ISSN: 0067-2904
GIF: 0.851

Influence of Cutting Position with IBA Hormone for Different Dipping Times on Rooting of Cassia tree *Cassia surattensis* Burm. Stem Cuttings

Amal Abdul .S. Habib*, Hatim J. Attiya
Department of Biology, College of Science, University of Baghdad, Baghdad, Iraq

Abstract:
The present study was carried out in the experimental in the nursery at Al – Dorah (Baghdad). During spring 2015 under natural environmental conditions in plastic house to evaluated the effect of different concentrations of IBA (100, 300, 500, 700 and 1000) mg/1 on different cutting position (basal, sub terminal and terminal) for different dipping times (24, 48) hours, on *Cassia surattensis* Burm. stem cuttings rooting. After 2 months of planting the results demonstrated that the basal cutting treated with 1000 mg/l IBA in 48 hours dipping time showed the earlier rooted period (4) weeks compared with control treatment 8 weeks. The same treatment also gave the highest mean rooting numbers 1.56per cutting and the highest mean rooting lengths 2.88 cm compared with other treatments. The 1000 mg/l IBA treatment with basal and sub terminal gave the highest mean value of rooting percentage 55.5% in both dipping times compared with control treatment that gave 0.0%.

Keywords: Cassia stems cuttings positions, IBA concentrations, dipping time and rooting characteristics.

تأثير مواقع العقل الساقية ومنظم النمو IBA مع فترات تنقيع مختلفة في تجذير نبات الكاسيا *Cassia surattensis* Burm

أمال عبد السلام الحبيب*، حاتم جبار عطية
قسم علوم الحياة ، كلية العلوم ، جامعة بغداد ، بغداد، العراق

الخلاصة
نفذت تجربة في احد المشاتل الاهلية في منطقة الدورة ، بغداد في ربيع 2015 تحت ظروف البيت البلاستيكي باستخدام تراكيز مختلفة من منظم النمو IBA (0 ،،100 300، 500، 700و1000) ملغم\لتر وبفترات تنقيع مختلفة (24 و 48) ساعة لمواقع مختلفة (قاعدية ، وسطية ، نهائية) للعقل الساقية لشجرة الكاسيا، تم اخذ القياسات التالية (النسبة المئوية للتجذير ، معدل عدد الجذور للعقلة الواحدة ، ،معدل طول الجذر بالسنتمتر وطول فترة التجذير بالاسبوع)، بعد شهرين من الزراعة ، دلت النتائج ان تركيز 1000 ملغم\لتر من منظم النمو في فترة تنقيع 48 ساعة قد اعطى اقل فترة تجذير(4) اسابيع مقارنة مع معاملة السيطرة (8) اسابيع ، واعلى معدل لعدد الجذور للعقلة الواحدة 1.56 بالاضافة الى اعلى معدل لطول الجذر2.88 سم بالمقارنة مع باقي المعاملات المدروسة، وان العقل الوسطية مع القاعدية اعطت اعلى معدل للنسبة المئوية للتجذير55.5%. اما معاملة المقارنة اعطت 0.0% نسبة تجذير.

Introduction

Cassia tree; *Cassia surattensis* Burm. is valued in agriculture as a shade and hedge tree. Economically it is a popular ornamental that has been introduced around the world for this reason with its attractive flowers that bloom throughout the year [1]. The species has been characterized as

*Email: a.justforu@yahoo.com

difficult to propagate by cuttings [2, 3]. In Iraq the flowers failed to produce seeds and in some cases the plant produce seeds but failed in germinations. For this reason it's problems in propagation causes rising its prices for customers in Iraq.

It has been reported that rooting success of stem cuttings is dependent on factors such as position of the cutting on the shoots [4, 5] presence or absence of hormone and concentrations [6], as well as the physical and environmental factors [7].

The influence of stem cuttings positions and different dipping times on rooting of cassia cuttings has not documented. However the using of IBA in rooting of stem cutting has been reported to stimulate adventitious root in cuttings [8]. The potential of the species for development has been reported by [9]. However, data is lacking on the use of stem cuttings for vegetative propagation of cassia cuttings in Iraq.

Therefore the objective of this study was how cutting position, IBA concentration and dipping times influences rooting of *cassia* stem cuttings. The results could facilitate the cheap and simple method of propagation by stem cuttings.

Material and methods:

The experiment was carried out a nursery in Dora region (Baghdad). During April 2015 under natural environmental conditions in plastic house.

The experiment was as three factorial experiments laid out in a complete randomized design with nine replicates. The treatments consisted of IBA concentrations (0,100,300,500, 700 and 1000) mg\l, type of cuttings in three positions (terminal, sub terminal and basal) positions, and two different dipping times (24, 48) hours.

Healthy and uniform semi hardwood cuttings sample material of *Cassia* tree collected from university of Baghdad in AL-Jaderia. The branches were cut into three pieces namely basal, sub terminal and terminal. Stem length and diameter are 12–14 (cm) and 7–8 (mm) respectively were obtained from the middle portion of three years old plants during February 2015. The cuttings were immediately dipped into normal tap water and subsequently washed in distilled water before applying in different treatments.

Preparation of hormonal solution: The desired amount of IBA (one gram) dissolved in small quantity (10-15 ml) of absolute alcohol in a 50 ml beaker, thoroughly mixed then one liter of distilled water were added with continuous stirring to form clear solution with1000mg\l IBA concentration (stock solution), the rest concentrations prepared from the stock solution by the following equation V1C1=V2C2.

All leaves were removed from the lower part of the cuttings. Each type of cuttings was dipping in two period times 24 and 48 hours for IBA concentration. The cuttings were cultured in the pots containing sand medium in nine pots replication. The cuttings were regularly watered after planting depending on weather.

The rooting parameters for all sampling after two months of planting were counted and the data was recorded for all treatments. These traits were (time of rooting, rooting percentage, number, and roots length in cm). Time of rooting means the beginning time of rooting in weeks.

Rooting percentage = (numbers of rooting pots x100 / total pot numbers).

Data were analyzed using Gen Stat [10] program. Analysis of variance (ANOVA) was performed to determine significant difference. Mean separation was carried out by the Least Significant Difference test (LSD) at level 5%.

Results and discussion:

The results in Table -1 showed that (0,100,300,500) ppm of IBA concentrations had no effects on reducing time of rooting. The reducing present in 700 and 1000 mg/l IBA 5.74 and 5.55 weeks. The result recorded that 48 hours dipping times had the lowest rooting time 7.17 weeks compared to 24 dipping times mean 7.27 weeks. This means that the more dipping time accelerates of the rooting time. The best effect in the interaction between cutting types, concentrations and hours in reducing time of rooting present in 1000 mg/l IBA was 4 weeks with basal cuttings in 48 hours dipping time compared with 8 weeks in control treatment. These results agreement with the result of [11] they found that IBA be more effective for root induction in *Ginkgo biloba* L stem cuttings, and reducing the time of rooting from 6 months' to three months. In another study [12] they suggested that the application of IBA may have an indirect influence by enhancing the speed of translocation and movement of sugar to the base of cuttings and consequently stimulate rooting.

Table 1- Effects of different IBA treatments on time of rooting

IBA Conc.	Type of cuttings						**Means of conc.**
	Basal		Sub terminal		terminal		
	Dipping time in hours						
	24	**48**	**24**	**48**	**24**	**48**	
0.00	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**
100	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**
300	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**
500	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**	**8.00**
700	**4.9**	**4.30**	**5.00**	**4.55**	**8.00**	**8.00**	**5.74**
1000	**4.4**	**4.00**	**4.66**	**4.22**	**8.00**	**8.00**	**5.55**
Mean	**6.88**	**6.72**	**6.94**	**6.79**	**8.00**	**8.00**	
L.S.D				**0.39**			**0.16**
Means of cutting types	**6.80**		**6.87**		**8.00**		
L.S.D	**0.11**						
	24	**48**					
Means of dipping times	**7.27**	**7.17**					
L.S.D	**0.09**						

The results in Table-2 Showed that the highest rooting percentage in 1000 mg/l IBA concentration was 37% followed by other treatments 500,700 mg/l concentrations which gave 29.6% compared to control which gave 0%. Dipping time 48 hours gave 20.35% compared to 18.5% in 24 hour dipping time. and basal cutting gave 29.6% , they get the highest value in effecting of rooting percentage, The terminal type of cutting did not show any effect on rooting percentage. The terminal type of cutting didn't show any effect on rooting percentage even applied with IBA in different treatments.

The interaction between treatments showed that 1000mg\l IBA concentration in basal and sub terminal cuttings with 24 or 48 hours gave 55.5% rooting compared with other treatments.

Table 2- Effect of different IBA treatments on rooting percentage

IBA Conc.	Type of cuttings						Means of conc.
	Basal		Sub terminal		terminal		
	Dipping time in hours						
	24	48	24	48	24	48	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300	33.3	44.4	33.3	33.3	0.00	0.00	25.9
500	33.3	44.4	33.3	44.4	0.00	0.00	29.6
700	44.4	44.4	44.4	44.4	0.00	0.00	29.6
1000	55.5	55.5	55.5	55.5	0.00	0.00	37.0
	27.75	31.45	27.75	29.6	0.00	0.00	
L.S.D	0.16					0.05	
Means of cutting types	29.6		28.67		0.00		
L.S.D	0.08						
	24		48				
Means of dipping times	18.50		20.35				
L.S.D	0.07						

The results in Table-3 showed that the effects of IBA treatments increased with the increasing of IBA concentrations, the highest IBA concentrations 1000 mg/l give 0.93rooting number. The basal cutting gave the highest result 0.7. The interaction between 1000 mg/l in basal cuttings with 48 hours dipping time obtained the highest value in rooting numbers 0.93. The untreated control cuttings were unable to put out roots may be due to the auxin was not sufficient to stimulate root initiation [13].

Table 3- Effect of different IBA treatments on rooting numbers

IBA Conc.	Type of cuttings						Means of conc.
	Basal		Sub terminal		terminal		
	Dipping time in hours						
	24	48	24	48	24	48	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300	0.67	1.11	0.44	0.82	0.00	0.00	0.51
500	0.88	1.11	0.78	0.89	0.00	0.00	0.61
700	1.00	1.12	1.00	1.10	0.00	0.00	0.70
1000	1.33	1.56	1.22	1.48	0.00	0.00	0.93
Mean	0.64	0.76	0.57	0.72	0.00	0.00	
L.S.D	0.35						0.14
Means of cutting types	0.70		0.64		0.00		
L.S.D	0.10						
	24	48					
Means of dipping times	0.40	0.49					
L.S.D	0.08						

In China (14) found that treatment of semi-lignified branches *C. surattensis*, with 250, 500, 1000 mg/l IBA and 250, 500, 1000 mg/l NAA were higher in average rooting number and root length than those of control treatment, the treatment with 500 mg/L IBA gave the highest result in rooting number and length. The results in Table - 4 showed a similar concept found in the previous tables that increasing in concentration and dipping times causing increasing effect on root length with basal cuttings. The interactions between these factors causing the highest root length 2.88 cm in 1000mg/l IBA in 48 hour dipping time for basal cuttings.

Many studies indicated that high IBA concentrations and long dipping times were required to efficiently induce adventitious roots in the hypocotyl cuttings of *Pinus radiate* and on number of roots formed [15]. Increasing in dipping times of cuttings caused accumulation of metabolites in the cuttings that increased their rooting numbers and length as compare with 24 hours dipping times [16]. Many researchers indicated that IBA increases rooting and root length in *Piper longum* and conclude that the reason was by increase in IAA in base of cuttings that causing increasing in the action of auxin activity which might have caused hydrolysis and translocation of carbohydrates and nitrogenous substances at the base of cuttings and this resulted in accelerating cell elongation and cell division in suitable environment [17]. In another study, IBA and other hormones enhanced polysaccharide hydrolysis to provide energy for meristematic tissues of roots and documented that a higher number of roots, root length [18].

Table 4- Effect of different IBA treatments on rooting length

IBA Conc.	Type of cuttings						Means of conc.
	basal		Sub terminal		terminal		
	Dipping time in hours						
	24	48	24	48	24	48	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00
300	1.23	1.44	1.10	1.22	0.00	0.00	0.83
500	1.33	1.44	1.12	1.33	0.00	0.00	0.87
700	2.00	2.33	2.00	2.11	0.00	0.00	1.40
1000	2.55	2.88	2.55	2.78	0.00	0.00	1.79
Mean	1.19	1.35	1.13	1.24	0.00	0.00	
L.S.D	0.39						0.16
Mean of cutting types	1.27		1.18		0.00		
L.S.D	0.19						
	24	48					
Means of dipping times	1.70	1.92					
L.S.D	0.16						

Conclusion:

The present study showed that C. *surattensis* can be propagated by stem cuttings and gave the highest results with basal cuttings in 1000 mg/l IBA concentration in 48 hours dipping times. It can be concluded that 1000 and 700 mg/l concentration of IBA affected rooting. These results can be interpreted that increasing concentration of IBA up to 1000 mg/l increasing the number and length roots and rooting percentage in addition to reducing the time of rooting.

Reference:

1. Hanelt, P., Buttner, R. and Mansfeld, R**. 2001**. *Mansfeld's Encyclopedia of Agricultural and Horticultural Crops (except Ornamentals)*. Berlin, Germany: Springer.
2. Doug Caldwell. **2013**. Fungus causing rust disease in cassia trees. *Collier County Extension*, (239)353-4244.
3. Toruan-Purba, A.V. **1999**. *Senna Miller* [Internet] Record from Proseabase. de Padua, L.S., Bunyapraphatsara, N. and Lemmens, .H.M.J. (Editors).
4. Hansen, J.**1986**. Influence of cutting position and stem length on rooting of leaf-bud cuttings of *Schefflera arboricola Scientia Horticulturae*, 28, pp:177-186.
5. Hansen, J.**1988**. Effect of cutting position on rooting.axillary bud break and shoot growth in Stephanotis *floribunda.Acta Horticulturae* 226, 159 -163.
6. AI-Saqri, F. and AIderson, P.G. **1996**. Effect of IBA, cutting type , rooting media on rooting of *Rosa centifolia. Journal of Horticultural Science,* 71, pp:729-731.
7. Wilson, P. J.**1993**. Propagation characteristic of Eucalyptus globulus Labill. ssp globulus stem cutting in relation to their original position in the parent shoot. *Journal of Horticultural Science*, 68, pp:715-724.
8. Araya, H.T., Soundy, P., du Toit, E.S. and Mudau, F.N. **2007**. Influence of cutting position, medium, hormone and season on rooting of bush tea stem cuttings. *Medicinal and Aromatic Plant Science Biotechnology*, 1, pp: 243 -252.
9. Van wyk B-E and Gericke N.**2000**. People" s plants. A Guide of Useful plants of Southern Africa Briza publications *Pretoria South Africa*, p:351.
10. Wilkinson, G. N. and Rogers, C. E. **1973**. Symbolic Description of Factorial Models for Analysis of Variance.*Journal of the Royal Statistical Society. Series C (applied Statistics)*, 22(3), pp:392–399. http://doi.org/10.2307/234678.
11. Aseesh Pandey, Sushma Tamta and Dinesh Giri .**2011**. Auxin on adventitious root formation and subsequent growth of cutting raised plantlets of *Ginkgo biloba* L. *International Journal of Biodiversity and Conservation*, 3(4), pp:142-146.
12. Haissig, B.E. **1974**. Influences of auxin synergists on adventitious root primordium initiation and development. *NZ J. For. Sci*, 4, pp: 311-323.
13. Gergő Sándor.**2011**.Changes of auxin content in the rooting zone of hardwood Plum cuttings, Ph.D. Thesis. University of Budapest.
14. Jing-Dong Luo.**2009**. Effects of Indole Butyric Acid (IBA) and Naphthalene Acetic Acid (NAA) on Softwood Cutting of Cassia surattensis Burm. *Journal of Anhui Agri .Sci.*, 37 (6), pp: 2495 - 2496.
15. Ezekiel, A. **2010**. Viable options and factors in consideration for low cost vegetative propagation of tropical trees. *Int. J. Bot.*, 6, pp: 187–193.
16. Smalley, T.J., Dirr, M.A. and Armitage, A.M. **1991**. Photosynthesis and leaf water, carbohydrate, and hormone status during rooting of stem cuttings of *Acer rubrum. J. Amer. Soc. Hortic. Sci.,* 116, pp: 1052–1057.
17. Toruan-Purba, A.V. **1999.** *Senna* Miller [Internet] Record from Proseabase. de Padua, L.S., Bunyapraphatsara, N. and Lemmens, .H.M.J. (Editors). Ezekiel, A. 2010. Viable options and factors in consideration for low cost vegetative propagation of tropical trees. *Int. J. Bot.*, 6, pp:187–193.
18. Elhaak, M.A., Matter, M.Z., Zayed, M.A. and Gad, D.A.**2015**. Propagation principles in using Indole-3-Butyric Acid for rooting rosemary stem cuttings, *J Horticulture*, 2, p:1.