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Evaluation The Activity of Onion Root Exudate as Promoter Rooting for Stem Cuttings of *Quisqualis indica*

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Abstract

The present study was carried out in the botanical garden, department of biology, college of science at Mustansiriyah University, Baghdad, during autumn 2016 under natural environmental conditions in plastic house. The aim of this study was to evaluate the activity of Onion root exudate and date fruit (Al Khastawi cultivar) aqueous extracts and yeast as root promoters on stem cuttings of the difficult rooting *Quisqualis indica* shrub. All extracts were used at different concentrations (2.5, 1.25 gm\L), with semi hard wood cuttings for two dipping times (24, 48 hours). The results indicated that the highest concentrations and the longest dipping time gave the best results in promoting root formations. The onion root exudate gave the highest results in rooting percentage, root numbers and root lengths compare to1000 mg\l IBA treatment and other treatments. The biochemical analysis indicated that the absence of IAA in onion root exudate and date fruit extract.

Keywords: *Quisqualis indica* stem cuttings, onion root exudate, date fruit extract, yeast, IBA.

الخلاصة

نفذت الدراسة في الحديقة النباتية لقسم علوم الحياة\كلية العلوم \الجامعة المستنصرية, بغداد , خلال خريف ٢٠١٦ تحت ظروف البيت البلاستيكي. الهدف من الدراسة هو تقييم فعالية افرازات جذور البصل وثمار تمر (صنف الخستاوي) كمستخلص مائي و وخمرة الخبز كمحفز لتجذير العقل الساقية صعبة) التجذير لنبات الياسمين تم استخدام تراكيز مختلفة (٠ , ١،٢٥ , ٢،٥) غرام \ لتر من المستخلصات في عملية تجذير للعقل الساقية النصف خشبية وبفترات تنقيع (٢٤ و ٤٨) ساعة. اظهرت النتائج بعد ٣٠ يوما من الزراعة ان التراكيز العالية مع فترات التنقيع الطويلة اعطت احسن النتائج في تحفيز التجذير وعدد وطول الجذور لعقل الساقية مقارنة مع ١٠٠٠ ملغم\ لتر اندول بيوترك اسد وباقي المعاملات. كشف التحليل الكيميائي على عدم وجود IAA في افرازات جذور البصل ومستخلص ثمار تمر.

Introduction

Quisqualis indica known as the Rangoon creeper or Rangoon Jasmine, Cultivated as an ornamental climber, It is a creeper with red flower clusters belongs to family Combretaceae. The origin of Rangoon is tropical Asia, and it is found in many other parts of the world (Saeed *et al*., 2013).

The methanol extracts of the flower Rangoon Jasmine., showed significant antibacterial activity even in low concentration (10µg/ml) (Kiruthika *et al*., 2013).

Quisqualis indica contains phytoconstituents such as trigonelline (alkaloid), L-proline (α-amino acid), L-asparagine (α-amino acid), quisqualic acid (agonist for both AMPA receptors), rutin (flavonoid) and two forms of the cysteine synthase, isoenzyme A and isoenzyme B (enzyme). Due to presence of these phytochemicals it is showing various activities such as anti-inflammatory activity, antipyretic activity, immunomodulatory activity, antistaphylococcal activity, anthelmintic activity, antiseptic activity (Jyoti et., 2012). Propagation and planting of Rangoon jasmine.can be propagated by seeds, air layering and root suckers and it was difficulty to propagated with stem cuttings (Mohy, 2009).

In our climatic condition, Rangoon Jasmine does not produce seeds so it is generally propagated by layering and cutting, the plants

which are produced by air layering are small in quantity, because of that, the easiest and economic method is multiplication through cuttings but the problem it is very low or undesirable percentage of success (Saeed *et al*.,). Adventitious root formation in stem cuttings is affected by many factors, including endogenous factors such as phytohormones with a central role of auxin. Growth regulator factors including the indole butyric acid improve rooting and promoted the development of the root system, in the cuttings (Wiesman *et al*., 2002).

Alternative method that can be taken that look for plants which their extracts contain bioactive compounds to be used as plant growth regulators (Fachirah et al., 2013).

For that reason the aim of this study was to investigate the effects of many plants extracts besides to different dipping times on promoting rooting ability of Rangoon jasmine cuttings.

Materials and Methodologies

Plant material

During this study, the cuttings of Quisqualis were taken from a 2-year from ALmustansiriyah region (Baghdad) in 2016 at the begging of November, under natural environmental conditions, inside a plastic house. To examine the best cutting types (Hard wood, semi hard wood or soft cuttings). Result showed that semi hardwood is the best for rooting Quisqualis cuttings.

Healthy and uniform semi hardwood cuttings were prepared from current year's shoots, which are becoming woody, at the base, while the tops were still soft. Stem cuttings length and diameter of these cutting were 12–14 (cm) and 7–8 (mm) respectively, the stem cuttings, were made with a slanted cut at the base of the cutting, to distinguish between the top and the bottom. The experiment was conducted in AL Mustansiriyah University. During autumn 2016 under greenhouse conditions, the experiment was factorial, it contains different treatments, with different concentrations, and the third factor was different dipping times (24, 48) hours. These factors laid out in a complete randomized design with five replicate, each replication consisted of three cuttings.

Date fruit (Alkhastawi cultivar) aqueous extract.

1. Yeast extract.
2. Onion root exudate, (one onion moderate size cultured in distills water for rooting, after three weeks, the stem cuttings of Rangoon jasmine were dipping in Onion exudate.
3. IBA in concentration 1000 mg\l.
4. Water as control treatment.
5. The concentrations for Date fruit and Yeast extracts were (0, 1.25, 2.5) gm/l.
6. Salkowski reagent test for colorimetric IAA detection.

Salkowski's reagent (2% of 0.5 M $FeCl_3$ in 35% $HClO_4$ solution for colorimetric IAA detection in liquid culture (Fett *et al* .,1987).

1ml of Onion root exudate or date fruit extraction mixed with 2ml of Salkowski's reagent in test tube. This was kept at room temperature in dark for 30 minute.

At the end of experiment after (30 days), traits including rooting percentage, number of roots, root length were investigated.

Results and discussion

The Salkowski reagent for colorimetric IAA detection indicated that Onion root exudate and date fruit gave negative results, this mean there are no reaction between the test plants and the reagent depending on the absences of IAA.

The results in Table 1 showed that the Onion root exudate gave the highest rooting percentage (36.65) compare with (30.0) in IBA, (30.1) in date fruit extract, (17.22) for yeast extract and (0.00) for the control treatment. Table 1 Indicated that date fruit extract had no significant difference with the growth regulator IBA. In general the highest concentration was the more effects in increasing the rooting percentage. The means of dipping times indicate that 48 hours gave the highest mean (33.31) than 24 hour that was (22.32). From the results in Table 1, the highest value 90.0 rooting percentage was obtained from the interaction between Onion root exudate with 48 hour dipping time.

Table 1: Effect of different treatments and different dipping times on rooting percentage of Rangoon creeper.

Treatments	Conc. in gm\L	Dipping times in hours		Means of Conc.
		24	48	
Yeast	0.00	0.00	0.00	0.00
	1.25	0.00	20.0	10.0
	2.5	30.0	53.3	41.65
Mean				17.22
Date fruit	0.00	0.00	0.00	0.00
	1.25	30.0	30.0	30.0
	2.5	56.6	70.0	63.3
Mean				30.1
Water	0.00	0.00	0.00	0.00
Onion root exudate		56.6	90	73.3
Mean				36.65
Water	0.00	0.00	0.00	0.00
IBA	1000	50.0	70.0	60.0
Mean				30
L.S.D		0.39	0.72	0.26

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The results in Table 2 Indicates that Onion root exudate gave the highest mean root numbers (1.49) compare with (0.00) in control treatment and (0.92) with IBA treatment . The highest concentration 2.5gm.\L was the best for increasing root numbers in all treatments; also Table 2 shows that the longest dipping time gave the best result than the short dipping time 24 hour. The interaction between Onion root exudate and 48 hours dipping time gave (3.33) compare to (0.00) in control treatment and (2.33) with IBA treatment.

Table 2: Effect of different treatments and different dipping times on rooting numbers of Rangoon creeper.

Treatments	Conc. in gm\L	Dpping times in hours		Means of Conc.
		24	48	
Yeast	0.00	0.00	0.00	0.00
	1.25	0.00	0.66	0.33
	2.5	1.00	1.3	1.15
Mean				0.74
Date fruit	0.00	0.00	0.00	0.00
	1.25	1.00	1.00	1.00
	2.5	1.66	2.00	1.83
Mean				0.94
Water	0.00	0.00	0.00	0.00
Onion root exudate		2.66	3.33	2.99
Mean				1.49
Water	0.00	0.00	0.00	0.00
IBA	1000	1.33	2.33	1.83
Mean				0.92
L.S.D		0.33	0.37	0.24

The results in Table 3 showed that the best result was 0.99 cm. in Onion root exudate compare to (0.52) cm in IBA treatment and (0.00) cm in control treatment. 48 hour gave (0.59) compare to 24 hour gave (0.47) cm. The highest result (2.66) cm gave by the interaction between Onion root exudate with 48 hour dipping time compare to (1.13) cm in IBA treatment and (0.00) in control treatment in the same interaction.

Table 3: Effect of different treatments and different dipping times on rooting lengths in cm. of Rangoon creeper.

Treatments	Conc. in gm.\L	Dpping times in hours		Means of Conc.
		24	48	
Yeast	0.00	0.00	0.00	0.00
	1.25	0.00	0.66	0.33
	2.5	0.50	0.80	0.65
Mean				0.33
Date fruit	0.00	0.00	0.00	0.00
	1.25	1.00	1.00	1.00
	2.5	1.00	1.70	1.35
Mean				0.78
Water	0.00	0.00	0.00	0.00
Onion root exudate		1.33	2.66	1.99
Mean				0.99

Water	0.00	0.00	0.00	0.00
IBA	1000	0.93	1.13	1.03
Mean				0.52
L.S.D		0.11	0.09	0.07

The results in this study indicated that onion root exudate treatment gave the highest results in rooting percentage, rooting numbers and rooting length of *Quisqualis indica* stem cuttings. Plant roots exudate release a wide range of compounds which are sugars, polysaccharides, amino acids, aliphatic acids, aromatic acids, fatty acids, sterols, phenolics, enzymes, vitamins and other secondary metabolites (Neumann,2001; Uren, N. C., 2000; Bertin ,*et al* ., 2003). The phenolic compounds in root exudate stimulate root formations, the availability of phenolic compounds, act synergistically with the endogenous auxin which stimulate root initiation (Haissig, 1974).

In addition to the oxidation of phenolics mainly by poly phenol oxidase leading to the formation of rooting cofactors by inhibiting IAA oxidase activity (Haissig,, 1974).

The carbohydrates in root exudates are essential to initiate and accompany the rooting process, during this process, the carbohydrates act as a source of energy and as constitutive elements for the newly formed cells. (BartolnIh, *et al.*, 1996).

The amino acid and other source of nitrogen in root exudate was important for roots formation and initiation because nitrogen is essential in synthesis of nucleic acids and protein which are necessary for root differentiation (Kim *et al*., 1977; Hambrick *et al*., 1985).

Some studies have indicated that root exudates improve the absorption of nitrogen of actinomyces（Jin *et al*., 2011).

In other study indicated that there was a synergistic effect between root exudates and N compounds, such as NO3-, NH4 + as an N source to be used by actinomyces (Toussaint *et al*., 2004). In another study obtained that the root exudates of the Chinese onion cultivars promote the growth of cucumber seedlings, and the stimulatory effect increased the bacterial community diversity in cucumber seedlings rhizosphere soil, in the same time decreased the growth of Fusarium and other fungi in rhizosphere soil.

Research conducted to study the effect of root exudates on rooting stem cutting the study indicated that the rooting of cuttings is improved with mineral nutrients and vitamins in root exudate (Hartmann *et al*., 2002).

Conclusions

In this study we can concluded that the natural product such as Onion root exudate and date fruit extract as rooting promoter with no toxicity and not expensive in addition to that they give the highest rooting percentage when compared with 1000 mg l^{-1} IBA. This means the presence of other simulating factors can use as rooting promoter than exogenous IBA in Rangoon jasmine stem cuttings.

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