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The Effect of Different Auxin Types and Acclimatization on the *Paulownia tomentosa* Plant

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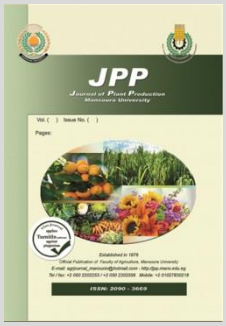

ABSTRACT

The *Paulownia tomentosa* tree is one of the quickest developing and most adaptative hardwood trees on the planet. Given the horticultural and business significance of the paulownia trees, this study was carried out in Al-Zahriya Garden at the Horticultural Institute of Agricultural Research Center in Giza, Egypt between 2018 to2020. This study was conducted in two phases, the first phase investigates the different effects of different levels of Auxin on the rooting process and the second phase explores different soil mixtures' effects on the acclimatization of the plant. Vegetative plants were obtained from pre-cultured tissues from the same laboratory and the same flower garden. In phase1, three different types of Auxins were used – IBA, NAA and IAA with concentration levels of 0mg/L, as a control phase, 1mg/L, 2mg/L and 3 mg/L. At control concentration [0mg/L], The experiment was conducted by this study to find out the best protocol for *in vitro* and *in vevo* micropropagation of *Paulownia Tomentosa*. The results showed that the IBA at 2 mg/L had the highest position for shoot fresh weight. NAA at 2 mg/L: acquired the highest number for shoot length, shoot fresh weight, root fresh weight and total chlorophyll content. IAA at 1 mg/L: got the most elevated grade for total chlorophyll content. IAA at 2 mg/L: had the most elevated degree for shoot length. IAA at 3 mg/L: attained the most elevated grade for the number of shoots and leaves. Potting Mix 3(Peat moss + Perlite + Vermiculite): Highest for Fresh Castor Weight.

***Keywords**: In vitro* culture, *Paulownia tomentosa*, rooting, acclimatization

INTRODUCTION

Paulownia *tomentosa* (Thunb.) Steud. is a very fast developing hardwood tree known as Sovereign tree which has a place with the family Paulowniaceae. It is planted as a decorative tree and as a wellspring of environmentally friendly power as well as paper mash, electric posts, development materials, compressed wood and furniture (Barton *et al*. 2007). Paulownia wood is top-notch and helpful for making instruments, boxes, chests, lightweight skis, furniture, moldings, entryways and windows. (Rafighi and Tabarsa, 2011). Likewise, Paulownia species are among the main ranger service crops on the planet. Traditional techniques for vegetative proliferation are slow and cannot cover the rising interest consistently. Tissue culture is the main apparatus that helps in delivering excellent establishing material in enormous amounts. Likewise, is a refined procedure that includes various stages which must be performed cautiously to effectively create the establishing material (Chesha *et al.* 2015). The spread of *Paulownia tomentosa* was accomplished principally by utilizing either seeds (Ozaslan *et.al*., 2005) or nodal explants (Rout *et.al*., 2001). The customary strategies are not suggested as an aftereffect of low the number created powerlessness to bothers and infections as well as unfortunate germination and slow development (Bergmann and Moon,1997). However, *in vitro* engendering energized the creation of tremendous quantities of solid, homogenous, free from bacterial and parasitic illnesses, and with an incredible likeness to the mother trees. Hence, utilization of tissue culture is incredibly suggested for upgrading the extension and probability of mass engendering by taking advantage of recovery conduct in a wide range of chosen agricultural plants (Bajaj,1986: Bonga and Durzan, 1987). The definitive objectives of this examination are to figure out the conceivable outcomes of the options of customary strategies for engendering Paulownia *tomentosa* tocover the ever-evolving request of this plant. Additionally, the creation of larger numbers in a brief time frame with few costs.

MATERIALS AND METHODS

This study was carried out in the Tissue Culture Laboratory, Zohriya, ornamental plants and landscape gardening res. Department horticultural Institute, Agricultural Research Center, Giza, Egypt from 2018 to 2020, in order to study the effect of water source and some cytokinin during multiplication study of *in vitro* propagation *Pauwlonia tomentosa* plant through tissue culture on *in vitro* is grown explants obtained from the same lab in Zohriya Garden.

1.Experiment Design

a.Rooting:

An explant, the product of multiplication from a pre-cultured tissue in laboratory conditions, is to be placed in a medium consisting of charcoal and auxin for a period of 30 days. Different concentrations of the auxin growth factor were tested under 4 different conditions, including the control test, with three different plant growth regulators (auxins) – IBA, NAA, and IAA at 0 mg/L, 1 mg/L, 2 mg/L

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and 3 mg/L. Every focus for each of the auxins was utilized and repeated in three different jars. An analysis of variance for the obtained data was conducted as described by Snedecor and Cochran (1989) next. The variances were compared by the Duncan critical range at a probability level of 5% (Duncan, 1955).

b. Acclimatization

a full plant Outside of rooting stage will be placed in potting media were: peat moss, perlite and vermiculite and a combination of (peat moss and vermiculite at 1:1 by volume) , (peat moss and perlite at 1:1 by volume) and (perlite, peat moss , and vermiculite at 1:1:1 by volume) then the plants will be moved to the plastic greenhouse. potted plants filled with certain potting media were put on meshed benches 1 m height under 25-27 °Cthen the reading will be taken after 30 days

2.Conditions

Glassware

Jars of 250 cm3 size were filled with about 40 cm3 media were used at all stages.

Incubation conditions

Cultures of all experiments were incubated at 28±2°C 2000-2500 lux fluorescent lighting at 16/8 day/night using fluorescent lamps (2 lamps per shelf). Each treatment comprised 3 replicates (jars), with 3 micro-shoots for each replicate in each plant.

Culture Media

" Murashige and Skoog medium (1962) (MS) in all later experiments were autoclaved and dispensed in jars as mentioned later. Supplied with 30g/l sugar and 7g/1 agar adjusted at 5.7+0.1 pH were autoclaved under 121 °C and 1.2 Kg/cm^2 pressure for 20 min. were poured in Jars of 250 cm^3 size were filled with about 40 cm^3 medium were used at all stages. The media left for 1 week to make sure that no contamination. The hormonal supplements differed according to the requirement of the specified experiments as will be mentioned later.

3. Experiment:

Phase 1: Rooting

1/2 strength MS medium augmented with one of the following auxins, such as indole-3-butyric acid (IBA), indole-3-acetic acid (IAA), or1-naphthaleneacetic acid (NAA), at 0, 1, 2 and 3 mg/L were prepared and autoclaved as mentioned before. Shoot explants, obtained from the previous stage. were inoculated singly in every 250 cm3 jar containing 40 ^{cm3} of the medium These vessels were kept in the incubation room under the mentioned conditions. Two factors were studied in this expert namely auxin type and auxin concentration, in addition to their interaction. Accordingly, a factor was designed in a completely randomized experiment was adopted in this case. Characters studied in this stage were shoot length (cm), the number of shoots, leaves, and roots, shot fresh weight (g), root fresh weight (g), root length, and total chlorophyll content (mg/g FW) are also factors to consider. (Spectrophotometer reading) after 30 days according to Saric et al., (1976).

Phase 2: *acclimatization*

4. plant material:

Invitro propagation *Pauwlonia tomentosa* plant through tissue culture on *in vitro* grown explants obtained from the same lab in Zohriya Garden.

5. Culture incubation conditions:

Cultures of all experiments were incubated at 28±2°C for 16/8 day/night under the fluorescent light of 2000-2500 lux using fluorescent lamps (2 lamps per shelf). Each treatment comprised3 replicates (jars), with 3 micro-shoots for each replicate in each plant.

6. Media type and strength experiment:

The media used in this experiment were one type of media in a completely randomized design experiment, namely Medium Murashige and Skoog (1962) (MS). The media were prepared at the concentrations mentioned before. Parameters studied were the number of shoots, the number of leaves, shoot length (cm) total chlorophyll (mg/g FW) and shoot fresh weight (g).

7. Acclimatization stage:

Acclimatization of grown plantlets started gradually in the incubation room according to well-known criteria until they were ready to be potted and moved to the greenhouse. Were pots of 3.5 cm diameter filled with certain potting media were put on meshed benches 1 m height under 25-27 °C and about 85 RH. that has been cultured in a different mixture (peat moss and perlite 1:1 v:v), (peat moss and vermiculite 1:1 v:v) and (peat moss, perlite, vermiculite 1:1 :1, v:v:v).

Data recorded:

Parameters were recorded as survival %, number of leaves and number of shoots, shoot fresh weight (g),
the number of roots, root length (cm), root fresh weight (g), and chlorophyll content (Spectrophotometer reading) after 30 days according to Saric *et al*., (1976).

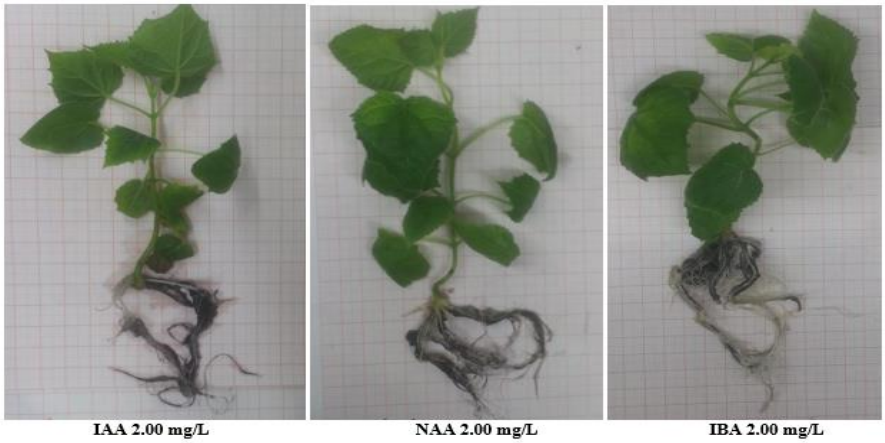

Photo 1. Effects of different auxin types and concentrations on shoot length, number of shoots, and leaves.

RESULTS AND DISCUSSION

1. Effects under auxin type and concentration on shoot length, as well as their interactions.

Data in Table (1) and Photo (1) showed the influence of auxin type which was significant. Applying NAA induced longer shoots (12.53 cm) than did IBA or IAA (11.13 and 11.11 cm, respectively). In addition, the effect of auxin concentration was significant since applying auxins at 2.00 mg/L produced, the longest shoots (13.18 cm), while the shortest ones were observed when no auxins were used (the control treatment) and when auxins were used at 3 mg/L (10.60 and 10.86 cm, respectively).

There was a substantial effect on the auxin type and concentration interactions. When 2.00 mg/L of either NAA or IAA was utilized, the longest shoots were detected (14.47 and 13.47 cm, respectively). as shown in Photo (1).

Table 1. Effects under auxin type and concentrations on shoot length (cm), as well as their relationships of *Paulownia tomentosa*

Conc.(mg/L) (B) auxin Type (A)	0	1	2	3	Mean of (A)
IBA	10.60 e	10.63 e	11.60 de	11.70 de	11.13 b
NAA	10.60 e	12.90 bc	14.47 a	12.13 cd	12.53 a
IAA	10.60 e	11.63 de	13.47 ab	8.73 f	11.11 b
Mean of (B)	10.60 c	11.72 b	13.18 a	10.86 c	

Means with the same letter do not differ appreciably at 5% probability.

2. Effect of auxin type, concentration and their association on the number of shoots (Table, 2).

Effect of auxin type:

Auxin type influence was significant, since using IAA induced a higher number of shoots compared to IBA and NAA (1.67, 1.00 and 1.00 roots respectively).

Effect of auxin concentration:

The effect of auxin concentration was significant. Applying auxins at 3 mg/L gave rise to a higher number of shoots than did 0.00, 1.00 and 2.00 mg/L (1.89, 1.00, 1.00 and 1.00 roots respectively).

Effect of the Auxin type and concentration interactions:

This interaction had a substantial impact on the outcome. IAA at 3.00 mg/L gave the maximum number of shoots (3.67 shoots). Other treatments didn't produce more shoots than the original one.

Table 2. Effect of auxin type, concentration and their association on the number of shoots of *Paulownia tomentosa*

Conc.(mg/L) (B) auxin Type(A)	0	1	2	3	Mean of (A)
IBA	1.00 b	1.00 b	1.00 b	1.00 b	1.00 b
NAA	1.00 b	1.00 b	1.00 b	1.00 b	1.00 b
IAA	1.00 b	1.00 b	1.00 b	3.67 a	1.67 a
Mean of (B)	1.00 b	1.00 b	1.00 b	1.89 a	

Means with the same letter do not differ appreciably at 5% probability.

3. Effect of auxin type, concentration and their association on the number of leaves (Table 3).

Effect of auxin type:

Auxin type influence was not significant. However, it could be noticed that IAA induced a greater number of leaves than did IBA and NAA (14.25, 13.17 and 13.25 leaves, respectively).

Effect of auxin concentration:

The Effect of auxin concentration was significant. Auxins at 3 mg/L produced the greatest number of leaves (16.67 leaves). Media was free of auxins induced the lowest value in this concern (10.67 leaves).

Effect of the Auxin type and concentration interactions:

This interaction had a substantial impact on the outcome. Applying IAA at 3.00 mg/L delivered the largest number of leaves (23.00 leaves), while the control treatment besides IAA at 1.00 mg/L gave the lowest number (10.67 and 11.00 leaves, respectively).

Table 3. Effect of auxin type, concentration and their association on the number of leaves of *Paulownia tomentosa*

Conc.(mg/L) (B) auxin Type (A)	0	1	2	3	Mean of (A)
IBA	10.67 c	14.00 bc	14.67 b	13.33 bc	13.17 a
NAA	10.67 c	13.33 bc	15.33 b	13.67 bc	13.25 a
IAA	10.67 c	11.00 c	12.33 bc	23.00 a	14.25 a
Mean of (B)	10.67 c	12.78 b	14.11 b	16.67 a	

Means with the same letter do not differ appreciably at 5% probability.

4. Effect of auxin type, concentration and their association on the number of roots (Table, 4).

Effect of auxin type:

Auxin type influence was significant. Using NAA resulted in a higher number of roots than did IBA or IAA (3.74, 3.09 and 2.56 roots, respectively).

Effect of auxin concentration:

The effect of auxin concentration was significant. Media deprived of auxins (the control treatment) induced the highest number of roots, while auxins at 3.00 mg/L gave the lowest value (5.33 and 1.70 roots, respectively).

Effect of the auxin type and concentration interactions:

The effect of this interaction was essential. The control treatment gave rise to the highest number of roots (5.33 roots). Using 3.00 mg/L of either IBA or IAA generated the least number of roots (1.15 and 1.37 roots, respectively).

Table 4. Effect of auxin type, concentration and their association on the number of roots of *Paulownia tomentosa*

Conc.(mg/L) (B) auxin Type (A)	0	1	2	3	Mean of (A)
IBA	5.33 a	3.31 bc	2.56 c-e	1.15 f	3.09 b
NAA	5.33 a	4.08 b	2.98 b-d	2.58 c-e	3.74 a
IAA	5.33 a	1.98 d-f	1.57 ef	1.37 f	2.56 b
Mean of (B)	5.33 a	3.12 b	2.37 c	1.70 d	

Means with the same letter do not differ appreciably at 5% probability.

5. Effect of auxin type, concentration and their association on shoot fresh weight(g), (Table, 5).

Effect of auxin type:

Auxin type influence was significant. Using either IBA or NAA gave heavier fresh shoots compared with IAA (6.19, 6.69 and 4.52 g, respectively).

Effect of auxin concentration:

auxin concentration affected shoot fresh weight significantly. The heaviest fresh shoots were obtained when auxins were used at 2.00 mg/L, while the lightest ones were a result of using the control treatment (0.00 mg/L auxins).

Effect of the Auxin type and concentration interactions:

This interaction had a substantial impact on the outcome. Applying 2.00 mg/L of either IBA or NAA induced the heaviest fresh shoots (13.00 and 11.67 g, respectively). The lightest fresh shoots were those grown on media free of auxins (1.42 g).

Table 5. Effect of auxin type, concentration and their association on shoot fresh weight (g) of *Paulownia tomentosa*

Conc.(mg/L) (B) auxin Type (A)	0	1	2	3	Mean of (A)
IBA	1.42 e	7.33 bc	13.00 a	3.00 de	6.19 a
NAA	1.42 e	6.00 b-d	11.67 a	7.67 b	6.69 a
IAA	1.42 e	7.00 bc	5.33 b-d	4.33 c-e	4.52 b
Mean of (B)	1.42 c	6.78 b	10.00 a	5.00 b	

Means with the same letter do not differ appreciably at 5% probability.

6. Effect of auxin type, concentration and their association on root fresh weight(g), (Table, 6).

Effect of auxin type:

Auxin type influence was significant. Using NAA resulted in heavier fresh roots than did IBA or IAA (0.48, 0.35 and 0.26 g, respectively).

Effect of auxin concentration:

The effect of auxin concentration was significant. Applying auxins at 2.00 mg/L gave the heaviest fresh roots (0.62 g), while auxins at 0.00 or 3.00 mg/L induced the lightest fresh roots (0.25 and 0.20 g, respectively).

Effect of the auxin type and concentration interactions:

This interaction had a substantial impact on the outcome. Applying NAA at 2.00mg/L and IBA at 3.00mg/L gave rise to the heaviest and the lightest fresh roots (0.94 and 0.08 g, respectively)

Table 6. Effect of auxin type, concentration and their association on root fresh weight(g)of *Paulownia tomentosa*

Conc.(mg/L) (B) auxin Type (A)	0	1	2	3	Mean of (A)
IBA	0.25 de	0.38 cd	0.68 b	0.08 f	0.35 b
NAA	0.25 de	0.43 c	0.94 a	0.30 c-e	0.48 a
IAA	0.25 de	0.32 c-e	0.25 de	0.21 e	0.26 c
Mean of (B)	0.25 c	0.37 b	0.62 a	0.20 c	

Means with the same letter do not differ appreciably at 5% probability.

7. Effect of auxin type, concentration and their association on total chlorophyll content (mg/g FW), (Table, 7).

Effect of auxin type:

Auxin type influence was significant. Applying NAA resulted in the highest total chlorophyll content, while IAA induced the lowest value (2.21 and 2.06 mg/g FW, respectively).

Effect of auxin concentration:

The effect of auxin concentration was significant. Applying auxins at 1 mg/L gave the highest content, while auxins at 3.00 mg/L produced the lowest value (.33 and 1.85 mg/g FW, respectively).

Effect of the auxin type and concentration interactions:

This interaction had a substantial impact on the outcome. Applying NAA at 2.00mg/L and IAA at 1mg/L resulted in the highest content (2.45 and 2.39 mg/g FW, respectively). The lowest score in this category. was a result of using IAA at 3.00 mg/L (1.74 mg/g FW).

Table 7. Effect of auxin type, concentration and their association on total chlorophyll content (mg/g FW) of *Paulownia tomentosa*

Conc.(mg/L) (B) auxin Type (A)	0	1	2	3	Mean of (A)
IBA	2.26 c	2.32 bc	2.08 d	1.95 e	2.15 b
NAA	2.26 c	2.27 c	2.45 a	1.85 f	2.21 a
IAA	2.26 c	2.39 ab	1.85 f	1.74 g	2.06 c
Mean of (B)	2.26 b	2.33 a	2.13 c	1.85 d	

Means with the same letter do not differ appreciably at 5% probability.

8-Effect of auxin type, concentration and their association on root length cm (Table, 8).

Data in Table (8) reveal that using IBA gave the longest roots (8.15 cm) than those induced by NAA (7.25 cm) and at the last IAA (6.92 cm). The concentration effect of auxin on root length was significant. Roots were the most extensive because of applying auxins at 2.00 mg/L, followed by a significant difference in the second position by roots induced by 3.00 mg/L levels of auxins (10.36 and 8.73 cm, respectively) and at the last position 1 mg/L (7.06 cm). The effect of the interaction was significant. The longest roots were obtained when using IBA at 2.00 mg/L, while roots induced by applying IAA at 3.00 mg/L occupied the second position (10.9 and 10.7 cm, respectively). The shortest roots were because of using IAA at 1 mg/L (5.8 cm).

Table 8. Effect of auxin type, concentration and their association on root length (cm) of *Paulownia tomentosa*

Conc.(mg/L) (B) auxin Type(A)	0	1	2	3	Mean of (A)
IBA	3.6 g	7.4 f	10.9 e	10.7 d	8.15 b
NAA	3.6 g	8 c	10.2 b	7.2a	7.25 a
IAA	3.6 g	5.8	10	8.3	6.92 c
Mean of (B)	3.6 d	7.06 c	10.36 b	8.73 a	

Means with the same letter do not differ appreciably at 5% probability.

Some of the following conclusions were confirmed by the findings:

IBA:

Wynne and McDonald (2002) remarked that the maximum root number of *Betula pendula* was achieved *in vitro* using IBA at 0.08-.15 mg/L. Bhuwad *et al.* (2007) mentioned that in rooting of the orchid *Dendrobium moschatum* shoots, ½ MS with 4 IBA mg/L showed the highest number of roots. Ghatas (2020) reported that the highest rooting response of *Myrtus communis L.* was observed with IBA 2 mg/liter. Viagano *et al.* (2007) ascertained that increasing IBA concentration up 1 mg/L in MS medium stimulated the root formation of *Prunus* rootstock cv. Mr. S. Moghaddam *et al.* (2011) stated that the maximum number of roots of *Centella asiatica* occurred in a medium containing 0.5 mg/l IBA. Abd El Gawad *et al.* (2012) found that the best number of roots was on ½MS medium with 3 mg/l IBA.of coffee plantlets. Shi (2014) declared the largest number of roots were generated by explants of Salix matsudana'Golden Spiral' cultivated in media with 0.05 mg/l IBA. Aygun and Dumanoglu (2015) noticed that on a medium containing 1 mg/L IBA, the greatest root number of *Pyrusel aeagrifolia* was achieved. Ferdous *et al.* (2015) noticed that the maximum number of roots of banana cultivars Amrita Sagar and Sabri were obtained by 0.3 mg/L IBA. Pérez *et al.* (2015) found the highest number of roots was obtained with IBA at 2mg/L. Rani *et al.* (2018) stated that MS medium containing 2mg/L IBA produced the highest number of roots of banana cv. Grand Naine. Park *et al.* (2019) stated that among three auxins, i.e., IBA, NAA and IAA, the on ½MS medium supplemented with 0.81 mg/L IBA, the most roots of *Mertensia maritima* were obtained.

NAA at 0.2 mg/L yielded the greatest root number in sugarcane, according to Lal (1992). According to Abdulmalik *et al*. (2012), groundnut micro-shoots sub-

cultured in media enriched with 1 mg/L NAA generated the most roots/plantlet. According to Seyyedyousefi *et al.* (2013), MS medium supplemented with 1.0 mg/l NAA produced the highest root number of Alstroemeria. For roots banana (Musa sp.) cv. Chenthuluvan shoots, Sujin *et al*. (2016) employed varied concentrations (0-3 mg/l) of NAA. They discovered that at 1.5 mg/l NAA, the number of roots was the best. On micro-shoots of sugarcane variety N14, Tolera (2014) evaluated four levels (0-3 mg/l) of NAA and IBA. He discovered that the medium with 1 mg/l NAA produced the most roots Arafa *et al*. (2017) commented that during the establishing phase of Hydrangea macrophylla, the medium containing NAA at 1.0 mg/l gave the largest number of roots.

Examination between IBA, NAA and IAA:

IBA more powerful:

Bashir *et al*. (2007) utilized IBA, IAA and NAA, each at 0.5-5.0 mg/L, to start roots from *in vitro derived* shoots of six promising kinds of jojoba cultivars. They saw that the centralization of 1.25 mg/l of every auxin gave agreeable outcomes, while higher fixations (2.5 and 5.0 mg/l) caused callus enlistment. IBA at 0.5 mg/l gave the greatest number of roots. Abdel-Baset (2009) announced that during the establishing phase of Coccoloba, the utilization of IBA was supportive of the number of roots. Ali et al. (2009) announced that IBA at 1.5 mg/l ended up being superior to NAA for establishing olive cv. Moraiolo in delivering the number of roots. Sun et al. (2010) expressed that to prompt establishing, shoots of Ilex glabra were subcultured on ¼ MS medium containing either IBA or NAA at 0.5-2 mg/L. IBA at 2 mg/L created the biggest number of roots. Asghar *et al.* (2011) demonstrated that root acceptance of *Dendrobium nobile* var. Emma White was completed by utilizing two auxins (IBA or NAA) at various levels (0.5-3.0 mg/l.). IBA at 2 mg/l expanded the number of roots more proficiently than NAA. Higher groupings of IBA or NAA (3.0 mg/l.) showed unfortunate aftereffects of the establishment. Miri (2020) expressed that those shoots of *Zingiber officinale* that were moved to MS medium enhanced with 2 mg/l IBA showed the largest number of roots, contrasted with those created utilizing NAA. Wang *et al.* (2020) expressed that MS medium containing 0.1 mg/l IBA was more powerful than NAA for instigating *invitro* establishing of *Pseudostellaria heterophylla*, as it brought about the most noteworthy root number.

NAA more powerful:

Then again, Martins *et al.* (2013) saw that a larger number of roots was seen when *Neoregelia concentrica* shoots were developed in NAA at 1.0 mg/L or higher, as contrasted with IBA. *Anuradha et al*. (2016) commented that NAA at 1 mg/l delivered the most extreme number of foundations of strawberry followed by IBA at 1 mg/l. Ritti *et al.* (2017) refined *Dendrobium ellipsophyllum* seedlings on a medium enhanced with the auxins IBA, NAA and IAA, each at 0.0-2.0 mg/l. They observed that the largest number of roots was seen on medium enhanced with 2.0 mg/l NAA. Impact of auxin type and focus and their connection on shoot new weight, Table (19). (19.a, 19.b and 19.c)

.a. Impact of auxin type: Auxin type impact was huge. Utilizing either IBA or NAA gave heavier new shoots thought about t IAA (6.19, 6.69 and 4.52 g, separately)

19.b. Impact of auxin fixation: auxin focus impacted shoot new weight fundamentally. The heaviest new shoots were acquired when auxins were utilized at 2 mg/L, while the lightest ones were an aftereffect of utilizing the control treatment (control).

Impact of the auxin type and fixation connections:

This cooperation significantly affected the result. Applying 2 mg/L of either IBA or NAA initiated the heaviest new shoots (13.00 and 11.67 g, individually). The lightest new shoots were those developed on media liberated from auxins (1.42 g).

Stage 2: Acclimatization: Effect of potting media on acclimatization.

Data in Table (9) and Photo (2) showed Survival%: The effect of potting material on survival percent was not significant, according to data in Table (9). All plants in all potting media survived successfully, achieving 100% survival.

There was no effect of potting material on the number of shoots because all plants only had one shoot and no new ones grew as shown in Photo (2).

Table 9. Effect of potting media on growth parameters of *Paulownia Tomentosa*

Potting Media	Survival %	Number of shoots	Total number of leaves	shoot length (cm)	shoot fresh weight (g)	Number of roots	Root length(cm)	Root fresh weight (g)	Total chlorophyll content (mg/g FW)
moss+verm	100.00 a	1.00 a	6.33 d	13.70 b	3.52 b	9.33 b	7.00 e	2.86 b	1.27 c
moss+per	100.00 a	1.00 a	6.67 cd	14.33 a	4.64 b	9.67 b	12.33 b	3.37 a	1.21 b
moss+verm+per	100.00 a	1.00 a	6.00 ab	15.30 a	5.29 a	8.67 b	15.03 a	3.15 a	1.15 b

Means with the same letter are not significantly different at 5% probability

peat moss and vermiculite | **peat moss and perlite and perlite** | **peat moss and perlite**

Photo 2. *Paulownia tomentosa* during the Acclimatization in different soil

The total number of leaves.

The total number of leaves was significantly affected by the potting medium. The greatest record in this concern was found on plants acclimatized on peat moss and perlite , followed without significant difference by those grown on peat moss and vermiculite (6.67 and 6.33 leaves, respectively). The lowest value was detected on plants grown on peat moss and perlite and vermiculite (6.00 leaves, respectively).

shoot length (cm):

The effect of potting media on plant height was significant. Acclimatizing plants on peat moss and perlite and vermiculite or peat moss and perlite gave rise to higher plants (15.30, 14.33 cm, respectively), compared to those grown on peat moss and vermiculite (13.70 cm, respectively).

shoot fresh weight:

The effect of potting media on plant fresh weight was significant. Plants were grown on peat moss and perlite and vermiculite or peat moss and perlite were heavier (5.29, 4.64 g, respectively) than those grown on peat moss and vermiculite (3.52 g, respectively).

Number of roots:

The number of roots was significantly affected by the potting medium. Plants that had the largest number of roots were those grown on peat moss and perlite (9.67 roots), followed in the second position by those grown on peat moss and vermiculite (9.33 roots, respectively). Growing plants on peat moss and perlite and vermiculite induced the lowest number of roots (8.67 roots).

Root length:

The effect of potting media on root length was significant. The longest root (15.03 cm) resulted from using peat moss and perlite and vermiculite as a potting medium, while the shortest one belonged to plants grown on peat moss and vermiculite (7.00 cm).

Root fresh weight:

The effect of potting media on root fresh weight was significant. Plants grown on peat moss + perlite or peat moss + perlite + vermiculite had heavier fresh roots in weight (3.37 and 3.15 g, respectively) than those grown on peat moss + vermiculite (2.86 g, respectively).

Total chlorophyll SPAD reading:

Effect of the potting mixture on total chlorophyll content (mg/g FW), Table (7) The effect of the potting mixture on total chlorophyll content was not significant. However, it could be noticed that using mixture 1 and mixture 3 resulted in the largest and lowest contents (1.27 and 1.15 mg/g FW, respectively).

Our discoveries were practically identical to those of numerous specialists. Kurtar *et al*. (2010) relocated plantlets of Winter Squash (Cucurbita maxima) to soil, sand, perlite and peat greenery, to decide the impacts of development media on endurance and development of in vitro plantlets of winter squash and pumpkin during acclimatization. They found that the best survival% and plant level were an aftereffect of involving peat greenery as a preparing medium. Gonbad *et al*. (2013) saw that the blend containing peat moss + vermiculite + perlite (2:1:1; v/v/v) brought about expanding plant level of tea clone Iran 100.Ubalua and Nsofor (2017) acclimatized cassava plantlets on three different substrates: (agar matrix), (river sand/sawdust) and (peat pellet/vermiculite). They remarked a gradual increase in shoot height on (peat pellet/vermiculite) and (river sand/sawdust). Baghbidi and Jowkar (2018) used 4 different potting mixtures, i.e.: (peat moss), (peat moss and perlite), (peat moss and sand) and (loam soil, sand and leaf compost) during the acclimatization process of 3 *Schefflera* cultivars. They noticed that the longest shoots resulted from using the mixture of peat moss and perlite.

CONCLUSION

In conclusion, using IBA at 2.00mg/L had the highest rank for shoot fresh weight. NAA at 2mg/L: acquired the highest grade for the length of shoots, fresh weight of shoots, and fresh weight of roots and total chlorophyll content. IAA at 1mg/L got the highest grade for total chlorophyll content. IAA at 2.00mg/L had the highest degree for shoot length. IAA at 3mg/L: attained the highest grade completed for the number of shoots and number of leaves using peat moss and perlite gave rise to higher plants and the largest number of roots (15.30, 14.33 cm, respectively) while peat moss and perlite and vermiculite were heavier (5.29, 4.64 g, respectively), peat moss and perlite and vermiculite give the longest root and heavier fresh roots in weight and shoot fresh weight (15.00 cm).

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تأثير اكسينات مختلفة والاقلمة علي نبات البولونيا

إيمان مختار علـى أبوالغيط [١] ، احمد سعيد محمد يوسف[١]، فيصل محمد عبد العليم سعداوى[٢] وعمرو عبد الحكيم احمد محمد [٢]

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تم تنفيذ البحث في مختبر زراعة الأنسجة، حديقة الزهرية، معهد بحوث البستنة، مركز البحوث الزراعية ، الجيزة ، مصر من ٢٠١٨ إلى ٢٠٢٠. لما لنبات البولونيا تومنتوزا من اهمية تجارية وبستانية حيث انها واحدة من أسرع الاشجار النامية والأكثر تكيفا على هذا الكوكب وتم البحث من أجل اولا دراسة التأثيرات المختلفة لمستويات مختلفة من الأوكسين على عملية التجذير و ثانيا استكشاف تأثير مخاليط التربة المختلفة على تأقلم النبات وتم البحث على نباتات تم الحصول عليها من نفس المعمل في حديقة الزهرية تم زراعتها في مراحل سابقة وتم استخدام ثلاثة أنواع مختلفة من الأوكسينات – IBA, NAA و IAA مع مستويات تركيز ٠ ملغ/لتر ، كمرحلة كنترول ، ١ ملغ/لتر ، ٢ ملغ/لتر و ٣ ملغ/لتر. وتم إجراء اقلمه للنباتات بعد مراحل زراعة الانسجة وذلك باستخدام مخلوط الزراعة من ثلاث مواد (بيتموس و فيرميكولايت و بيرلايت) أجرى هذا البحث لمعرفة أفضل بروتوكول لتجزير واقلمة البولونيا تومينتوزا. وأظهرت النتائج ان اعلى وزن من الافرع الطازجة كان لاندول بيوترك اسيد عند تركيز ٢ ملغ / لتر:بينما كان أعلى قرائة للوزن الطازج للافرع والجزور , واعلي قرائة لطول النبات واعلي محتوي من الكلوروفيلات الكلية عند استخدام اندول اسيتك اسيد بتركيز . ١ ملغ / لتر: حصلت على أكبر عدد للنموات الخضرية ، ووزن طازج للنموات الخضرية ، والجذر الوزن الطازج ومحتوى الكلوروفيل الكلي. ، وفى مرحلة الأقلمة وجد ان المخلوط المحتوى علي (بيت موس+بيرلايت+ فيرميكيولايت) ادى للحصول على أعلى وزن رطب للأفرع .