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PHYSIOLOGICAL STUDY ON THE PROPAGATION OF ZAMIOCULCAS ZAMIIFOLIA BY SPRAYING WITH GROWTH REGULATORS AND USING DIFFERENT GROWING MEDIA

Hala Abdel-Rahman Abdel-kadir
Hort and Landscape Dept./College of Agric.and Forestry/Mosul.Univ. Iraq
hala62_iraq@uomosul.edu.iq

Abstract

This study was carried out in the greenhouse and then in the lath house of Horticulture &Landscape Design Department from 21 October/ 2018 to 20 September /2019 to investigate the effect of growing media peat moss, peat moss + soil (2 : 1) by volume and growth regulator (IBA) Indol butyric acid at concentrate 200mg. L^{-1} and (NAA) Naphthalene acetic acid at concentrate 0.5 g. $100g^{-1}$ by dipping the bases of the leaflet cutting with IBA or NAA powder and test for their ability to enhance rooting of leaflet cutting of z z plant . In addition, a second experiment was carried out using the rooted cuttings obtained from the first experiment and interaction with spraying with benzyl adenine at a concentrate 0, 150 mg. L^{-1} the results indicated that the results showed an increase in the number of roots formed on the leaf cuttings when planting in peat moss alone and it reached 7.89 roots. $Cuttings^{-1}$ the longest roots formed on the cuttings were also obtained and reached 3.39 cm. The leaf cuttings were treated with NAA at a concentration of 50 g. 100 gm^{-1} resulted in an increase in the number of roots and the length of the longest root, reaching 7.50 roots. $Cutting^{-1}$ and 2.94 cm, respectively, in exchange for 4.72 roots. $Cutting^{-1}$ and 2.03 cm when treated with IBA growth regulator at a concentration of 200 mg. L^{-1}. The interaction between the planting medium of house moss alone and the treatment of the leaf cuttings with the growth regulator NAA had a significant effect in increasing the number of roots formed on the cuttings, which amounted to 10.07 roots. $Cutting^{-1}$, as well as increasing the length of its longest root. The results of the second experiment indicated an increase in the number of branches on the rooted leaf cuttings that were previously planted in the house moss alone and significantly different from the cuttings that were planted in the house moss + garden soil, and the number of branches formed on the rooted leaf cuttings increased significantly when the cuttings were previously treated with growth regulators. IBA and NAA treatment of rooted cuttings with benzyl adenine at a concentration of 150 $mg.l^{-1}$ increased the number of branches to 2,350. $Cutting^{-1}$ rooted branches compared to 1,333 $Cutting^{-1}$ rooted branches without spraying with benzyl adenine. The triple interaction increased the number of branches. The branches formed on the leaf cuttings amounted to 3.166 branches. Rooted $cuttings^{-1}$ when planted in the middle of house moss and pre-treated with growth regulator NAA at a concentration of 5 g.100 g^{-1} and treated with benzyl adenine at a concentration of 150 $mg.L^{-1}$.

Keywords: growing media, IBA Indole butyric acid, NAA Naphthalene acetic acid, BA Benzyl adenine, leaflet cutting.

Introduction

Zamioculcas zamiifolia (LODD.)ENGL. Is an ornamental potted foliage plant his common name z z plant ,aroid palm ,arumfern , emerald frond (Dole and Wilkins,2005)it is a suberect and stemless, the plant is herbaceous monocotyledonous perennial it belong to Araceae family (Feng et al ,2006; Wong ,2009 and Harrison , 2009) it is a native of Eastern Africa from Kenya to northeastern Africa ,z z plant has long ,rigid pinnately compound leaves that arise from a thick horizontal rhizome . The leaflet are bright, shiny green on an elongate rachis with succulent petiole (Mayo et al., 1997; Dole and Wilkins, 2005). Rhizome vary in size depending on the age of the plant with diameter ranging from 0.4 – 10 cm or larger after two years, Basal leaves include pinnate and petiole, and petioles are strongly erect, up to 60 cm long leaflets are up to 15 cm and their wide 7 cm, broadly ovate- elliptic to lanceolate, alternate to semi opposite and close to overlapping (Chen and Henny, 2003). We can propagated Zambia vegetative by rhizome division and using leaflets or leaflet sections or rachis and because of its slow rate of growth and lower rate of multiplication making the plant very expensive (cutter, 1962 ; Nirmala , 2017). Growing media play avital role in plant growth and development of indoor potted plants , it must have some properties like nutrient supply , availability of water , gaseous exchange and gave physical support to plant , peat moss is the most widely organic substrate used in growing media for the potted ornamental plants (Ashour etal.,2020). Sinthanayothin et al. (2014) studied the effect of growing media in propagate leaflet cutting of zz plants and they found that peat moss or sand and rice husk charcoal mix (1: 1) by volume produced a larger rhizome and better root quality in addition the new shoot emerged earlier than those in coir dust and rice husk charcoal mix or coir dust and sand mix .another researcher Seneviratne et al. (2013) studied the effect of two growing media solid medium (compost : sand 1:1) and liquid medium (distilled water) on rooting properties of Z. zamiifolia , they found that roots number was not significantly different between the two media but the solid medium was better than the liquid medium for root elongation.

Plant growth regulators are chemical substances produced to regulate plants growth and development , when used with low concentration can inhibit or modified the physiological process of plant (Atiia and Jaddoh, 1999) .Prathibha et al. (2018) found that when propagating Zambia Zamiokulcas zamiifolia using leaf cuttings and dipping them in solutions of growth regulators BA and kinetin at a concentration of (3.0 - 1.0) $g.L^{-1}$, NAA and IBA at a concentration of (0.1 - 0.3) $g.L^{-1}$ for 30 minutes and their overlaps and then planted in containers on Vermiculite: Coir pith at a ratio of 1:1, the best number of roots was obtained at Treatment with kinetin at a concentration of 0.1 $g.L^{-1}$ + 1.0 $g.L^{-1}$ of NAA after 120 days and an average of 2.2 branches formed after 180 days when treated with kinetin at a concentration of 1.0 $g.L^{-1}$ + 1.0 g. L^{-1} 10.2 NAA. While the researchers Chen and Henny (2003) indicated the addition of rooting stimulants is not necessary when propagating the Zambia plant by leaf cuttings. Benzyl adenine is one of the synthetic cytokines with high biological activity. It is used on a

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commercial scale in the field of plant production for its role in stimulating cell division and increasing the size of cells accidentally (Al-Jalabi and Al-Khayat, 2013). Also, benzyl adenine has a role in stimulating bud initiation and root growth, as well as its role in nutrient transport (Soni et al., 2022) found (Sajjad et al., 2015) when Gladiolus sp. Amsterdam cultivar before planting with solutions of gibberellic acid, benzyl adenine, or ether for 24 hours at concentrations of 0.50, 100, and 150 mg l^{-1}, soaking the corms with benzyl adenine at a concentration of 150 mg l^{-1} stimulated the formation of buds on the plant and reached 2.14 buds. 1 It also increased the production of corms. This study was carried out to propagate plant by leaflet cutting and enhance shoot production for accelerate production of potted plant by treated with growth regulators.

Material and Methods

The research was conducted in the greenhouse of the Department of Horticulture and Landscaping - College of Agriculture and Forestry, the University of Mosul for the period from October 21, 2018, to October 28, 2019, on the Zambian plant Zamiokulcas zamiifolia. The experiment aims to propagate Zambian plants using leaf cuttings taken from the base of the plant (Parthibha et al. ., 2018) and the experiment included the following factors: Using two mediums for the propagation of peat moss + soil with a volume ratio of 1:1 or peat moss alone. The leaf cuttings of the plant were also treated with growth regulators Indol butyric acid (IBA) at a concentration of 200 mg L^{-1} and Naphthalene acetic acid (NAA). At a concentration of 0.5 g. 100 gm^{-1} in addition to the comparison treatment, where the bases of the leaf cuttings were dipped in the powder containing (IBA) or (NAA) and then planted in pots with a diameter of 6 cm containing the previous media. The experiment included 6 treatments which are the interaction between the growing media and the treatment with growth regulators. growth regulators (IBA and NAA) as well as the comparison treatment, and the experiment was carried out using the complete random sectors RCBD (Al-Rawi and Khalaf Allah, 2000) with three replications and six paper cuttings for each repeater longest root

For the purpose of studying the formation of branches on rooted cuttings, a second experiment was conducted in the wooden canopy of the Department of Horticulture and Garden Engineering, where the rooted leaf cuttings resulting from the first experiment were taken and planted in containers on the house moss only. The treatments in the first experiment overlapped with the treatment with benzyl adenine at a concentration of 0, 150 L^{-1} mg sprayed on the rooted cuttings a week after planting them in pots containing moss, then the rooted cuttings were treated with benzyl adenine for the second time a month after the first treatment by injecting the rhizome with benzyl adenine concentrations at a rate of 0.2 ml. Branches formed on the rooted cuttings on October 28, 2019. The second experiment was designed using a randomized complete block design (RCBD) with three replicates and three rooted brains for each replicate.

Results and Discussion

The number of roots (root. Cuttings^{-1}):

The results show in Table (1) that the cultivation medium in which the cuttings of Zambia plants were planted had a significant effect, as it was noticed that the number of roots formed on the leafy cuttings increased significantly when planting in the house moss only, as it formed 7.89 roots. Cutting1-in the medium containing peatmoss + soil and is in agreement with (Mousa et al., 2015; Younis et al., 2016 and Badran et al. 2017) who found that peat moss alone increased the growth of a number of different indoor ornamental plants such as Gardenia and Rhapis exclesa L. . The number of roots formed on the cuttings 7.50 root. Cuticle^{-1} when treated with the growth regulator NAA at a concentration of 50 g. L^{-1}, which has 4.72 roots. Cutting^{-1} this may be due to the role of auxin in the formation of tubers and roots, as NAA has a stimulating effect on the formation of roots (Prathibha et al., 2018).

Table (1): Effect of growing media, growth regulater (IBA, NAA) and their interactions on root number per leaflet cutting of ZZ. Plant.

Growing media	Growth regulator con.			Growing media effect
	0	IBA 200 mg.L^{-1}	NAA 50 , 100 mg.L^{-1}	
Peat moss	8.07ab	5.52 bc	10.07 a	7.89 a
Peat moss+ Soil	4.36 bc	3.91 c	4.93 bc	4.40 b
IBA , NAA effect	6.22 ab	4.72 b	7.50 a	

The interaction between the planting medium and growth regulators increased the number of roots formed on the cuttings, reaching 10.07 roots. Cutting^{-1} when cuttings were grown in peat moss alone and treated with NAA growth regulator at a concentration of 50 g. 100 g^{-1} and significantly differed from the values of the other interventions except for the number of roots in cuttings grown at home moss alone and without treatment with growth regulators IBA and NAA. g L^{-1} NAA. And the least number of roots was 3.91 root. Cutting^{-1} when growing cuttings in peat moss + soil and treated with IBA growth regulator at a concentration of 200 mg. liter^{-1}.

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2The length of the longest root (cm):

Table (2) indicated that the length of the roots formed on the leaf cuttings of the Zambia plant increased, as the length of the longest root reached 3.39 cm when planting in peat moss alone, and it differed significantly from the length of the longest root when planting in peat moss + soil. This agreed with Ashour et al. (2020) that Peat moss planting medium increases the number of roots. Plant^{-1} and the root length of Dracaena marginata attributed this to the characteristics of house moss in terms of containing an appropriate amount of organic matter, low percentage of salinity (EC) and acidity (PH) as well as its ability to retain moisture. Treatment with growth regulator NAA 50 g.100 g^{-1} led to an increase the length of the longest root was 2.94

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cm, and it differed significantly from the length of the longest root when treated with IBA, the length of the longest root was 2.03 cm.

Table (2): Effect of growing media, growth regulater (IBA, NAA) and their interactions on the longest root (cm) in leaflet cutting of ZZ. Plant.

Growing media	Growth regulator con.			Growing media effect
	0	IBA 200 mg.L^{-1}	NAA 50 , 100 mg.L^{-1}	
Peat moss	3.77 a	2.66 ab	3.74 a	**3.39 a**
Peat moss + Soil	1.83 bc	1.40 c	2.14 bc	**1.79 b**
IBA , NAA effect	2.80 a	2.03 b	2.94 a	

The interaction between the factors of the experiment shows that cuttings grown in peat moss alone had the longest roots without treatment with growth regulators or when treated with IBA and NAA growth regulators, and the highest values were 3.77 cm when grown in peat moss alone and without the addition of growth regulators and they did not differ Significantly, the values of the longest root length when growing cuttings in peat moss alone and treated with NAA at a concentration of 0.5 g. . Liter^{-1}.

Figure 1 shows the number of roots when treated with the growth regulator NAA

Second Experiment:

3 -Number of branches (branch. cuttings rooted leaf):

It is evident from Table (3) that the leaflet rooting cutting planted in the middle of peat moss alone was distinguished in increasing the number of branches formed on the rooted leaf cuttings, reaching 2,044 branches. Rooted and grown in the middle of peat moss + soil, in which the number of branches reached 1.639. Cutting^{-1} rooted leaf.The treatment of cuttings with IBA and NAA growth regulators led to an increase in the number of branches formed on the rooted leaf cuttings, reaching 1.941 and 2,000 branches. Rooted cuttings^{-1} and significantly different from rooted cuttings when not treated with growth regulators. The treatment with benzyl adenine BA resulted in a concentration of 150 mg. L^{-1} resulted in a significant increase in the number of branches formed on the rooted leaf cuttings, amounting to 2,350 branches. Cutting^{-1} rooted leaf in exchange for 1.333 branches. Cutting^{-1} leaf rooted without treatment

with benzyl adenine. The reason may be due to the well-known role of cytokinins in inducing branch doubling in a number of ornamental plants, and Ragini et al. 2019 mentioned that benzyl adenine and kinetin help in stimulating cell division and regulating the size of the meristems and the number of leaf principles. Leaf primordia number and growth of branches and leaves, as indicated by (Soni et al., 2022). The cytokinins stimulate cell division and lead to an increase in their size and differentiation, sprouts and root growth.

The bilateral interaction between the growing media and the growth regulator indicates an increase in the number of branches formed on the rooted cuttings when planting in the middle of peat moss alone and treated with the NAA growth regulator at a concentration of 0.5 g. 100 gm^{-1} as it reached 2,500 branches. $Cutting^{-1}$ is a rooted leaf that differs significantly from all other treatments.The interaction between the growing media and benzyl adenine BA increased the number of branches formed on the rooted leaf cuttings, and the highest values were 2.477 and 2.222 branches. A rooted 1-leaf cuttings when grown in peat moss alone or peat moss + soil and treated with benzyl adenine BA at a concentration of 150 mg. L^{-1} and significantly different from the other treatments.

Table (3): Effect of growing media, growth regulator (IBA, NAA), benzyl adenine (BA) and their interactions on shoot number of ZZ. Plant.

Growing media	**Growth regulator con. ($mg.L^{-1}$)**	**BA con. $mg.L^{-1}$**		**Growing media x Growth regulator**	**Growing media effect**
		0	**150**		
Peat moss	**0**	1.333 e-g	2.000 cd	1.666 bc	2.044 a
	IBA	1.667 d-f	2.266 bc	1.966 b	
	NAA	1.833 c-e	3.166 a	2.500 a	
Peat moss+ Soil	**0**	1.000 g	2.000 cd	1.500 c	1.639 b
	IBA	1.167 fg	2.667 ab	1.917 b	
	NAA	1000 g	2000 cd	1.500 c	
Growing media x BA Con.	**Peat moss**	1.611 b	2.477 a	**Growth regulator ($mg.L^{-1}$)**	
	Peat moss + Soil	1.055 c	2.222 a		
Growth regulator x BA Con.	**0**	1.166 c	2.000 b	1.583 b	
	IBA	1.417 c	2.466 a	1.941 a	
	NAA	1.416 c	2.583 a	2.000 a	
BA effect		1.333 b	2.350 a		

The interaction between the growth regulators IBA, NAA and BA showed that leaf cuttings previously treated with IBA at a concentration of 200 $mg.l^{-1}$ or NAA at a concentration of 0.5 g. $Cutting^{-1}$ leafy branch is rooted, respectively, while the lowest

values for the number of branches were 1.166. (Prathibha et al.2018) indicated that cytokinin led to an increase in the formation of rhizomes and resulted in a doubling of the number of branches.

The interaction of the studied factors led to an increase in the number of branches formed on the rooted cuttings and the highest values were 3.166. 100 gm^{-1} and benzyl adenine BA at a concentration of 150 $mg.l^{-1}$ and it differed significantly from all other treatments, while the lowest values reached 1,000 branches. Rooted cuttings-1 when planting cuttings in peat moss + soil and without treatment with growth regulators or treatment with NAA at a concentration of 0.5 g. 100 g^{-1} and without treatment with benzyl adenine.

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