Effect of cutting length and thickness on rooting of Geranium plant Pelargonium hortorum cuttings in Basrah City

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الملخص

اجريت الدراسة في مشتل خاص في مدينة البصـرة للفتـرة مـن 16 / 3 ولغاية 30 / 8 /2011 لمعرفة تأثير طول العقلة (8 و 10 و 12 سم) وسمكها (6-8 و 8- 10 و 10-12 ملم) في تجذير عقل نبات الجيرانيـوم *Pelargonium hortorum* في مدينة البصرة. تم تسجيل البيانات على نسبة التجذير وعدد الجذور/ العقلة ومعدل طول الجذر ونسبة المادة الجافة في الجذر ، في تجربة عاملية نفـذت باستعمال التصميم العشوائي الكامل (CRD) بثلاثة مكررات، كـان العامـل الأول طول العقلة والثاني كان سمك العقلة.

وقد اظهرت النتائج حدوث زيادة معنوية في نسبة التجذير و عدد الجذور/ العقلـة ومعدل طول الجذر والنسبة المئوية للمادة الجافة في الجذر في العقل بطول 10 و 12 سم وحدثت زيادة معنوية في المؤشرات المذكورة في العقل بسمك 8-10 و 10-12 ملم.

كما اظهرت نتائج الدراسة ان التداخل بين طول العقلة وسمكها كان له تأثيراً معنوياً في النسبة المئوية للتجذير وبلغت 66.1 % في العقل بطول 12 سـم وسـمك 10-12 وفي عدد للجذور على العقلة (2.9) في العقل ذاتها بينما لـم يكـن تـأثيره معنويا في باقي المؤشرات المدروسة.

Abstract

The study was conducted in a private nursery in Basrah city from 16/3 until 30/8/2011 to investigate the effect of three cutting lengths (8,10 and 12 cm) and three cutting thickness (6-8, 8-10 and 10-12 mm) on the rooting of tip shoots cuttings of geranium plant Pelargonium hortorum L.

Data were tabulated on rooting percentage, number of roots per cutting, average root length and dry matter of roots, in a factorial experiment designed with a Complete Randomized Design (CRD) with three replications, the first factor was cutting length and the second one was cutting thickness.

Results showed a significant increase in rooting percentage, number of roots per cutting, average root length and dry mater of root in the cuttings of 10 and 12 cm length, similar results were obtained from cuttings of 8-10 and 10-12 mm thickness.

The interaction between the two factors was found significant in rooting percentage (66.1%) in cuttings of 12 cm long and 10-12 mm thickness and number of roots per cutting (2.9) obtained from the same previous ones, while it was not significant in the other two indicators.

Introduction

Geranium *(Pelargonium hortorum)* is among the most popular flowering plant it belongs to the Geraniaceae family, and it originated from South Africa, (Dole and Wilkins, 2005). It was listed as potentially invasive species because it has a demonstrated ability to invade nearby natural areas, use caution when landscaping (Anonymous, 2011a).

Outdoors are suited for wide variety of applications and uses like for decorations, as gift plants, indoor potted plant, used in window boxes, patio and porch boxes, ,used in hanging baskets, as well as a bedding plant, they are used as annual bedding plants.

Indoors they are cultured as houseplants in sunny locations. (Behe *et al.,* 1994 ; Anonymous, 2006a; Russell, 2011)

Bedding plants are commonly used in residential and commercial landscapes to provide color. No other group of plants can so quickly and economically create a colorful landscape. In addition to flowers, bedding plants may be grown for their colorful foliage or interesting forms or textures. With proper selection, they can be used to provide color throughout the year. (Anonymous, 2011b)

Geranium can be propagated from stem cuttings, root divisions, leaf cuttings or seeds, in addition to propagation by tissue culture. Propagating from seed can be tricky for several reasons. Only true species can be cultivated successfully from seeds, but due to cross-pollination. Cuttings are the preferred propagation method for many growers.

Propagating by cuttings is a very simple method for asexual propagation and most common in many plants.

Cuttings made of shoots of plants that are mature enough to break when bent sharply. The lower leaves are

often removed or cut to reduce the area exposed to air and so prevent wilting. The cuttings should have some leaves, though, as this will help them to root faster. rooting hormone, may be used to hasten root growth. Plants from which cuttings are to be taken should receive plenty of sunlight for several days before the cutting is made. This builds up the sugar-energy storage and improves the success of the cutting.

The use of cutting is often the preferred method for plant propagation because it is the easiest and most cost effective way to produce a clone of a particular parent plant. Other methods that are more difficult or more expensive may exist but are often not chosen. When propagating plants by stem cuttings, major factors to be considered are the parent plant or stock plant and the propagating conditions along with the techniques and tools of cutting propagation (Dick and Bilderback, 2011).

Flower beds of colorful bedding plants add a lot to the landscape but require a fair amount of maintenance to stay looking their best.

For the importance of this plant as a variable uses one and the ability of growing in relatively dry hot places like Basrah city, this study was conducted.

Materials and Methods

The study was conducted in a private nursery at Basrah city through 16/3 - 30/8/2011 to investigate the effect of three cutting lengths (8,10 and 12 cm) and three cutting thickness (6-8, 8-10 and 10-12 mm) on the rooting of tip shoots cuttings of geranium plant Pelargonium hortorum.

Harmonized stem cuttings of lengths (8,10 and 12 cm) and 6-8, 8-10 and 10-12 mm thickness were taken from the tip of stock plants in a factorial experiment designed with

a Complete Randomized Design (CRD) with three replications, the first factor was cutting length and the second one was cutting thickness (Al-Rawi and Kalaf Alla, 1980). The treatments were repeated three times and each treatment consisted of 3 pots, each pot contained three cuttings, The analysis of variance indicated the significant differences ($p<0.05$) among treatments in relation to all rooting characteristics.

All cuttings had 3000 ppm IBA treatment before planting to accelerate rooting formation, and the lower leaves were removed. The media was sand, peat moss and perlite in a ratio of 1:1:1 sterilized with formalin 4% (Saeed and Al-Doory, 1982). The pots were well irrigated in all treatments and the pots were put in a lath house to provide shade and humidity.

Data were tabulated 45 days after planting of the cuttings on :

$$\text{rooting percentage} = \frac{\text{number of rooted cuttings in any treatment}}{\text{total number of cuttings in that treatment}} \times 100$$

,average number of roots per cutting, average root length and dry matter of root (Anonymous, 2006b).

Results and Discussion

Rooting percentage: A significant increase in rooting percentage was found in cutting of 10 and/or 12 cm long as compared to cuttings of 8 cm long ($P < 0.05$) , cuttings of 10-12 mm thickness showed a significant increase in this indicator too as compared with other cuttings (Table. 1). These results could probably be attributed to higher water holding capacity of the long and thick cuttings. The interaction between the two factors was found significant in

rooting percentage giving the highest percentage (66.1) in cutting of 12 cm length and 10 -12 mm thickness. There was a significant difference ($P < 0.05$) between the various treatments.

For the rooted cuttings, could probably be attributed to high water and nutrient holding capacity of the more long and thick cuttings. The low shoot in order for cuttings to form a new root system, they must have a ready moisture supply at the cut surface (Anonymous, 2007) .

Table 1. Effect of cutting length and thickness on rooting percentage (%) of Geranium plant *Pelargonium hortorum*

Cutting length treatments cm	Cutting thickness treatments mm			Means of Cutting length treatments
	6-8	8-10	10-12	
8	52.3	54.2	61.0	55.83
10	61.3	63.0	63.8	62.70
12	63.9	65.0	66.1	65.00
Means of Cutting thickness treatments	59.16	60.73	63.63	61.17

RLSD cutting length $_{(0.05)}$ = 2.143 , RLSD cutting thickness = $_{(0.05)}$ 2.261

RLSD interaction $_{(0.05)}$ = 2.391

Number of roots per cutting : results revealed a significant increase in number of roots per cutting in cuttings of 10 and 12 cm long, it was also found significant in cuttings of 8-10 and 10-12 mm thickness. The interaction between the two factors was found significant too, the highest number of roots per cutting (2.40) was obtained from cuttings of 12 cm long and 10-12 mm thickness (Table, 2).

The number of roots produced per cutting is determined by type of cutting used, plant growth regulators utilized,

temperature, dry matter content of the cuttings before sticking in the media and health status of the plant. Since all cuttings used in this investigation were uniform, the highest number of leaves per cutting observed in geraniums could be attributed to other (Govinden-Soulange *et al.,* 2009).

Table 2. Effect of cutting length and thickness on the average number of roots of Geranium plant Pelargonium hortorum

Cutting length treatments cm	Cutting thickness treatments mm			Means of Cutting length treatments
	6-8	8-10	10-12	
8	1.7	1.8	1.9	1.80
10	2.0	2.3	2.4	2.23
12	2.0	2.6	2.9	2.50
Means of Cutting thickness treatments	1.90	2.23	2.40	2.17

RLSD cutting length $_{(0.05)}$ = 0.410 , RLSD cutting thickness $_{(0.05)}$ = 0.436

RLSD interaction $_{(0.05)}$ = 0.449

Average root length : it is evident from (Table .3) that average root length was affected significantly ($P < 0.05$) by cutting length and thickness of geranium plant, the highest number of average root length was obtained from cuttings of 12 cm long, with no significant difference from the treatment of 10 cm cutting length (9.8 cm).

Similar results were found in cuttings thickness and The interaction between the two factors was found not significant.

As long as cutting were of two lengths and two cuttings from the same stock plants, carbohydrates content of cuttings were variable, lengths of the cuttings effect had

seemed to be in relation with the clonal differences and cutting time (Bojarczuk and Jankiewicz, 1975).

Table 3. Effect of cutting length and thickness on the average root length (cm) of Geranium plant *Pelargonium hortorum*

Cutting length treatments cm	Cutting thickness treatments mm			Means of Cutting length treatments
	6-8	8-10	10-12	
8	7.0	8.4	9.1	8.16
10	9.3	9.9	10.2	9.8
12	9.8	10.0	10.5	10.1
Means of Cutting thickness treatments	8.7	9.43	9.93	9.35

RLSD cutting length $_{(0.05)}$ = 0.697 , RLSD cutting thickness $_{(0.05)}$ = 0.739
Interaction (n.s.)

Roots dry matter : results show a significant increase ($P < 0.05$) in the dry matter of roots in cuttings of 10 and 12 cm long and 10-12 mm thickness The interaction between the two factors was found not significant (Table 4).

Table 4. Effect of cutting length and thickness on the dry matter of root (%) of Geranium plant *Pelargonium hortorum*

Cutting length	Cutting thickness treatments mm			Means of Cutting
	6-8	8-10	10-12	

treatments cm				length treatments
8	25.84	26.32	26.92	26.36
10	26.10	27.63	28.85	27.52
12	29.44	29.55	31.30	30.09
Means of Cutting thickness treatments	27.12	27.83	29.02	27.99

RLSD cutting length $_{(0.05)}$ = 1.023 , RLSD cutting thickness $_{(0.05)}$ = 1.067

Interaction (n.s.)

Accumulation of dry matter in roots of more long cuttings and / or more thick ones seems to be expected for the more number of roots produced and the average root length in them (Table 2 and 3).

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