in improving root growth and increasing their length, especially at the higher concentration (compared to not using the hormone). Likewise, increasing the hormone concentration in the treatments from 250 to 500 ppm and 500 to 1000 ppm, achieved an increase in root length by 14.8% and 9.9%, respectively, but this increase was not significant.

As for the length of *Aglaonemamodestum* plants, Table (2) shows that the two concentration treatments (1000 and 500 ppm) were significantly superior to the control (without any significant differences between the two treatments mentioned), and the plant length in these treatments was 15.19, 13.83, and 8.79 cm, respectively. On the other hand, there were no significant differences between the 250-ppm concentration treatment and the control treatment on the one hand, and between it and the two concentration treatments 500 and 1000 ppm on the other hand, and the plant length in this treatment was 11.70 cm. The results showed that the use of IBA hormone gave an increase in plant length compared to the control, but this increase was not significant at the first level of the hormone (250 ppm and an increase of 33.1% compared to the control), while increasing the hormone concentration to the second level (500 ppm) and the third (1000 ppm) gave a significant increase compared to the control in the plant length trait (57.34% and 72.8% respectively). Therefore, treating *Aglaonemamodestum* cuttings with IBA hormone is a positive thing as it achieves an increase in plant growth, especially when using high concentrations of 500 and 1000 ppm.

### 3.3 The effect of the concentration of the rooting hormone IBA on the rooting of *Euonymus japonica* plant cuttings:

**Table (3): Effect of IBA concentration on rooting of *Euonymus japonica* plant cuttings**

Treatment	Number of roots	Root length (cm)	Plant length (cm)
0 ppm	0 <sup>c</sup>	0 <sup>b</sup>	3.2 <sup>b</sup>
250 ppm	7.3 <sup>b</sup>	2.3 <sup>a</sup>	8.05 <sup>a</sup>
500 ppm	8.3 <sup>b</sup>	2.1 <sup>a</sup>	7.52 <sup>a</sup>
1000 ppm	20 <sup>a</sup>	1.9 <sup>a</sup>	6.65 <sup>a</sup>
Mean	7.4	1.23	4.3
L.S.D. (5%)	5.67	0.81	2.88

From Table (3) we note that the best number of roots was at a concentration of 1000 ppm of indole butyric acid, as treatment 1000 outperformed the rest of the treatments with clear significant differences and the number of roots in it reached 20 roots. The two concentration treatments of 500 ppm and 250 ppm came in second place without any significant differences between them, with several roots reaching 8.3 and 7.3 roots, respectively. While the control treatment did not give any rooting. As for the root length trait, all treatments outperformed the control significantly and without any significant differences between those treatments, as the root length values in treatments (250, 500, and 1000) ppm reached (2.3, 2.1, and 1.9) cm, respectively. While there were no roots on the control cuttings. The higher root length (2.3 cm) obtained when treated with the lower concentration of hormone (250 ppm) can be explained by the fact that there

are fewer roots on the plant and thus the increase in root length occurred at the expense of the smaller number of roots formed.

Also, for the plant length trait, all treatments were significantly superior to the control, without any significant differences between treatments, as the plant length values in treatments (250, 500 and 1000) ppm reached (8.05, 7.52, and 6.65) cm, respectively. While the length of the cuttings in the control plants was 3.2 cm. The higher plant length (8.05 cm) obtained when treated with the lower concentration of the hormone (250 ppm) can be explained by the presence of fewer roots on the plant and the lack of consumption of the food reserves stored in the cutting to form a large number of roots, thus increasing the plant length.

### 3.4 The effect of the concentration of the rooting hormone IBA on the rooting of *Jasminum humile* cuttings:

Table (4): Effect of IBA rooting hormone concentration on rooting of *Jasminum humile* cuttings

Treatment	Number of roots	Root length (cm)	Plant length (cm)
0 ppm	0.5 <sup>c</sup>	0.42 <sup>b</sup>	1.26 <sup>b</sup>
250 ppm	3.4 <sup>b</sup>	1.82 <sup>a</sup>	6.40 <sup>a</sup>
500 ppm	5.7 <sup>a</sup>	2.49 <sup>a</sup>	8.33 <sup>a</sup>
1000 ppm	7.1 <sup>a</sup>	3.04 <sup>a</sup>	10.64 <sup>a</sup>
Mean	3.42	1.55	5.41
L.S.D. (5%)	2.51	1.37	4.83

Table (4) shows that the two concentration treatments of 1000 ppm and 500 ppm (without significant differences between them) outperformed both the 250-ppm concentration treatment and the control treatment. The values of the number of roots in the mentioned treatments were 7.1, 5.7, 3.4 and 0.5 roots, respectively. The 250-ppm concentration treatment also outperformed the control significantly. The results show that the use of the hormone achieved a significant increase in the number of roots compared to the control, and thus the positive role of the use of the hormone in improving the quality of the cuttings and their growth strength. Also, increasing the hormone concentration achieved a significant increase in the number of roots on the cuttings, as the second concentration outperformed the first, while the continued increase in the hormone concentration (from the second concentration to the third concentration) achieved an increase in the number of roots, but this increase was not significant.

In the root length trait, all experimental treatments were significantly superior to the control and without significant differences between them. The root length in the treatments was 1000 ppm, 500 ppm, and 250 ppm, and the control was 3.04, 2.49, 1.82, and 0.42 cm, respectively. The results show

that the use of the rooting hormone IBA achieved a significant increase in root length compared to the control, and thus the positive role of using the hormone in improving root growth and thus improving the growth of rooted cuttings. However, although increasing the concentration of the hormone in the treatments led to an increase in the root length of the treated *Jasminum humile* cuttings, this increase did not achieve significant differences between the treatments, and thus the importance of increasing the concentration of the hormone in rooting yellow jasmine cuttings is reduced here and there is no need to use higher concentrations concerning this trait. About the plant length trait, Table (4) shows that all experimental treatments were significantly superior to the control and without significant differences between the experimental treatments. The plant lengths in the treatment of 1000 ppm, 500 ppm, 250 ppm, and the control were 10.64, 8.33, 6.40, and 1.26 cm, respectively. The results show that the use of the rooting hormone indole butyric acid achieved a significant increase in plant length compared to the control, and thus the use of the hormone played a positive role in increasing the length of plants and improving their vegetative growth. On the other hand, increasing the concentration of the hormone achieved an increase in the length of the treated jasmine plants, but this increase did not achieve significant differences between the treatments, and thus using the first concentration (250 ppm) is sufficient to obtain plants superior to the control in the vegetative growth rate, but increasing the concentration of the hormone has no real benefit from using it concerning improving the growth of rooted plants.

## IV. CONCLUSIONS

This study examined the effects of the hormone indole butyric acid (IBA) on the rooting of cuttings from three ornamental plants: *Aglaonema modestum*, *Euonymus japonica*, and *Jasminum humile*. The results demonstrated that the plants responded differently to the treatment with the rooting hormone.

- For *Aglaonema modestum*, all cuttings were able to form roots even without treatment with the hormone IBA (control). However, using the hormone increased the number of roots formed and increased their length and the length of the treated plants, and increasing the concentration of the hormone did not achieve any significant increase in the studied traits.
- In the case of *Euonymus japonica*, the cuttings did not root until after treatment with the hormone, and treatment with the hormone (minimum concentration 250 ppm) achieved a significant increase in all studied traits, rooting percentage, number of roots, their length, and plant length, compared to the control. Increasing the concentration of the hormone also achieved a significant

increase in the number of roots formed on the cutting, a non-significant increase in the rooting percentage, and a non-significant decrease in the length of the roots and plant length.

- For *Jasminum humile*, 20% of the cuttings were rooted without treatment with rooting hormone, but treatment with the hormone achieved a significant increase in the rooting percentage, the number of roots, their length, and the length of the plant, compared to the control. Increasing the concentration of rooting hormone also achieved a significant increase in the rooting percentage and the number of roots formed on the cutting, and an insignificant increase in the length of the roots and the length of the plants. The concentration of 1000 ppm achieved the best results.

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