International Journal of Pharmaceutical Science Invention
ISSN (Online): 2319 – 6718, ISSN (Print): 2319 – 670X
www.ijpsi.org || Volume 4 Issue 2 || February 2015 || PP.25-29

The influences of rooting media and hormone applications on rooting percentage and some root characters in *Schefflera arboricola*

Hakan Şevik[1], Kerim Güney[2], Osman Topaçoğlu[2], Canan Ünal[3]
[1(]*Kastamonu University, Faculty of Engineering and Architecture, 37150, Turkey)*
[2(]*Kastamonu University, Faculty of Forestry, 37150, Turkey)*
[3(]*Forest Tree Seeds and Tree Breeding Research Directorate, 06560 Gazi / Ankara / Turkey)*

ABSTRACT : *Schefflera arboricola is used as an indoor plant in many places across the world besides the area it covers naturally. Therefore, it is produced intensely. However, it is usually produced through body cutting, which damages rootstock and allows obtaining only few cuttings from a plant. This study makes an attempt to determine the influences of rooting media and hormone applications on rooting percentage and some root morphological characters in cuttings taken from Schefflera arboricola in small amounts without damaging rootstock to the contrary of common practice. In this study, cuttings were treated with 1000 ppm, 3000 ppm, and 5000 ppm doses of IAA, IBA, NAA, and GA3 hormones, and rooting trials were carried out in sand, pearlite, and peat media. The research results show that the employed methods are significantly influential on rooting percentage and root morphological characters, and rooting percentage can be increased up to 75%.*

KEY WORDS: *Schefflera arboricola, Hormone, Rooting Media*

I. INTRODUCTION

Schefflera arboricola is an evergreen plant belonging to Araliaceae family. It is naturally found in Taiwan, Hainan, and China and can grow taller up to 3 to 4 m. [1, 2] Schefflera kind has up to 150 species [3]. Widely used as an indoor plant, *Schefflera arboricola* is intensely produced and merchandised because of its common usage. *Schefflera arboricola* is usually produced by use of branches with some leaf groups on them. That damages rootstock and allows obtaining only very few number of cuttings from a medium-sized plant (Fig. 1).

Figure 1. The production of Schefflera arboricola through body cuttings [4]

However, it is envisaged that *Schefflera arboricola* can be produced by using only leaf cuttings. This mode of production is quite important because it allows obtaining cuttings without damaging rootstocks. In addition, this method allows mass production, and many individuals can be produced simultaneously thanks to it. This study investigates the influence of rooting media and some hormone applications on the rooting of leaf cuttings of *Schefflera arboricola* and some of its morphological characters.

II. MATERIAL AND METHOD

In the present study, Schefflera arboricola leaf cuttings were obtained by breaking leaf off the point where it combined with body. Until the applications were performed, the prepared cuttings were conserved by keeping the half of leaf stalk in water. 1000 ppm, 3000 ppm, and 5000 ppm concentrations of IAA, IBA, GA3, and NAA hormones were used as rooting hormones. The cross sections of the prepared cuttings were made to contact with these hormones for 4 to 5 seconds, and the cuttings were planted in rooting media. Sand, pearlite, and peat were used as rooting media. They were irrigated once every three days so that they remained humid all the time. In this way, the cuttings exposed to 13 applications (3 doses from each one of 4 hormones and one control group application) were taken to 3 different rooting media. Thus, 39 different applications were performed. The cuttings were kept in the rooting media for 45 days. At the end of this period, measurements were carried out on the cuttings to determine rooting percentage (RP), the number of roots (RN), the biggest root length value (RL), the average root length value (ARL), and root diameter (RD). SPSS package was employed for data evaluation. Firstly, variance analysis was made on the data. Duncan's test was applied to the values between which a significant difference at a reliability level of minimum 95% was found in the variance analysis. Then the results were evaluated.

III. FINDINGS

Table 1 presents the results of the variance analysis applied to the data to determine the influences of the rooting media on germination percentage and morphological characters.

Table 1. The influences of the rooting media in *Schefflera* cuttings

		Sum of Squares	df	Mean Square	F	Sig.
RP	Between Groups	12736,014	2	6368,007	21,494	,000
	Within Groups	67548,077	228	296,263		
	Total	80284,091	230			
RN	Between Groups	48,361	2	24,181	1,043	,354
	Within Groups	5285,873	228	23,184		
	Total	5334,234	230			
RL	Between Groups	4020,743	2	2010,371	9,008	,000
	Within Groups	50885,604	228	223,182		
	Total	54906,347	230			
ARL	Between Groups	1354,742	2	677,371	8,536	,000
	Within Groups	18091,850	228	79,350		
	Total	19446,592	230			
RD	Between Groups	6360,331	2	3180,165	14,424	,000
	Within Groups	50267,514	228	220,472		
	Total	56627,844	230			

It is clear from the table 1 that there is no statistically significant difference between the rooting media in terms of the number of roots. Table 2 indicates the differences between the rooting media in terms of all other characters at a reliability level of 99.9%.

Table 2. The influences of the rooting media and the Duncan's test results

Media	RP		RN		RL		ARL		RD	
	Value	Group	Value	Group	Value	Group	Value	Group	Value	Group
Sand	37,50	a	5,09	a	15,226	a	11,587	a	75,09	b
Peat	51,39	b	6,48	a	26,476	b	17,873	b	76,74	b
paerlite	59,29	c	6,31	a	27,490	b	18,776	b	65,82	a

As is seen in the table 2, the highest rooting percentage was obtained in the pearlite (59.26%) medium, which was followed by the peat (51.39) medium. The lowest rooting percentage was obtained in the sand (37.5%) medium. No difference was found between the rooting media in terms of the number of roots. The biggest root length value and the biggest average root length value were obtained in the pearlite medium, and the biggest root diameter value was obtained in the peat and sand media. Table 3 presents the results of the variance analysis indicating the influences of the applied hormones on rooting percentage and other morphological characters.

Table 3. The influences of the hormone applications on cuttings

		Sum of Squares	df	Mean Square	F	Sig.
RP	Between Groups	33601,461	10	3360,146	15,835	,000
	Within Groups	46682,630	220	212,194		
	Total	80284,091	230			
RD	Between Groups	14409,796	10	1440,980	7,509	,000
	Within Groups	42218,048	220	191,900		
	Total	56627,844	230			
RN	Between Groups	1960,704	10	196,070	12,786	,000
	Within Groups	3373,530	220	15,334		
	Total	5334,234	230			
RL	Between Groups	15511,616	10	1551,162	8,662	,000
	Within Groups	39394,730	220	179,067		
	Total	54906,347	230			
ARL	Between Groups	5034,401	10	503,440	7,685	,000
	Within Groups	14412,191	220	65,510		
	Total	19446,592	230			

It is clear from the table 3 that the hormone applications had statistically significant influences on all characters. These influences are significant for all characters at a reliability level of 99.9%. Table 4 contains the results of the Duncan's test that show the differences between the applications as well as the average values.

Table 4. The influences of the hormone applications in the cuttings and the Duncan's test results

Horm.	Dose (ppm)	RP		RD		RN		RL		ARL	
		Value	Group	Value	Group	Value	Group	Value	Group	Value	Group
IAA	5000	66,07	de	72,93	bc	8,71	ef	23,849	bc	15,076	ab
	3000	50,00	c	65,5	ab	6,25	cde	33,525	cd	20,240	bcd
	1000	42,50	bc	59,4	a	1,6	a	13,636	a	12,344	a
IBA	5000	48,86	c	77,73	c	5,55	cd	19,797	ab	12,766	a
	3000	30,36	a	59,86	a	1,43	a	11,670	a	10,203	a
	1000	50,00	c	68,25	abc	4,5	bc	46,785	e	26,225	d
GA3	1000	37,50	ab	60	a	12,33	g	35,430	d	22,883	cd
NAA	5000	75,00	e	89,33	d	7,67	def	26,882	bcd	19,875	bc
	3000	50,00	c	71,75	bc	2,25	ab	33,075	cd	25,580	cd
	1000	62,50	d	73,75	bc	9,63	f	27,211	bcd	20,248	bcd
Kont.	0	51,14	c	67,73	abc	5,82	cde	28,560	bcd	19,970	bc

It is seen in the table 4 that the highest rooting percentage value (75%) was obtained in the 5000 ppm NAA application. Apart from that, the highest root diameter was obtained in the 5000 ppm NAA application. Among other characters, the biggest number of roots and the biggest average root length value were obtained in the 1000 ppm GA3 application, and the biggest root length value was obtained in the 1000 ppm IBA application.

IV. DISCUSSION AND CONCLUSION

The biggest rooting percentage value (75%) was obtained in the 5000 ppm NAA application; the biggest root diameter value was obtained in the 5000 ppm NAA application; the biggest number of roots and the biggest average root length value were obtained in the 1000 ppm GA3 application; and the biggest root length value was obtained in the 1000 ppm IBA application.

Many previous studies have reported that hormone applications have positive influences on the rooting percentages and morphological characters of plants. Many studies have dealt with the influences of auxin group hormones on rooting and plant development. [5, 6], investigated the influences of IAA, IBA, NAA, and GA3 on body cuttings and root cuttings in Melissa officinalis; [7] investigated the influences of IAA and IBA in Malus pumila; [8] investigated the influences of IAA and IBA on *Prunus* spp.; [9] investigated the influences of IAA, IBA, and NAA in Oryza sativa; [10] investigated the influences of IBA and NAA in Lilium oritential and Lilium longifolorum; and [11] investigated the influences of Lilium oritential in IAA, IBA, and NAA. The previous studies mostly show that hormones are influential on rooting. That is consistent with the results of the present study.

V. IMPLICATIONS

In the present study, hormone applications had positive influences on rooting percentage, and every application yielded different results for different characters. These results may be quite beneficial for Schefflera production in practice. In the present study, 1 leaf (along with its stalk) was used as a cutting in Schefflera. Despite that, quite high rooting percentages were obtained (Fig. 2). These results indicate that many plants can be produced out of one plant when an appropriate medium is provided and the proper application is performed. In addition, when this method is employed, rootstock is not harmed, and the form of the plant is conserved.

Figure 2. Rooted *Schefflera arboricola* cutting

The present study revealed that different applications influence morphological characters to different degrees. This result demonstrates that applications should be performed in accordance with the requested characters. For example, when high rooting percentage is requested, 5000 ppm NAA application should be performed; when a big number of roots are requested, 1000 ppm GA3 application should be performed; and when long roots are requested, 1000 ppm IBA application should be performed.

Quite important data may be obtained if similar studies are carried out in species whose mass production is important such as ornamental plants or medical and aromatic plants. Studies of this sort may help save labor, time, and cost in plant production.

ACKNOWLEDGEMENTS

This project supported by the Kastamonu University Scientific Research Projects (Project number is KUBAP-01/2013-45). We thanks the Kastamonu University Scientific Research Studies Project Management Coordination.

REFERENCES

[1] Hanafy, M.S. Saadawy, F.M. Milad S.M.N., Ali, R.M.2012. Effect of Some Natural Extracts on Growth and Chemical Constituents of Schefflera arboricola Plants, Journal of Horticultural Science & Ornamental Plants 4 (1): 26-33.

[2] Fatemeh B., Zaynab, M., 2014. Enhanced Rooting of Leaf Bud Cuttings of Schefflera arboricola Using Mycorrhizal Fungi, Annual Research & Review in Biology 4(18): 2892-2900.

[3] Akman, Y., Güney, K., Ketenoğlu, O., Hamzaoğlu, E., Kurt, L., Tuğ, N., 2007. Lilium, Angiospermae (Kapalı Tohumlular), Palme Yayıncılık, 715

[4] URL1. http://s62.photobucket.com/user/Big_Vine/media/Plants/Dragon%20-%20Roots%20Over%20Rock/July11.jpg.html

[5] Şevik, H., Güney, K. 2013. Effects of Some Hormone Applications on Morphological Features of *Melissa officinalis* L. Root Cuttings, Soil-Water Journal, 2(2), p:1647-1652

[6] Sevik, H., Guney, K., 2013, Effects of IAA, IBA, NAA, and GA3 on Rooting and Morphological Features of *Melissa officinalis* L. Stem Cuttings, The Scientific World Journal, Volume 2013, Article ID 909507, 5 pages

[7] Alvarez, R., Nissen, S.J., Sutter, E.G., 1989. Relationship between Indole-3-Acetic Acid Levels in Apple (*Malus pumila* Mill) rootstocks cultured in vitro and adventitious root formation in the presence of lndole-3-Butyric Acid, Plant Physiol. 89: 439-443

[8] Stefancic, M., Stampar., F., Osterc, G., 2005., Influence of IAA and IBA on root development and quality of *Prunus* "GiSelA 5" leafy cuttings, HortScience, 40(7): 2052-2055

[9] Chhun, T., Taketa, S.,, Tsurumi, S., Ichii, M., 2003., The effects of auxin on lateral root initiation and root gravitropism in a lateral rootless mutant Lrt1 of rice (*Oryza sativa* L.), Plant Growth Regulation 39: 161–170

[10] Chen, L.J., Zhang, X.G., Ma S., Zhong, M., Guo Z.F., Ming J. (2010). Study on the rapid propagation of *Lilium oritential* and *Lilium longifolorum*, Northern Horiticulture, 2010-14

[11] Yan, F.Y., Hu, X.Y., Pei, X.H., Yin, D.S. (2008) Effect of hormone on scale propagation of *Lilium oriental*, Liaoning Agricultural Science, 2008-06