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PROPAGATION OF SOME DIFFICULT CUTTINGS OF HEDGES AND CLIMBERS 1- *QUISQUALIS INDICA* L. (RANGON CREEPER).

BY

Neima A.E. Farouk, *, Hussein, M.M.M., Ahmed, G.E.F.** Hend M. Suefi.** and Gmaa, S.A.A.***

* Ornamental Plants Res. Dept., Hort. Res. Inst. Agric. Res. Center, Giza, Egypt.

** Ornamental Hort.. Dept., Fac. of Agric., Cairo Univ., Egypt.

ABSTRACT

This experiment was carried out during two seasons of 2005/2006 and 2006/2007 at the experimental nursery of Ornamental Plants Research Department, Horticulture Research Institute, Giza, Egypt. So the *Quisqualis indica* cuttings were chosen from a mother stock of two years old. Semi-hardwood cuttings of 10-15 cm. length without leaves were dipped their basal ends in the soluble concentrations of IBA (300,500, and 10000 ppm), NAA (500,1000 and 1500ppm) and catechol (Polyphenol) (300,500 and 1000ppm) for 12 or 24 hours. After preparing the cuttings it were planted in plastic pots 15 cm. in diameter containing peatmoss (5 cuttings/pot) under plastic shady tunnels, in 4 planting dates, as follows spring season (mid April), summer season (mid July), Autumn season (mid October) and winter season (mid December) for the two seasons the planting in spring season (mid April) is only favorable and successfully. Meanwhile, there are no rooting ability occurred in the three other planting dates. The results revealed that, dipping the basal ends of cuttings in catechol at 1000 ppm for 24 hours resulted in a significant increase in the survival percentage of cuttings and the length of performed roots, in the two measured times (rooting time and 15 days after rooting) in both seasons as compared to control (treated with distilled water only). On the other hand catechol at 300 ppm for 24 hours produced the highest number of roots at the rooting time or after 15 days from rooting in both seasons, however catechole at 500 ppm for 12 or 24 hours increased significantly the number and length of branches and the length of intact seedling in the two measured times in tow seasons. Chemical composition was also affected significantly by different catechol treatments, especially catechol at 1000 ppm for 12 or 24 hours which increased the total carbohydrates in roots, chlorophyll a, b and the total indoles in the intact seedlings.

It could be concluded that, dipping the basal ends of semi-hardwood free leaves *Quisqualis indica* cuttings in solution of catechol at 500 or 1000 ppm for 12 or 24 hours to optimized the propagation of the plant by cuttings.

Key words: 6 Indole,-3-butyric acid (IBA), 1-naphthalene acetic acid (NAA), catechol,-cutting collecting time-dipping period Quisqualis.

INTRODUCTION

Climbers these are the plants with soft stems that grow only with a support. Climbing plants can provide some of the most stunning aspects of our landscaping. Bar walls and fences can be quickly beatified and transformed by planting fast-growing vines alongside them and providing supports for the plants to grow on. Creepers is a type of plant, which cannot stand by itself, it trails or climber. Most creepers are flowering plats (annual, bi-annual or perennial). Climbers are commonly used on walls, arches, pergolas, trellises porches, arbours, and pillars. Many climbers which grow and flower for several years are perennials and they are valued because once established and trained on support, they continue to flower with little

care. *Quisqualis indica* L., Madabilata or Rangoon creeper is one of these plants type.

Quisqualis indica L., (Fam: Combretaceae), is hardy in the extreme south of the U.S.A. and is also sometimes grown in the wormhouse, the flowers appear from June to September and last well when cut, after flowering the plant should be cut back severely and water applied les frequently until the wood is ripened, new growth starts the following spring, it is remarkably free from insect pests and fungous disease, and propagation is by softwood cuttings (Bailey, 1976). *Q. indica* used widely in traditional medicine in some countries, and considered to be the most promising for large scale culture, Quintana *et al.*, (1983).

Cutting propagation is commonly used in the commercial production of ornamental crops. Cuttings of some species root readily without an auxin treatment, while cuttings of other species benefit from auxin treatment through enhanced promotion of rooting; benefits may be dependent upon the species and cultivar, condition of the cutting wood, time of year, and other factors (Griffith, 1998; Hartmann *et al.*, 2002). Root-promoting chemicals for cutting propagation commonly contain indole-3-butyric acid (IBA), 1-naphthaleneacetic acid (NAA), or a combination of the two, and are available in liquid, talc, tablet, and gel formulations. Liquid formulations are generally sold as solventbased concentrates that may be diluted to the desired concentration for treating cuttings of specific crops (Blythe *et al.*, 2004).

IBA gave the best propagating results, as 80% of cuttings formed roots during the first month of rooting of leafy cuttings of cherry rootstock (Gisela 5) (Stefancic, *et al.*, 2007). As well as increasing salinity levels of the soil suppressed the growth parameters Viz, number of leaves/ plant, root length, leaf area and biomass production in IBA treated cuttings. (Limbasiya, *et al.*, 2007).

Cuttings were obtained every fortnight between April and August, and treated with IBA (100mg/L.) for 24h after 90 days the number of cuttings that rooted were evaluated, (Calfun, *et al.*, 2003). Meanwhile Pacholezak *et al.*, (2005) stated that spraying stock plants with NAA in the range of concentrations of 50-500mg. dm-3 was the effective way of auxin application in ornamental use of rooting powders. As well as, NAA treatment (5000 and 10000ppm) increased the number of root per stoock but decreased both rooting percentage and root length. The higher concentration of NAA decreased all parameters (Tripathi, *et al.*, 2006). Rooting could be enhanced in layers by the exogenous application of NAA, and the 400ppm NAA may by the best concentration for getting high success and survival in all 3 cultivars of sweet orange. When cuttings of *Quisqualis indica* were 16 cm long collected from 2-yr-old branches in March, and treated by dipping their basal ends in 10-4 mg/Liter NAA for 24h and then planted gave the best results (Chen Dengxiong, *et al.*, 2000).

Catechol is a strong reducing agent that has been reported to regulate the rate of IAA oxidation in plant tissues. Only, 60 μM IAA together with 50 μM catechol resulted in a rooting response of Hedera shoots, that was almost equal to that produced by the optimum NAA level, suggesting that catechol protected IAA from light-induced degradation. At low irradiance (7 μmol.m-2.s-1), IAA alone produced almost as many roots as IAA + catechol in high lighting. The rooting response of adult shoot tips in low light was very similar to that of juvenile tips in high light. Catechol (and phloroglucinol, 500 μM), increased the number of adventitious shoots formed from leaf callus of tobacco. Catechol promoted the rooting of etiolated *Populus robusta* cuttings in conjunction with IAA and sucrose. George *et al.*, (2007).

This trial, however, was done to investigate the best propagation technique of *Quisqualis indica* L. by cuttings treated with different growth regulators (NAA and IBA) and catechol, and explore the effect of these treatments on growth behavior and chemical composition of the plant.

MATERIALS AND METHODS

This investigation was carried out in the experimental nursery of Ornamental Plants Department, Horticultural Research Institute, Giza, Egypt, throughout the two seasons 2005/2006 and 2006/2007.

Cuttings of *Quisqualls indica* L. were chosen from a mother stock of two years after transplanting to the nursery, semi-hard wood cuttings of 10-15cm. length without leaves. Four times collecting the cuttings were occurred to every season (mid April) as spring seasons, (mid of August) as summer seasons, (the mid October) as Autumn season and (mid of January) as winter. Three growth regulators were applied to dipping the basal ends of the cuttings for two times 12 or 24h., IBA at the rates (300, 500 and 1000ppm), NAA (500, 1000 and 1500 ppm) were dissolved in 100 cm ethyl alcohol for each concentration. Catechol (Polypenol) at the rates (300, 500 and 1000ppm) were dissolved in distilled water, distilled water was used as a control with both dipping periods.

The cuttings after preparing were planted in plastic pots. 15cm. in diameter (5 cuttings in each pot filled with peat moos medium) under plastic shady tunnels. Cuttings did not develop adventitious roots until 65 days after collection and plating which was the first recorded record. The layout of the experiment was a factorial design with 2 factors (type of growth regulator and dipping period). The experiment had 20 treatment contained 3 replicates, each replicate contained 5 cuttings. Irrigation and agricultural practices were done whenever plants needs. The obtained data were statistically analyzed using SAS (1995) Computer program, and mean were compared by L.S.D method, and all percentages were transformed according to Snedecor and Chochran (1980).

Data recorded:

Vegetative growth:

(No. of roots, root length, , branches length, plant height and survival percentage of cuttings). These data were recorded in two times, during the rotting period and 15 days after rotting.

Chemical constituents:

Total indoles and phenols % in cuttings before planting and in the rooted cuttings according to O.A.C (1995) and total carbohydrate % in cuttings, leaves and roots according to Doubios *et al.*, (1956).

Table (A): Chemical properties of used peat-moss.

pH	Salinity g/l	Organic matter %	ASH	Density g/L	Cations (ppm)			Average nutrients			
					Fe	Mn	Zn	Cu	N	P	K
3.8	0.3	93	7.8	87	421	27	41	8.8	1.09	0.23	1.77

Irrigation and agricultural practices were done whenever plants needs.

RESULTS AND DISCUSION

Attention:

From the data obtained throughout the experimental seasons, there are no rooting occurred in summer, autumn and winter, in both years. Concerning the spring planting the all parameters were studied in the two seasons.

1. Survival percentage of cuttings:

Data in Table (1) showed that all growth regulator treatments were affected on percent survival at the two dipping periods when recorded with the two times. The maximum percent survival resulted significantly from dipping the hardwood cuttings in catechol 1000ppm for both 12 and 24h. Also, the treatments of NAA 1500ppm, catechol 300 or 500ppm gave a significant increase on percent survival with the two dipping times (12,24h) at the two recorded times throughout the both seasons, when compared with untreated cuttings. Concerning, to IBA treatments, there were a significant increase on percent survival resulted from cuttings were

dipped in 500 or 1000ppm for 24h. in the first season, while, the same recorded were non .Significant in the second season. The interaction between different growth regulators or catechol and the dipping periods presented a significant increase resulted from the all catechol treatments with the short dipping period, while the IBA treatments (500 and 1000ppm) and the all catechol treatments gave a significant increase on the survival percentage with the prolonging period in the first season. Meanwhile, the all treatments of catechol gave a significant increase with the two dipping periods in the second season. These results are agreement with those obtained by Bhramal, *et al.*, (2005),and Pandey (1997).

2. Root length/cutting (cm.):

It can be concluded from data in Table (2) that the recorded times and the treatment of NAA (1000 ppm) or IBA (1000 ppm) and the all catechol levels had a marked effects on the roots length of Quisqualis through the both seasons.

Table (1): Effect of different growth regulators and catechol at two dipping periods and their interaction on the survival percentage of *Quisqualis indica* L. recorded for two times throughout the two seasons 2005/2006 and 2006/2007.

	First season					
	Rooting time			15 days after rooting		
	12h	24h	Mean	12h	24h	Mean
Control	0.08	0.08	**0.08**	0.01	0.01	**0.01**
NAA 500	2.22	4.44	**3.33**	2.22	6.66	**4.44**
NAA 1000	4.44	6.66	**5.55**	4.44	6.66	**5.55**
NAA 1500	6.66	8.88	**7.77**	6.66	11.11	**8.88**
IBA 300	2.22	4.44	**3.33**	2.22	6.66	**4.44**
IBA 500	4.44	8.88	**6.66**	4.44	8.88	**6.66**
IBA 1000	4.44	6.66	**5.55**	6.66	11.11	**8.88**
Cati. 300	8.88	11.11	**10.00**	11.77	16.66	**14.22**
Cati. 500	13.33	15.55	**14.44**	15.00	26.66	**20.83**
Cati. 1000	15.55	20.00	**17.78**	23.33	29.66	**26.50**
Mean	**6.23**	**8.67**		**7.68**	**12.41**	
L.S.D Growth Reg.		**4.71**			**5.10**	
L.S.D Soaking Per.		**2.11**			**2.28**	
L.S.D G. R. X S.P.		**6.66**			**7.22**	
	Second season					
Control	0.08	0.08	**0.08**	0.02	0.02	**0.02**
NAA 500	4.44	2.22	**3.33**	4.44	2.22	**3.33**
NAA 1000	2.22	4.44	**3.33**	6.66	6.66	**6.66**
NAA 1500	4.44	6.66	**5.55**	6.66	8.88	**7.77**
IBA 300	2.22	4.44	**3.33**	2.22	6.66	**4.44**
IBA 500	4.44	2.22	**3.33**	8.88	6.66	**7.77**
IBA 1000	2.22	2.22	**2.22**	8.88	8.88	**8.88**
Cati. 300	8.88	11.11	**10.00**	11.11	13.33	**12.22**
Cati. 500	11.11	11.11	**11.11**	11.11	6.66	**8.89**
Cati. 1000	11.11	13.33	**12.22**	13.33	17.77	**15.55**
Mean	**5.12**	**5.78**		**7.33**	**7.77**	
L.S.D Growth Reg.		**4.61**			**4.33**	
L.S.D Soaking Per.		**2.06**			**1.94**	
L.S.D G. R. X S.P.		**6.52**			**6.13**	

Table (2): Effect of different growth regulators and catechol at two dipping periods and their interaction on root length / cutting (cm.) of *Quisqualis indica* L. Recorded for the two times throughout the two seasons 2005/2006 and 2006/2007.

	First season					
	Rooting time			15 days after rooting		
	12h	24h	Mean	12h	24h	Mean
Control	1.17	1.17	**1.17**	1.27	1.27	**1.27**
NAA 500	2.33	2.10	**2.22**	2.37	2.88	**2.63**
NAA 1000	2.43	4.90	**3.67**	3.07	7.40	**5.24**
NAA 1500	1.13	1.83	**1.48**	3.73	3.73	**3.73**
IBA 300	2.33	2.90	**2.62**	3.13	3.22	**3.18**
IBA 500	2.77	2.67	**2.72**	4.43	5.57	**5.00**
IBA 1000	2.87	3.60	**3.24**	3.10	4.67	**3.88**
Cati. 300	4.23	4.08	**4.16**	5.87	8.82	**7.35**
Cati. 500	6.51	8.33	**7.42**	10.31	11.36	**10.84**
Cati. 1000	6.25	8.42	**7.34**	10.24	11.58	**10.91**
Mean	**3.20**	**4.00**		**4.75**	**6.05**	
L.S.D Growth Reg.		**3.30**			**2.56**	
L.S.D Soaking Per.		**1.48**			**1.15**	
L.S.D G. R. X S.P.		**4.67**			**3.63**	
	Second season					
Control	1.47	1.47	**1.47**	1.50	1.50	**1.50**
NAA 500	2.23	2.50	**2.37**	3.70	3.83	**3.77**
NAA 1000	2.23	3.95	**3.09**	3.50	4.67	**4.09**
NAA 1500	1.37	0.79	**1.08**	2.30	2.03	**2.17**
IBA 300	2.17	2.33	**2.25**	2.93	4.67	**3.80**
IBA 500	2.73	2.50	**2.62**	4.37	4.27	**4.32**
IBA 1000	2.13	3.33	**2.73**	3.73	4.27	**4.00**
Cati. 300	4.57	3.67	**4.12**	6.87	4.20	**5.54**
Cati. 500	4.23	4.83	**4.53**	4.53	5.60	**5.07**
Cati. 1000	6.33	6.67	**6.50**	5.97	6.47	**6.22**
Mean	**2.95**	**3.20**		**3.94**	**4.15**	
L.S.D Growth Reg.		**1.03**			**1.44**	
L.S.D Soaking Per.		**0.46**			**0.64**	
L.S.D G. R. X S.P.		**1.45**			**2.03**	

All treatments of catechol had superior significant increment on roots number specially the two levels (500 and 1000ppm) when the data were recorded in the both two seasons of the two experimental years. The second dipping period was the best treatment affecting significantly in the root length when the NAA (1000) or IBA (1000 ppm) were applied in the first season at the two dipping periods. The data recorded at 15 days after rooting presented that most levels of the growth regulators and catechol instead of the treatment of NAA (1500 ppm) gave a significant increase in the both seasons.

These results are coincided wit that obtained by Reddy *et al.*, (2006), Kazankaya *et al.*, (2005). And Ercisli *et al.*, (*2005*) concerning to the different growth regulators and the period of dipping data in Table (2) cleared that there were a significant increase in root length due to soaking the cuttings in each NAA, IBA and catechol in all levels used for the two periods of dipping when compared with each other, through the two experimental years.

3. Root numbers/cutting:

Data in Table (3) represented that all catechol treatments had a significant increment on root numbers/cuttings at the two recorded times throughout the two experimental years, when compared with the untreated ones.

It is cleared that the catechol appeared a superior effect with a significant effect than the two other growth regulators in the both seasons. As for, there are negligible differences between NAA or IBA treatments used. The increased dipping period gave the best values in the first rooting time in the both seasons. Meanwhile, the effect was not clear between the two applied dipping periods throughout the second record time (summer). Concerning the interaction between the growth regulators and catechol and the two dipping period cleared a significant effect resulted from the all treatments of atechol at both the short or long period of dipping in the both seasons. The best mean due to the treatment of catechol (1000 ppm) depped for 12 hours. These results are agreement with those obtained by Bahrmal *et la.*, (2005), Singh (2004) and Ucler *et al.*, (2004).

Table (3): Effect of different growth regulators and catechol at two dipping periods and their interaction on number of roots of *Quisqualis indica* L. Recorded for the two times throughout the two seasons 2005/2006 and 2006/2007.

	First season					
	Rooting time			15 days after rooting		
	12h	24h	Mean	12h	24h	Mean
Control	0.01	0.01	**0.01**	0.01	0.01	**0.01**
NAA 500	0.33	0.67	**0.50**	0.67	1.00	**0.84**
NAA 1000	0.67	1.33	**1.00**	0.67	1.67	**1.17**
NAA 1500	1.33	1.00	**1.17**	1.33	1.33	**1.33**
IBA 300	0.33	0.67	**0.50**	0.33	0.83	**0.58**
IBA 500	0.67	1.33	**1.00**	1.00	1.33	**1.17**
IBA 1000	0.67	1.33	**1.00**	1.33	1.50	**1.42**
Cati. 300	2.33	5.00	**3.67**	3.50	5.00	**4.25**
Cati. 500	3.50	3.72	**3.61**	3.66	4.25	**3.96**
Cati. 1000	4.33	4.05	**4.19**	4.63	4.16	**4.40**
Mean	**1.42**	**1.91**		**1.71**	**2.11**	
L.S.D Growth Reg.		**1.35**			**1.24**	
L.S.D Soaking Per.		**0.60**			**0.56**	
L.S.D G. R. X S.P.		**1.90**			**1.76**	
	Second season					
Control	0.01	0.01	**0.01**	0.01	0.01	**0.01**
NAA 500	0.67	0.33	**0.50**	1.00	0.67	**0.84**
NAA 1000	0.33	1.00	**0.67**	1.33	2.00	**1.67**
NAA 1500	0.67	0.67	**0.67**	2.00	1.67	**1.84**
IBA 300	0.33	0.67	**0.50**	0.67	2.00	**1.34**
IBA 500	1.00	0.67	**0.84**	2.00	2.00	**2.00**
IBA 1000	0.33	0.33	**0.33**	1.50	1.33	**1.42**
Cati. 300	1.33	3.17	**2.25**	2.17	3.50	**2.84**
Cati. 500	1.33	1.17	**1.25**	2.83	1.83	**2.33**
Cati. 1000	2.17	1.33	**1.75**	3.00	2.67	**2.84**
Mean	**0.82**	**0.94**		**1.65**	**1.77**	
L.S.D Growth Reg.		**1.21**			**0.93**	
L.S.D Soaking Per.		**0.54**			**0.42**	
L.S.D G. R. X S.P.		**1.70**			**1.32**	

Concerning, the interaction there were marked effect between the different values resulted from the treatments occurred t catechol with the dipping time (24h) to cuttings collected in spring or summer was the best orders for production of Quisqalis through the experiment years.

4. Transplanted length (cm):

It is evident from Table (4) that the transplanted length was affected by all the treatments. While, the treatments of catechol were superior than the other treatments with the two dipping periods throughout the two recorded times. There was a significant increase in the plant length due to applying with catechol at its levels used with the two dipping periods comparing with each other or with untreated cuttings, throughout the two recorded times at the both seasons.

Table (4): Effect of different growth regulators and catechol at two dipping periods and their interaction on transplant length (cm.) of *Quisqualis indica* L. Recorded for the two times throughout the two seasons 2005/2006 and 2006/2007.

	First season					
	Rooting time			15 days after rooting		
	12h	24h	Mean	12h	24h	Mean
Control	0.42	0.42	**0.42**	0.81	0.81	**0.81**
NAA 500	1.83	4.13	**2.98**	2.07	5.83	**3.95**
NAA 1000	3.10	4.10	**3.60**	4.43	6.50	**5.47**
NAA 1500	4.00	5.33	**4.67**	4.33	7.77	**6.05**
IBA 300	1.57	3.40	**2.48**	2.30	4.87	**3.58**
IBA 500	4.20	7.10	**5.65**	5.47	8.85	**7.16**
IBA 1000	4.90	6.70	**5.80**	5.77	8.38	**7.08**
Cati. 300	6.77	6.88	**6.82**	8.92	7.55	**8.23**
Cati. 500	7.14	6.11	**6.63**	9.27	7.62	**8.44**
Cati. 1000	6.08	6.27	**6.17**	8.57	7.01	**7.79**
Mean	**4.00**	**5.04**		**5.19**	**6.52**	
L.S.D Growth Reg.		**2.11**			**3.21**	
L.S.D Soaking Per.		**0.94**			**1.44**	
L.S.D G. R. X S.P.		**2.98**			**4.54**	
	Second season					
Control	0.57	0.57	**0.57**	0.63	0.63	**0.63**
NAA 500	6.27	5.67	**5.97**	6.73	6.73	**6.73**
NAA 1000	6.03	5.07	**5.55**	7.87	7.13	**7.50**
NAA 1500	5.60	5.20	**5.40**	6.97	6.25	**6.61**
IBA 300	4.83	5.67	**5.25**	5.20	8.30	**6.75**
IBA 500	6.43	6.67	**6.55**	8.73	8.17	**8.45**
IBA 1000	5.17	6.33	**5.75**	6.70	6.36	**6.53**
Cati. 300	8.50	9.53	**9.02**	12.63	10.93	**11.78**
Cati. 500	10.83	7.93	**9.38**	12.67	11.10	**11.88**
Cati. 1000	8.53	7.33	**7.93**	11.67	11.50	**11.58**
Mean	**6.28**	**6.00**		**7.98**	**7.70**	
L.S.D Growth Reg.		**2.17**			**2.36**	
L.S.D Soaking Per.		**0.97**			**1.05**	
L.S.D G. R. X S.P.		**3.06**			**3.33**	

The treatment of catechol at the dipping of 12h with the first recorded time gave the best results at both seasons. All treatments of growth regulators or catechol applied at the two dipping times gave a significant increase in the transplanted length at rooting time except both NAA (500 ppm) or IBA (300 ppm) treatments at the first season in the short dipping period. While, all treatments of growth regulators or catechol resulted in significant increase in the second season. The best values resulted from catechol treatments used at the two dipping periods.

These results are agreement with those obtained by Mohinder, *et al.*, (1996) that concluded that polyphenol oxidase (catechol) was applied as a pretreatment, then soaking in IBA increased rooting and growth.

With respect, to the interaction data cleared that there were a significant differences resulted from using the different levels of NAA, ABA and catechol with the two dipping periods for cuttings collected at the two times (spring-summer) when compared with each other or untreated cuttings at both seasons. Similar findings were obtained by Allobeed (2000).

5. Tallest branch length (cm) of transplanted seedlings:

Data given in Table (5) showed a significant increase in the tallest branch length/cutting resulted from using cateched (1000ppm) treatment in the first and second seasons.

Table (5): Effect of different growth regulators and catechol at two dipping periods and their interaction on tallest branch of transplant of *Quisqualis indica* L. Recorded for the two times throughout the two seasons 2005/2006 and 2006/2007.

	First season					
	Rooting time			15 days after rooting		
	12h	24h	Mean	12h	24h	Mean
Control	0.17	0.17	**0.17**	0.17	0.17	**0.17**
NAA 500	0.17	0.83	**0.50**	0.50	2.17	**1.33**
NAA 1000	0.40	0.77	**0.58**	0.58	2.43	**1.51**
NAA 1500	0.23	1.10	**0.67**	0.67	3.60	**2.13**
IBA 300	0.17	0.60	**0.38**	0.38	2.37	**1.38**
IBA 500	0.70	1.75	**1.23**	1.23	5.03	**3.13**
IBA 1000	0.27	1.67	**0.97**	0.97	4.62	**2.79**
Cati. 300	1.25	1.85	**1.55**	1.40	4.03	**2.72**
Cati. 500	1.42	1.39	**1.40**	1.40	5.05	**3.23**
Cati. 1000	2.28	1.55	**1.92**	1.92	3.91	**2.91**
Mean	**0.70**	**1.17**		**0.92**	**3.34**	
L.S.D Growth Reg.		**0.48**			**1.60**	
L.S.D Soaking Per.		**0.22**			**0.72**	
L.S.D G. R. X S.P.		**0.68**			**2.27**	
	Second season					
Control	0.23	0.23	**0.23**	0.30	0.30	**0.30**
NAA 500	1.27	1.00	**1.13**	2.40	1.73	**2.07**
NAA 1000	0.70	0.73	**0.72**	2.53	2.13	**2.33**
NAA 1500	0.27	0.53	**0.40**	2.30	1.58	**1.94**
IBA 300	0.17	1.67	**0.92**	0.87	3.30	**2.08**
IBA 500	1.10	2.33	**1.72**	3.73	3.83	**3.78**
IBA 1000	0.17	1.67	**0.92**	1.37	1.97	**1.67**
Cati. 300	4.53	3.33	**3.93**	7.30	5.20	**6.25**
Cati. 500	5.83	3.60	**4.72**	6.43	8.33	**7.38**
Cati. 1000	6.27	3.83	**5.05**	6.67	7.17	**6.92**
Mean	**2.05**	**1.89**		**3.39**	**3.55**	
L.S.D Growth Reg.		**2.10**			**2.50**	
L.S.D Soaking Per.		**0.94**			**1.12**	
L.S.D G. R. X S.P.		**2.98**			**3.54**	

While, using both NAA and IBA at the three applied levels gave significantly increase through the two seasons. These results are agreement with those of Mohinder-Pal *et al.* (1996).

Concerning the dipping period data in Table (5) revealed that in the first season significant increase resulted by using the second period (24h) comparing with the first ones. Meanwhile, the differences between the two dipping periods were non significant with a superior increase due to using the first dipping period (12h) comparing with each other in the second season.

The interaction between the growth regulators and the dipping periods was insignificant in the first season. While data in Table (5) indicated that the effect of the interaction was significant in the second season. Generally, the data recorded with the second time had greatest values, when compared with the first recorded time. Similar, finding was resulted by Sharma *et al.*, (2004).

Chemical constituents:

1. Total indoles%:

Data in Table (6) investigated that all growth regulators and catechol treatments gave a significant increase in total indoles% in both pre-planted cutting and rooted cutting when compared with each other, throughout the both seasons. The treatments of IBA (1000 ppm) or the three levels of catechol recorded the greatest vales of the total indoles%. The first dipping period gave superior increase in the total indoles% recorded with the pre-planting cuttings. Meanwhile, there were a gradual increase resulted by increasing the growth regulators levels when determined the total indoles% in the rooted cutting.

Concerning the interaction between the growth regulators and the two dipping periods there were a significant increase when compared the treatments with each other throughout the two seasons. The applayed treatment of catechol (500ppm) with the dipping period of (12h) gave the greatest value of total indoles% of the pre-planting cutting content. While, the treatment of catechol (1000ppm) dipped for (12h) gave the greatest content of indole% of the rooted cutting. These results are in parallel of those obtained by Amal (2003).

2. Total phenoles%:

It is evident from Table (7) that all treatments of growth regulator gave a significant increase in the total phenoles% accept the treatment of NAA (500ppm) that used to the pre-planting cutting in the first season. While, the total phenoles% of the rooted cutting recorded a significant increase in the first and second seasons. The greatest value resulted by using the treatment of catechol (300ppm) to the pre-planting cutting in the two seasons. Data in Table (6) revealed that increasing time of the dipping period of any regulators gave the least value compared to the short dipping period, of the pre-planted cutting, while, the mentioned reason have a significant increase in the rooted cutting. With respect, the interaction caused a significant increase in the total phenols that determined in both pre-planted cutting or rooted cutting under the effect of the all treatment used throughout the two seasons. The best results were recorded from using the treatments of catechol (300 ppm) for (12h) in the pre-planted cutting. Whereas, the treatment of NAA (1500ppm) for (12h) dipped period gave the greatest content of phenols% in the rooted cutting. While the treatment of IBA at (1000ppm) for (24h) dipped period gave the greatest value for the rooted cutting. These results are in agreement with obtained by Amal (2003).

3. Total carbohydrates:

Data in Table (8) represented the effect of different growth regulators levels and catechol when cuttings were dipped in such of it for two periods throughout the two seasons 2005/2006 and 2006/2007. It is evident that the effect of the different growth regulators reached to the level of significance as a result of both NAA ,or catechol when the cuttings were dipped for 24h throughout the two seasons. While, the total carbohydrates revealed a significant increase as a result of all growth regulators with the prolonging period in the two seasons. When determined in the all plant parts.

As free, the best contents were resulted with the catechol treatments of rooted cuttings when compared with the other parts of the plant. These results are in agreement with that obtained by Amal (2003).

Table (6): Effect of different growth regulators and catechol at two dipping periods and their interaction on total indoles % in the cuttings before planting and after rooting of *Quisqualis indica* L.

	First season					
	Cuttings			Rooted cuttings		
	12h	24h	Mean	12h	24h	Mean
Control	0.073	0.073	**0.073**	0.300	0.300	**0.300**
NAA 500	0.082	0.088	**0.085**	0.354	0.332	**0.343**
NAA 1000	0.093	0.092	**0.093**	0.362	0.354	**0.358**
NAA 1500	0.137	0.103	**0.120**	0.399	0.387	**0.393**
IBA 300	0.191	0.210	**0.201**	0.321	0.309	**0.315**
IBA 500	0.354	0.231	**0.293**	0.333	0.318	**0.326**
IBA 1000	0.369	0.257	**0.313**	0.395	0.400	**0.398**
Cati. 300	0.501	0.223	**0.362**	0.399	0.220	**0.310**
Cati. 500	0.779	0.234	**0.507**	0.389	0.224	**0.307**
Cati. 1000	0.469	0.111	**0.290**	0.508	0.386	**0.447**
Mean	**0.305**	**0.162**		**0.376**	**0.323**	
L.S.D Growth Reg.		**0.017**			**0.023**	
L.S.D Soaking Per.		**0.007**			**0.010**	
L.S.D G. R. X S.P.		**0.023**			**0.033**	
	Second season					
Control	0.080	0.080	**0.080**	0.299	0.299	**0.299**
NAA 500	0.075	0.072	**0.074**	0.311	0.302	**0.307**
NAA 1000	0.081	0.080	**0.081**	0.342	0.350	**0.346**
NAA 1500	0.083	0.082	**0.083**	0.354	0.361	**0.358**
IBA 300	0.185	0.134	**0.160**	0.391	0.385	**0.388**
IBA 500	0.193	0.132	**0.163**	0.395	0.390	**0.393**
IBA 1000	0.194	0.197	**0.196**	0.400	0.367	**0.384**
Cati. 300	0.126	0.578	**0.352**	0.468	0.437	**0.453**
Cati. 500	0.102	0.225	**0.164**	0.210	0.450	**0.330**
Cati. 1000	0.581	0.413	**0.497**	0.518	0.613	**0.566**
Mean	**0.170**	**0.199**		**0.369**	**0.395**	
L.S.D Growth Reg.		**0.012**			**0.037**	
L.S.D Soaking Per.		**0.005**			**0.017**	
L.S.D G. R. X S.P.		**0.017**			**0.052**	

Table (7): Effect of different growth regulators and catechol at two dipping periods and their interaction on total phenoles % in the cuttings before planting and after rooting of *Quisqualis indica* L.

	First season					
	Cuttings			Rooted cuttings		
	12h	24h	Mean	12h	24h	Mean
Control	0.241	0.241	**0.241**	2.524	2.524	**2.524**
NAA 500	0.244	0.200	**0.222**	1.435	1.354	**1.395**
NAA 1000	0.333	0.321	**0.327**	2.512	1.678	**2.095**
NAA 1500	0.457	0.359	**0.408**	2.810	1.987	**2.399**
IBA 300	0.532	0.423	**0.478**	1.945	2.321	**2.133**
IBA 500	0.324	0.333	**0.329**	1.877	2.891	**2.384**
IBA 1000	0.368	0.321	**0.345**	1.795	2.992	**2.394**
Cati. 300	0.777	0.654	**0.716**	0.734	2.501	**1.618**
Cati. 500	0.760	0.343	**0.552**	0.859	2.419	**1.639**
Cati. 1000	0.738	0.410	**0.574**	1.396	1.260	**1.328**
Mean	**0.477**	**0.361**		**1.789**	**2.193**	
L.S.D Growth Reg.		**0.037**			**0.133**	
L.S.D Soaking Per.		**0.017**			**0.059**	
L.S.D G. R. X S.P.		**0.052**			**0.188**	
	Second season					
Control	0.221	0.232	**0.226**	2.432	2.432	**2.432**
NAA 500	0.283	0.264	**0.273**	1.644	1.579	**1.612**
NAA 1000	0.346	0.365	**0.355**	2.000	1.688	**1.844**
NAA 1500	0.440	0.418	**0.429**	2.346	1.996	**2.171**
IBA 300	0.387	0.376	**0.381**	2.000	2.001	**2.001**
IBA 500	0.323	0.339	**0.331**	2.348	2.119	**2.234**
IBA 1000	0.511	0.518	**0.515**	1.999	2.953	**2.476**
Cati. 300	0.318	0.921	**0.620**	0.769	1.453	**1.111**
Cati. 500	0.495	0.956	**0.726**	1.739	1.856	**1.798**
Cati. 1000	0.606	0.999	**0.803**	1.654	1.753	**1.704**
Mean	**0.393**	**0.539**		**1.893**	**1.983**	
L.S.D Growth Reg.		**0.037**			**0.128**	
L.S.D Soaking Per.		**0.017**			**0.057**	
L.S.D G. R. X S.P.		**0.052**			**0.181**	

Table (8): Effect of different growth regulators and catechol at two dipping periods and their interaction on total carbohydrates % in the cuttings, leaves and roots of *Quisqualis indica* L.

	First season								
	Cuttings			Leaves			Roots		
	12h	24h	Mean	12h	24h	Mean	12h	24h	Mean
Control	20.99	20.99	**20.99**	14.33	14.33	**14.33**	18.67	18.67	**18.67**
NAA 500	19.87	20.46	**20.17**	15.17	18.34	**16.75**	17.56	21.12	**19.34**
NAA 1000	20.32	22.01	**21.17**	16.32	17.32	**16.82**	18.32	22.05	**20.19**
NAA 1500	21.33	23.10	**22.22**	17.65	18.00	**17.82**	19.21	21.90	**20.55**
IBA 300	20.19	22.00	**21.10**	16.15	18.32	**17.24**	17.78	20.28	**19.03**
IBA 500	20.32	22.96	**21.64**	16.44	18.46	**17.45**	18.33	23.30	**20.82**
IBA 1000	20.50	23.34	**21.92**	16.33	18.99	**17.66**	18.75	24.43	**21.59**
Cati. 300	20.99	24.55	**22.77**	17.00	19.74	**18.37**	18.88	23.54	**21.21**
Cati. 500	21.59	25.63	**23.61**	17.24	20.47	**18.86**	22.43	24.92	**23.68**
Cati. 1000	17.49	23.00	**20.24**	16.31	17.24	**16.78**	16.50	25.38	**20.94**
Mean	**20.36**	**22.80**		**16.29**	**18.12**		**18.64**	**22.56**	
L.S.D Growth Reg.		**1.39**			**1.09**			**1.33**	
L.S.D Soaking Per.		**0.62**			**0.49**			**0.60**	
L.S.D G. R. X S.P.		**1.97**			**1.54**			**1.89**	
	Second season								
	Cuttings			Leaves			Roots		
Control	22.99	22.99	**22.99**	15.33	15.33	**15.33**	19.32	19.32	**19.32**
NAA 500	21.87	22.27	**22.07**	16.14	17.44	**16.79**	21.57	22.63	**22.10**
NAA 1000	22.32	22.46	**22.39**	16.77	17.50	**17.13**	22.37	22.17	**22.27**
NAA 1500	23.33	24.01	**23.67**	17.93	18.00	**17.97**	22.80	23.17	**22.98**
IBA 300	22.19	25.22	**23.71**	16.61	18.02	**17.32**	23.10	24.28	**23.69**
IBA 500	22.32	24.00	**23.16**	16.36	18.92	**17.64**	24.03	23.10	**23.56**
IBA 1000	22.50	23.21	**22.86**	17.65	18.22	**17.94**	23.12	26.77	**24.94**
Cati. 300	22.69	24.87	**23.78**	15.71	19.89	**17.80**	20.56	24.00	**22.28**
Cati. 500	25.00	25.34	**25.17**	18.43	20.33	**19.38**	25.66	24.24	**24.95**
Cati. 1000	24.67	23.69	**24.18**	17.55	19.96	**18.75**	25.88	26.95	**26.42**
Mean	**22.99**	**23.81**		**16.85**	**18.36**		**22.84**	**23.66**	
L.S.D Growth Reg.		**1.77**			**1.13**			**1.49**	
L.S.D Soaking Per.		**0.79**			**0.50**			**0.67**	
L.S.D G. R. X S.P.		**2.51**			**1.59**			**2.11**	

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إكثار بعض العقل الصعبة الاكثار من الاسيجة والمتسلقات
١- الكويسكوالس *Quisqualis indica* L.

نعمة فاروق عبد الحى*، محمد مرسي محمد حسين، جمال الدين فهمى احمد** ،**
هند مصطفي سويفى، صلاح عبد العزيز جمعة***

* معهد بحوث البساتين – مركز البحوث الزراعية.
** قسم بساتين الزينة – كلية الزراعة – جامعة القاهرة.

أجريت هذه الدراسة بالمزرعة التجريبية بمعهد بحوث البساتين، الجيزة، مصر خلال الموسمين المتتاليين ٢٠٠٥/٢٠٠٦ و ٢٠٠٦/٢٠٠٧ لدراسة تأثير بعض منظمات النمو النباتية و الكاتيكول بتركيزات مختلفة على إكثار نباتات الكويسكواليس بواسطة العقل، حيث تم فصل عقل نصف خشبية خالية من الأوراق طولها يتراوح من ١٠ – ١٥ سم من أمهات عمرها عامين، ثم نقع قواعدها في محلول من اندول حمض الخليك (IBA) تركيزه (٣٠٠ ، ٥٠٠ و ١٠٠٠ جزء في المليون)، نفثالين حمض الخليك (NAA) تركيزه (٥٠٠ ، ١٠٠٠ ، ١٥٠٠ جزء في المليون) أو الكاتيكول (catechol) تركيزه (٣٠٠ ، ٥٠٠ و ١٠٠٠) لمدة ١٢ أو ١٤ ساعة. بعد معاملة العقل تم زراعتها في أصص بلاستيكية قطرها ١٥ سم (بمعدل ٥ عقل/أصيص) مملوءة بالبيت موس. و تم ذلك في أربع مواعيد من كل موسم (الربيع، الصيف، الخريف و الشتاء)، ولم تنجح زراعة العقل الا فى موسم الربيع واظهرت الثلاث مواعيد الأخرى عدم قابلية على التجذير.

أظهرت النتائج التالي: نقع قواعد العقل في الكاتيكول بتركيز ١٠٠٠ جزء في المليون لمدة ٢٤ ساعة عمل على زيادة النسبة المئوية لحيوية العقل و زيادة طول الجذور المتكونة عليها في وقتي القياس (وقت التجذير أو بعد ١٥ يوم من التجذير) في كلا الموسمين مقارنة بنباتات المقارنة (النقع في الماء فقط)، بينما أدى نقع قواعد العقل في الكاتيكول تركيزه ٣٠٠ جزء في المليون لمدة ٢٤ ساعة إلى الحصول على أكثر عدد للجذور المتكونة على العقل في وقت التجذير أو بعد ١٥ يوم من التجذير في كلا الموسمين، و أدت المعاملة بالكاتيكول ٥٠٠ جزء في المليون لمدة ١٢ أو ٢٤ ساعة إلى زيادة معنوية لعدد الأفرع و طولها و طول الشتلة الناتجة في وقتي القياس بكلا الموسمين. و عملت المعاملة بالكاتيكول ١٠٠٠ جزء في المليون لمدة ١٢ أو ٢٤ ساعة الى زيادة معنوية للكربوهيدرات الكلية في الجذور و كلوروفيللي أ، ب و الاندولات في الشتلات الناتجة في كلا الموسمين.

بناءاً على ما سبق يمكن التوصية بنقع قواعد عقل نبات الكويسكواليس النصف خشبية الخالية من الأوراق في محلول من الكاتيكول تركيزه ٥٠٠ أو ١٠٠٠ جزء في المليون لمدة ١٢ أو ٢٤ ساعة لرفع كفاءة إكثار النباتات بواسطة العقلة.