J. of Plant Production, Mansoura Univ., Vol. 15 (5):243 - 247, 2024

Journal of Plant Production

Journal homepage & Available online at: www.jpp.journals.ekb.eg

Influence of Medium Type and Iba Concentration on Rooting Ability and Anatomical Study of Schefflera (*Schefflera arboricola* Endl.) Stem Cuttings

Cross Mark

Helaly, A. A. E. [1*]; A. A. Hegazy[1] and E. A. Elboraie[2]

[1]Vegetable and Floriculture Dept., Faculty of Agric., Mansoura University, Egypt.
[2]Horticulture Department (Floriculture), Facility of Agriculture, Damietta University, New Damietta 34517, Egypt.

ABSTRACT

A pot experiment was done to improve the rooting ability of schefflera stem cuttings by using different media types (sand, sand: clay, sand: peat moss and vermiculite: peat moss as 1: 1, V/V), different indole-3-butyric acid (IBA) concentrations (0.0, 2000, 4000 and 6000 ppm) and their combination treatments. This experiment was conducted at a private Farm under a saran greenhouse, in Mansoura, Dakahlia Governorate, Egypt, during the two summer consecutive seasons of 2022 and 2023. Sand: peat moss, thereafter vermiculite: peat moss mixture media significantly enhanced rooting %, number of roots per cutting, fresh and dry root weights per cutting and produced the longest roots in comparing with the additional media that are being examined. Sand: peat moss medium recorded the highest values of leaf total chlorophyll content. The highest significant values of rooting parameters and total chlorophyll content were obtained with 4000 ppm of IBA compared to the other concentrations and control. In general, soaking schefflera cuttings base in IBA at 4000 ppm for 10 seconds and then culturing them in sand: peat moss medium enhanced rooting percentage and number of roots per cuttings compared to the other combinations under study. Moreover, examining the anatomical alterations of the adventitious root of schefflera cuttings cleared that culturing in various media under the influence of IBA increased the diameter of the xylem vessels, phloem, and xylem tissue, and root diameter.

Keywords: Schefflera, cutting, medium, IBA, rooting, chlorophyll, anatomical.

INTRODUCTION

One of the most common foliage-forming plants used for interior landscapes is the umbrella plant, also known as dwarf schefflera (*Schefflera arboricola*), which belongs to the Araliaceae family (Beura *et al*., 2007). It is widely used as one of the most decorative foliage pot plants due to the beauty of its palmate and variegated leaves. It could also be used for gardening and landscape design. Maybe it kept multiple-stemmed and bushy by cutting back. Propagation is by seeds, cuttings, and air-layering (Bailey, 1976). The shoot cuttings of various types are the main method for propagating Schefflera plants in Egypt, but the medial and basal cuttings usually take a long time to root and that may cause rooting the bases of these cuttings, especially if the rooting medium, irrigation system, and plant growth regulators were improper (Shahin *et al*., 2017). Hence, a great amount of cutting material is lost.

The diversity in cuttings' rooting capacities is influenced by the physical characteristics of the rooting media and how the medium is managed (Caldwell *et al*., 1988). The identification of a universally applicable or optimal rooting ability for cuttings remains elusive. The selection of a suitable propagation medium is contingent upon various factors, including the specific species, type of cutting, season, propagation mechanism, as well as the cost and accessibility of the components comprising the medium (Hartmann *et al*., 2011). Therefore, it is imperative to ascertain the optimal rooting media for every individual species and cultivar (Ashour *et al*., 2020).

The increased cell wall flexibility and cell division, as well as the promotion of callus development and root growth, are the reasons for the increased rooting percentage resulting from IBA administration (Weaver, 1972). Moreover, according to Şevik *et al.* (2015), cuttings grown in sand + pearlite or peat media and given 3000 or 5000 ppm concentrations of NAA or IBA hormones had a substantial impact on the rooting percentage and root morphological characteristics of *Schefflera arboricola*, as rooting percentage can be increased up to 75%.

This investigation was undertaken to evaluate the impact of different rooting media and IBA concentration on some rooting parameters and anatomical characters of schefflera stem cuttings. So, determination of the suitable mixture of medium type and more simulative effect of growth regulators is the main objective, as IBA used on rooting of *Schefflera arboricola* cuttings for successful propagation to increase commercial production in ornamental nurseries.

MATERIALS AND METHODS

Two pot experiments were achieved at a private Farm under a saran greenhouse, in Mansoura, Dakahlia Governorate, Egypt, during both summer seasons of 2022 and 2023. This experiment aimed to propagate *Schefflera arboricola* through intermediate stem cuttings. This was achieved by treating cuttings with various concentrations of IBA (0.0, 2000, 4000, and 6000 ppm) before culturing in different growth medium types, including sand, sand: clay (1:1, *V/V*), sand: peat moss (1:1, *V/V*) and vermiculate: peat moss (1:1, *V/V*). The objective was to assess the impact of these factors; both individually and in combination, on the rooting ability, total chlorophyll content, and anatomical alterations of the adventitious root of schefflera cuttings. The chemical properties of the used media are presented in Table 1 according to Chapman and Pratt (1978).

Cuttings of *Schefflera arboricola* were obtained from a privately owned nursery (Abo Eisa Nursery) situated in the Belbas District of Sharkia Governorate, Egypt. Cuttings were cultured on 14 and 16 of February during 2022 and 2023,

*** Corresponding author.**
E-mail address: helaly@mans.edu.eg
DOI: 10.21608/jpp.2024.286780.1338

respectively. Semi-hardwood cuttings were obtained from the middle portion of one-year-old shoots, with an average diameter of 1 cm and about 5 cm in length with one leaf (Pic. 1). Each pot included two cuttings. Schefflera cuttings bases were immersed in an indole-3-butryic acid (IBA) solution with the specified concentration for 10 seconds. Subsequently, they were placed in pots with a diameter of 16 cm, which were filled with the previously indicated grown medium.

Table 1. Properties of the experimental media's chemical composition (averaged over two seasons).

Media type	pH	EC ($dS.m^{-1}$)	Organic matter (%)	Available nitrogen (mg/kg)	Available phosphorus (mg/kg)	Available potassium (mg/kg)
Sand	7.32	0.73	0.09	1567	298	398
Sand + clay	7.56	1.23	1.53	3745	534	622
Sand +peat moss	6.42	1.36	2.04	5342	603	804
vermiculate +peat moss	6.64	1.26	2.08	5223	621	792

Pic. 1. Culturing two stem cuttings of schefflera per pot (16 cm diameter).

Experimental design:

Three replicates, each containing 96 cuttings, were used to set up the aforementioned treatments in a split-plot design. In the sub-plots, IBA concentration treatments were organized, while medium-type treatments were dispersed across the main plots.

Recorded data:

After the experiment wasover (after sixty days from cutting cultivation), the following parameters were recorded:

A. Rooting ability:

1. Rooting percentage.
2. Roots number per cutting.
3. Fresh and dry weights of roots/cutting (g).
4. Root length (cm).

B. Chlorophyll content:

According to Mazumadar and Majumder (2003), total chlorophyll (a+ b) content (mg/100 g as fresh weight) was estimated.

C. Anatomical Studies

The anatomical studies were carried out to follow the changes occurring in the adventitious root of schefflera cuttings at 60 days as affected by different levels of IBA when cultured in the sand: peat moss (the best medium regarding rooting ability). After being killed, the specimens were fixed in FAA (10 ml formalin, 5 ml glacial acetic acid, and 85 ml 70% ethyl alcohol) for a minimum of 48 hours. The chosen materials underwent the following steps: 50% ethyl alcohol washing, normal butyle alcohol dehydration, embedding in paraffin wax with a melting point of 56 °C, sectioning to a thickness of 20 µm, double staining with safranin and fast green, xylene clearing, and mounting in Canada balsam (Nassar and El-Sahhar, 1998). Sections were examined to detect histological manifestations of the chosen treatments and photomicrography.

Statistical Analysis:

The data from the present study were subjected to statistical analysis using the methodology outlined by Gomez and Gomez (1984). The significance of the differences between the means of the tested treatments, specifically the growing medium and IBA concentrations, was determined by comparing them to the least significant differences (L.S.D) at the 5% level. This analysis was performed using the Statistix Version 9 computer program developed by Analytical Software (2008).

RESULTS AND DISCUSSION

Rooting ability and total chlorophyll content

Results tabulated in Tables 2, 3, and 4 shows that the highest values of rooting percentage (63.25 and 64.00 as well as 63.92 and 61.42 %) of schefflera cuttings were obtained from sand : peat moss as well as vermiculite : peat moss mixture media compared to sand alone or sand + clay during both seasons. The highest roots number per cutting, fresh and dry weights of roots per cutting, and the longest root were obtained when schefflera cuttings were cultured in sand: peat moss compared to the other media. In general, all medium mixtures significantly increased all rooting parameters compared to the control (sand media). Total chlorophyll content in schefflera leaf significantly increased when stem cuttings were cultured in the sand: peat moss mixture medium compared to the other media under study in the two consecutive seasons (Table 4). A good medium would give the plant enough support, act as a reservoir for nutrients and water, allow oxygen to diffuse to the roots, and permit gaseous exchange between the roots and atmosphere, depending on the results found by Agro (1998). The provision of aeration, moisture, nutrients, and support to the growing plant is beneficial for the appropriate development and growth of decorative cuttings. The optimal selection of growing media can be determined through a comprehensive examination of the hydraulic and physical characteristics of the media (Raviv, 2005). Sand is a commonly employed natural substrate for vegetatively propagated carnation plants. When combined with other substances, it significantly enhances the process of root development due to its distinct physical and chemical constituents (Wei *et al*., 2017).

These results follow those pointed out by Nair *et al.* (2008) on *Stewartia pseudocamellia* cuttings, El-Naggar and Esmaiel (2022) on *Dracaena* cuttings and El-Sabagh *et al.* (2023) found that growing *Euphorbia milii* cuttings. Furthermore, Abdulraahman and Ayoub (2023) discovered that the propagation medium only significantly affected the *Cupressus macrocarpa* rooting characteristics (roots number per cutting, length of longest root per cutting, and dry weight of roots per cutting). Cuttings planted in the sand + perlite and the sand + peat moss + perlite) media produced the best rooting results.

Using IBA significantly increased cuttings rooting percentage and number of roots per cutting compared to control (Table 2). The highest values in fresh and dry weights of roots per cuttings were obtained from 4000 ppm IBA compared to control and the other concentrations under study (Table 3). The same concentration (2000 ppm) gave the longest root and highest content of total chlorophyll compared to the lowest and highest concentrations under study during both seasons (Table 4). Concerning the effect of IBA on rooting ability it was found that the *Ficus binnendijkii* exhibited the greatest fresh root weight when subjected to IBA at 4000 or 6000 mg/l, with the cuttings being obtained during the early September period (Babaie *et al*., 2014). Also, there is a notable variation in the rooting capacity among the twelve genotypes of *Rosa damascena*. The genotype Kurdistan 5 exhibited the greatest root fresh and dry weights (mg) when treated with 1,000 mg l^{-1} of indole-3-butyric acid (Nasri *et al.*, 2015).

Table 2. Impact of media type (A), IBA concentration (B), and their interaction (A×B) on rooting percentage and number of roots/cutting of schefflera cuttings during 2022 and 2023 seasons

Media Type (A)	IBA concentration as ppm (B)									
	0.0	2000	4000	6000	Mean (A)	0.0	2000	4000	6000	Mean (A)
	2022 season					2023 season				
	Rooting percentage									
Sand	41.33	47.67	53.00	50.33	48.08	42.00	50.67	51.67	51.67	49.00
Sand: clay	40.33	43.00	46.67	46.00	44.00	38.67	44.00	49.33	46.67	44.67
Sand: peat	54.00	63.00	71.67	64.33	63.25	57.67	66.00	69.33	63.00	64.00
Vermiculite: peat	56.00	62.00	73.67	64.00	63.92	54.00	59.00	70.00	62.67	61.42
Mean (B)	47.20	53.92	61.25	56.17		48.08	54.92	60.08	56.00	
L.S.D. at 5%	A=1.13		B= 0.95		A×B= 1.99	A= 1.36		B= 1.01		A×B= 2.20
	Number of roots per cutting									
Sand	3.33	4.33	4.67	5.33	4.42	3.00	3.67	4.67	4.67	4.00
Sand: clay	2.67	3.33	4.33	5.00	3.83	3.00	4.00	3.67	4.33	3.75
Sand: peat	4.33	5.33	7.00	6.33	5.75	4.67	5.67	7.33	5.67	5.83
Vermiculite: peat	3.67	5.00	7.00	5.00	5.17	4.00	4.00	6.33	4.67	4.75
Mean (B)	3.50	4.50	5.75	5.42		3.67	4.33	5.50	4.83	
L.S.D. at 5%	A= 0.95		B= 0.65		A×B= 1.47	A= 1.01		B= 0.75		A×B= 1.64

Table 3. Impact of media type (A), IBA concentration (B), and their interaction (A×B) on weight of fresh and dry roots / cutting (g) of schefflera cuttings during 2022 and 2023 seasons

Media Type (A)	IBA concentration as ppm (B)									
	0.0	2000	4000	6000	Mean (A)	0.0	2000	4000	6000	Mean (A)
	2022 season					2023 season				
	Weight of fresh roots/ cutting (g)									
Sand	1.27	1.37	1.53	1.50	1.42	1.17	1.30	1.47	1.33	1.32
Sand: clay	0.98	1.10	1.30	1.13	1.13	0.79	1.20	1.13	1.20	1.08
Sand: peat	1.43	1.83	2.80	2.17	2.06	1.43	1.83	2.70	2.30	2.07
Vermiculite: peat	1.80	2.37	2.57	2.17	2.23	1.87	2.37	2.53	1.93	2.18
Mean (B)	1.37	1.67	2.05	1.74		1.32	1.68	1.96	1.69	
L.S.D. at 5%	A= 0.06		B= 0.09		A×B= 0.16	A= 0.07		B= 0.05		A×B= 0.11
	weight of dry roots/ cutting (g)									
Sand	0.37	0.44	0.54	0.50	0.46	0.31	0.45	0.51	0.48	0.44
Sand: clay	0.35	0.40	0.50	0.42	0.42	0.30	0.46	0.45	0.46	0.42
Sand: peat	0.50	0.62	0.92	0.81	0.70	0.52	0.65	0.90	0.87	0.74
Vermiculite: peat	0.64	0.81	0.84	0.85	0.79	0.70	0.85	0.89	0.81	0.81
Mean (B)	0.47	0.57	0.70	0.64		0.46	0.60	0.69	0.65	
L.S.D. at 5%	A= 0.04		B= 0.03		A×B= 0.06	A= 0.04		B= 0.03		A×B= 0.06

Table 4. Impact of media type (A), IBA concentration (B), and their interaction (A×B) on the longest root (cm) and total chlorophyll content (SPAD unit) of schefflera during 2022 and 2023 seasons

Media Type (A)	IBA concentration as ppm (B)									
	0.0	2000	4000	6000	Mean (A)	0.0	2000	4000	6000	Mean (A)
	2022 season					2023 season				
	The longest root (cm)									
Sand	2.20	2.40	2.77	2.73	2.53	2.20	2.27	2.77	2.57	2.45
Sand: clay	1.80	1.93	2.50	2.37	2.15	1.97	2.20	2.40	2.33	2.23
Sand: peat	2.60	3.23	4.03	3.93	3.45	2.67	3.33	3.67	3.67	3.33
Vermiculite: peat	2.53	3.13	3.93	3.23	3.21	2.43	3.30	3.70	3.40	3.21
Mean (B)	2.28	2.68	3.31	3.07		2.32	2.78	3.13	2.99	
L.S.D. at 5%	A= 0.12		B= 0.11		A×B= 0.23	A= 0.15		B= 0.11		A×B= 0.24
	Total chlorophyll content in leaves (SPAD)									
Sand	9.20	10.30	12.40	12.80	11.18	9.37	9.70	11.57	13.23	10.97
Sand: clay	9.90	10.67	11.50	13.33	11.35	10.20	10.67	10.73	12.60	11.05
Sand: peat	12.50	14.47	16.17	15.10	14.56	12.80	13.67	15.73	14.27	14.12
Vermiculite: peat	11.77	13.47	15.43	13.63	13.58	12.30	13.03	16.30	13.60	13.81
Mean (B)	10.84	12.23	13.88	13.72		11.17	11.77	13.58	13.43	
L.S.D. at 5%	A= 0.34		B= 0.19		A×B= 0.48	A= 0.21		B= 0.29		A×B= 0.54

Concerning the combination influence, increasing of IBA concentration under each medium type of gradually increased root number, rooting percentage per schefflera cutting, fresh and dry weights of roots, longest root, and total chlorophyll content. When compared to the other combinations under investigation, IBA at 4000 ppm under sand: peat moss mixture medium alone produced the best values in this regard (Tables 2, 3, and 4). Nair et al. (2008) on Stewartia pseudocamellia cuttings, Singh *et al.* (2020) on Bougainvillea buttiana cv. Mahara cuttings, El-Naggar and Esmaiel (2022) on Dracaena cuttings, and El-Sabagh et al. (2023) on Euphorbia milii also have reported similar results concerning the effect of culture medium on rooting ability. Also, Paul and Aditi (2009) on Syzygium javanica, Fouda *et al.* (2012) on Aloysia triphylla, Babaie et al. (2014) on Ficus binnendijkii, Nasri et al. (2015) on Rosa damascene, Sokhuma et al. (2018) on mulberry and Shiri et al. (2019) on Duranta erecta cuttings have found similar results regard IBA effect.

Anatomy of adventitious root of schefflera

Microscopical measurements of certain histological characters of the adventitious root of schefflera plant as affected by different levels of IBA when cultured in sand: peat moss (the best medium regarding rooting ability) in Table 5. Likewise, microphotographs depict these treatments are shown in Figure 1.

Sections taken from the roots of cuttings of schefflera plants that were treated with 2000 ppm increased the root diameter of schefflera by 31.8 % over the control.

Table 5. Assessing the microns of specific histological characteristics in transverse sections of the adventitious root of a 60-day-old Schefflera plant, influenced by varying IBA concentrations. (Average of three segments from three samples)

Histological characters (µm)	Treatments						
	Control	2000 ppm	± % to control	4000 ppm	± % to control	6000 ppm	± % to control
Root diameter	1.059	1.396	+ 31.8	1.864	+ 74.3	1.353	+ 27.7
Thickness of epidermis	9.9	19.7	+ 99	19.7	+ 99	19.7	+ 99
Thickness of cortex	287	402.6	+ 40.2	511.5	+ 78.2	299.5	+ 4.3
Thickness of pith	148.5	323.4	+ 117.7	395	+ 166	154.5	+ 4.1

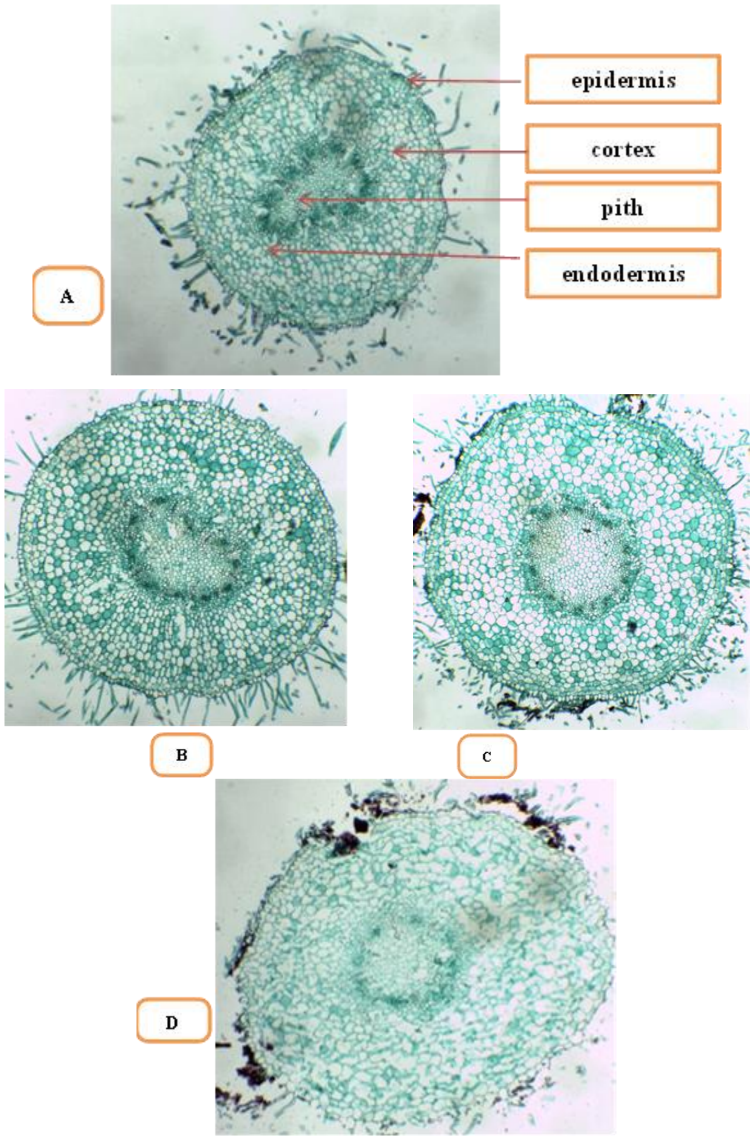

Fig. 1.Transverse sections through the adventitious root of schefflera, as affected by different levels of IBA (40 x)

A. From roots initiated on untreated cutting. **B. From roots initiated on cutting treated with 2000 ppm IBA.**
C. From roots initiated on cutting treated with 4000 ppm IBA. **D. From roots initiated on cutting treated with 6000 ppm IBA.**

The increase in root diameter could be attributed mainly to the increase in all included tissues. The thickness of the epidermis, cortex, and pith were 99, 40.2, and 117.7 % more than the control, respectively. It was noted that sections taken from the roots of cuttings of plants that were treated with 4000 ppm increased the root diameter of schefflera by 74.3 % more than the control. The increase in root diameter could be attributed mainly to the increase in all included tissues. The thickness of the epidermis, cortex, and pith were 99, 78.2, and 166 % more than the control, respectively. Samples taken from the roots of cuttings of plants that were treated with 6000 ppm increased the root diameter of schefflera by 27.7 % more than the control. The increase in root diameter was a result of the increase in all internal tissues. The thickness of the epidermis increased by 99% compared to the control and the cortex was more than the control by 4.3 %. Pith thickness increased by 4.1% compared to the control.

CONCLUSION

Consulting the abovementioned results proved that culturing schefflera stem cuttings in sand: pet moss medium (1: 1, v/v) after soaking their bases in IBA at 4000 ppm significantly improved the rooting ability of stem cuttings and total chlorophyll content in *Schefflera arboricola* leaf.

REFERENCES

Abdulraahman, Y. and M. Ayoub (2023). Effect of propagation dates, media and auxins treatments on rooting of Monterey cypress (*Cupressus macrocarpa*) semi-hardwood cuttings. Kirkuk University Journal for Agricultural Sciences, 14 (3): 190-200.

Agro, W.R. (1998). Root medium physical properties. Hort. Technol., 8: 481-485.

Analytical Software (2008). Statistix Version 9, Analytical Software, Tallahassee, Florida, USA.

Ashour, H. A.; A. B. El-Attar and M. M. Abdel Wahab (2020). Combined effects of NPK fertilizer with foliar application of benzyladenine or gibberellic acid on *Dracaena marginata* ‘Bicolor’ grown in different potting media. Ornamental Horticulture, 26 (4): 545-561.

Babaie, H.; H. Zarei; K. Nikde and M. N. Firoozjai (2014). Effect of different concentrations of iba and time of taking cutting on rooting, growth and survival of *Ficus binnendijkii* ‘Amstel Queen’ cuttings. Not. Sci. Biol., 6 (2):163-166.

Bailey, L. H. (1976). Hortus Third, Macmillan Publishing Co., Inc., 866 Third Avenue, New York, N.Y. pp: 1022-1290.

Beura, S.; P. Samal and P. N. Jagadev (2007). Preliminary studies of in vitro cloning of dracaena (*Dracaena sanderiana*). Acta Hort.760: 241-246.

Caldwell, J.D., D.C. Coston and K.H. Brock (1988). Rooting of semi-hardwood ‘Hayward’ kiwifruit cuttings. Hort. Sci., 23:714-717.

Chapman, D. H. and R. F. Pratt (1978). Methods of Analysis for Soils, Plants and Waters. Div. Agric. Sci. Univ. of California USA pp16-38.

El-Naggar, A.H. and Y.A.A. Ahmad (2016). The effect of light intensity and NPK fertilization on growth of *Yucca rupicola*, L. Journal of Advanced Studies in Agricultural, Biological and Environmental Sciences, 3 (1): 32-41.

El-Sabagh, E.G.M. ; E. M. Abou El-Ghait; Y. F. Y. Mohamed and S. M. Mohamed (2023). Influence of planting date and different growing media on rooting of cutting of *Euphorbia milii* L. plant. J. of Plant Production, Mansoura Univ., 14 (8): 401–404.

Fouda, R. A.; H. H. Abdel-Kader; K. H. El-Hindi; H. Y. Massoud and F. R. Ibrahim (2012). Effect of wounding, auxin type and concentration on rooting of lemon verbena (*Aloysia triphylla* (L’HER.) Britton) plant. J. Plant Production, Mansoura Univ., 3 (12): 2927 – 2943.

Gomez, K. A. and A. A. Gomez (1984). Statistical Procedures for Agricultural Research. John Wiley & Sons Inc., Singapore 680.

Hartmann, H.; D. Kester; F. T. Davies and R.L. Geneve (2011). Plant Propagation: Principles and Practices. Prentice-Hall, Inc. USA.

Mazumadar, B.C. and K. Majumder (2003). Methods on Physico-Chemical Analysis of Fruits. Daya Publishing House, Delhi, India.

Nair, A.; D. Zhang; J. Smagula and D. Hu (2008). Rooting and overwintering stem cuttings of *Stewartia pseudocamellia* Maxim relevant to hormone, media, and temperature. Hortscience, 43 (7): 2124–2128.

Nasri, F.; A. Fadakar; M. K. Saba and B. Yousefi (2015). Study of indole butyric acid (IBA) effects on cutting rooting improving some of wild genotypes of damask roses (*Rosa damascena* Mill.). Journal of Agricultural Sciences, 60 (3): 263-275.

Nassar, M.A. and K. F. El-Sahhar (1998). Botanical Preparations and Microscopy (Microtechnique). Academic Bookshop, Dokki, Giza, Egypt, pp: 219 (In Arabic).

Paul, R. and Ch. Aditi (2009). IBA and NAA of 1000 ppm induce more improved rooting characters in air-layers of water apple (*Syzygium javanica* L.). Bulgarian Journal of Agricultural Science, 15 (2): 123-128.

Raviv, M. (2005). Production of high-quality composts for horticultural purposes - a mini-review. Hort. Technology, 15:52-57.

Şevik, H.; K. Güney; O. Topaçoğlu and C. Ünal (2015). The influences of rooting media and hormone applications on rooting percentage and some root characters in *Schefflera arboricola*. International Journal of Pharmaceutical Science Invention, 4 (2): 25-29.

Shahin, S. M.; S. S. Ahmed and A. H. Dergham (2017). Effect of rooting medium and irrigation interval on rooting of shoot cuttings of *Schefflera arboricola* Endl plant. Middle East Journal of Applied Sciences, 7 (3): 472-481.

Shiri, M.; R. M. Mudyiwa; M. Takawira; C. Musara and T. Gama (2019). Effects of rooting media and indole-3-butyric acid (IBA) concentration on rooting and shoot development of *Duranta erecta* tip cuttings. African Journal of Plant Science, 13 (10): 279-285.

Singh, B.; S. S. Sindhu; H. Yadav and N. K. Saxena (2020). Effect of different potting media on *Bougainvillea* propagation cv. Mahara. Chemical Science Review and Letters, 33 (9): 158-161.

Sokhuma, P.; S. Intoorathed and R. Phonpakdee (2018). Effect of IBA and NAA on rooting and axillary shoot outgrowth of ‘Himalayan’ mulberry stem cutting. International Journal of Agricultural Technology, 14 (7): 1939-1948.

Weaver, R. J. (1972). Plant growth substances in agriculture. San Francisco W. H. Freeman, United States of America. Pp. 467- 469.

Wei, G.; N. Tang; M. Wei; H. Yan and Y. Han (2017). Effects of different substrates on root development of carnation cuttings. J. Qinghai Univ., 2: 7-15.

تأثير نوع بيئة النمو وتركيز IBA على القدرة التجذيرية والدراسة التشريحية على العقل الساقية لنبات الشفليرا

أحمد عبد المنعم السيد هلالي[1] ، احمد عبد العال حجازى[1] و السيد عطية حامد[2]

[1]قسم الخضر والزينة- كلية الزراعة جامعة المنصورة ، مصر.
[2]قسم البساتين (زينة) – كلية الزراعة – جامعة دمياط – مصر

الملخص

أجريت تجربة أصص لتحسين قدرة تجذير عقل نبات الشفليرا باستخدام أنواع مختلفة من بيئات التجذير (الرمل، الرمل: الطمي، الرمل: البيتموس والفيرميكوليت: البيتموس بنسبة 1: 1، حجم/حجم)، وحمض الإندول 3- البيوتريك بتركيزات مختلفة (صفر، 2000، 4000 و 6000 جزء في المليون) ومعاملات التداخل بينهما. أجريت هذه التجربة في مزرعة خاصة في صوبة مغطاه بالساران، في المنصورة، محافظة الدقهلية، مصر، خلال موسمي الصيف المتتاليين لعامي 2022 و 2023. أدت زراعة العقل في مخلوط من بيئة الرمل: البيتموس تلاه بيئة الفيرميكوليت: البيتموس إلى تحسن معنوي في نسبة التجذير المئوية، عدد الجذور لكل عقلة، الأوزان الطازجة والجافة للجذور لكل عقلة وأنتج جذوراً أطول مقارنة ببيئات التجذير الأخرى قيد الدراسة. سجل مخلوط بيئة الرمل: البيتموس أعلى القيم لمحتوى الأوراق من الكلوروفيل الكلي. تم الحصول على أعلى القيم المعنوية لصفات التجذير والمحتوى من الكلوروفيل الكلي عند استخدام حمض الإندول 3- البيوتريك بتركيز 4000 جزء في المليون مقارنة بالتركيزات الأخرى والكنترول. بشكل عام، عند نقع قاعدة العقل الساقية للشفليرا في حمض الإندول 3- البيوتريك بتركيز 4000 جزء في المليون لمدة 10 ثواني ثم زراعتها في بيئة الرمل: البيتموس تحسن كل من نسبة التجذير المئوية وعدد الجذور/ عقلة مقارنة بمعاملات التداخل الأخرى قيد الدراسة. من خلال فحص التغيرات التشريحية للجذر العرضي لعقل الشفليرا، تبين أن الزراعة في البيئات المختلفة تحت تأثير حمض الإندول 3- البيوتريك أدت إلى زيادة في قطر أوعية الخشب وأنسجة اللحاء والخشب وقطر الجذر.