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INFLUENCE OF SOME ANTIOXIDANTS AND LICORICE ROOT EXTRACT ON SOME CHARACTERISTICS OF SALAKHANI POMEGRANATE CUTTING

Ali MuhiAldeen Omar Aljabary and KhabatHasan AL-jabbari
Technical College of Applied SciencesChamchamal Research Station
Sulaimani Polytechnic University, IraqDirectorial ofAgriculture research/Sulaimani, Iraq
Emails : ali.omar@spu.edu.iq, khabatagro@gmail.com

ABSTRACT

This study was conducted on the effect of dipping basic of Salakhani pomegranate cuttings in ascorbic acid, citric acid and salicylic acid (0, 150, 300, 450) $mg.L^{-1}$ each of them, and licorice roots extract (0, 5, 10, 15) $g.L^{-1}$, on some cuttings properties. The results indicated that 450 $mg.L^{-1}$ascorbic acid significantly increased diameter and length shoot, leaf area, vegetative dry weight percentage and root dry weight percentage compared to control. Concerning the effect of citric acid, cuttings treated with 300 $mg.L^{-1}$increased length shoot, leaf area, vegetative dry weight percentage and root dry weight percentage significantly compared to control. On the other hand, dipping in 450 $mg.L^{-1}$ of the salicylic acid solution significantly raised diameter and length shoot, leaf area, vegetative dry weight percentage, number and length root and root dry weight percentage than control. As for licorice roots extract cuttings dipping in 10 or 15 $g.L^{-1}$ caused to recording the highest diameter and length shoot, leaf area, vegetative dry weight percentage, number and length root and root dry weight percentage than the control treatment.

Keywords: Ascorbic acid, Citric acid, Salicylic acid, Licorice roots, Salakhani pomegranate.

Introduction

Pomegranate (*Punica granatum L.*) is native to the subtropical region with high fruit nutritional values. The pomegranate propagated can be by stem cuttings, grafting and layering. Damar *et al*. (2014) indicated that the propagation of commercially pomegranate done by cuttings. Plants increase through cutting which is more convenient way and also by the cuttings a stronger plant can be advanced considerably in the minimal period. Also, Frey *et al*. (2006) reported that success stem cutting reduplication of horticultural crops depend on several agents such as mother plant condition, planting time, part of the tree, and tree age from where the condition of the tree part that is taken from it the cuttings, humidity and rooting media, rainfall, care during planting and next care.

Considered ascorbic acid is essential for plant growth. Smirnoff, (2000) showed that it has been known that Ascorbic acid has the positive effect on plant growth, and there is vigorous proof that wall ascorbate is related to cell expansion. Furthermore, daily spraying with citric acid or ascorbic acid solutions can be promoted ex vitro rooting and survival of sweet cherry micro shoots in greenhouse (Vasar, 2001). On the other hand, Dore, (1965) indicated that in some plants can be get better rooting of cuttings by utilize some vitamins such as; vitamin C, K and some of the B-group.

Pomegranate is one of the most horticultural crops produced in Iraqi Kurdistan especially cv. Salakhani in Shahrazor area due to its suitable climate for this cultivar. The fruits are characterized as a medium to enlarge fruits in size, and the peel is thick reddish-yellow in color, impregnated with pink color. Further, arils are juicy with a red to pink color, with a good flavor and sour-sweet taste. This cultivar is also the most important for exports to other countries (Al-Jabary, 2007).Since Salakhani cultivar is in demand for exporting, and its fruits have a good quality, also the propagation by cuttings (cloning) produces plants having characteristics as their own parent. Wherefore, this study was conducted to knowledge the influence of some antioxidants and licorice root extract on some characteristics of Salakhani pomegranate cuttings.

Material and Methods

This experiment was carried out at Chamchamal Research Station belong to Directorial of Agriculture research/Sulaimani, Iraqi Kurdistan region, during the period from February to August 2019. This is to study the effect of some antioxidants such as; Ascorbic acid, Citric acid and Salicylic acid with three concentrations (0, 150, 300, 450) $mg.L^{-1}$ and Licorice roots extract (0, 5, 10, 15) $g.L^{-1}$, were applied on some Salakhani pomegranate cuttings properties. Ten cuttings were planted for each treatment and a total of 390 cuttings were tested in the plastic greenhouse. By utilizing Factorial experiment within Complete Randomized Design (CRD) with three replicates. The data was offered to the analysis of variance by using XLSTAT software. Mean comparisons were conducted by using the Duncan test at 0.05.

Terminal shoot cuttings were collected from Salakhani pomegranate trees 25 years' old, vigor shoots and healthy. On the collected branches uniform lengths, 15 cm in lengths and 11.41 mm was recorded as an average of cuttings diameter, from a private orchard in Halabja governorate. Cutting of basal ends 1-1.5 cm of the cutting were dipped in dilute solution for ten (10) seconds and immediately planted in the rooting media. For rooting media, sand was mixed with peat moss in the ratio of (1:1) and placed in polyethylene bags.

All the studied root and shoot properties were recorded at the termination of the experiment at the last week of August. Shoot and root number was measured by calculating the number of shoots and roots formed on pomegranate cutting. Length (mm) and diameter (mm) of shoot and root were measured by using the Vernier. Leaf area (cm^2) was measured as mentioned by (Dvornic, 1965). Vegetative and root dry weight of pomegranate cutting were measured according to (Horwitz, 2000).

Results and Discussion

Vegetative Growth

The maximum shoot number per cutting were produced in 450 $mg.L^{-1}$ of salicylic acid and 5 $g.L^{-1}$ licorice root extract, but the minimum shoot number per cutting was observed in 10 $g.L^{-1}$ licorice root extract. Although, 300, 450 $mg.L^{-1}$ of salicylic acid and 450 $mg.L^{-1}$ of ascorbic acid significantly influenced the shoot diameter compared to control, and the highest shoot diameter was observed in 300 $mg.L^{-1}$ of salicylic acid but the lowest shoot diameter was observed in 150 $mg.L^{-1}$of citric acid. While concerning the shoot length most of the treatments significantly superior on the untreated cutting, the highest shoot length was recorded the in 5 $g.L^{-1}$ licorice root extract that significantly superior on other treatments in this parameter (Table 1).

The Data in (Table 1) shows the higher leaves number per cutting was observed in cutting treated with 300 $mg.L^{-1}$salicylic acid which significantly superior on the other treatments, while the lowest leaves number was noted in cutting treated with 150 $mg.L^{-1}$ citric acid. As regards leaf area, also cutting treated with 300 ppm Salicylic acid recorded the maximum value of leaf area which significantly superior on the control, which does not differ significantly from most other treatments.

The results in (Table 1) shows the cuttings treated with all concentrations of antioxidant and licorice root extract significantly promoted the percentage of vegetative dry weight compared with the control, except cuttings treated with 300 $mg.L^{-1}$ ascorbic acid, 150 $mg.L^{-1}$ citric acid and 450 $mg.L^{-1}$salicylic acid.

Table 1 : Effect of some antioxidants and licorice root extract on number, diameter and length of shoot, leaves number, leafarea and Vegetative dry weight of Salakhani pomegranate cutting.

Treatment	Shoot number	Shoot diameter (mm)	Shoot length (mm)	Leaves number	leaf area (cm^2)	Vegetative dry weight (%)
Control	5.000 ab	1.826de	25.033e	190.133 b	4.626 b	51.451d
Ascorbic Acid 150	4.867abc	1.720fg	24.700e	175.467cde	4.458 b	55.285c
Ascorbic Acid 300	4.667 bc	1.653 g	24.423 e	142.533i	4.976ab	51.747d
Ascorbic Acid 450	4.733 abc	1.937abc	28.453 b	170.200 de	5.025 ab	57.862b
Citric Acid 150	4.800 abc	1.513h	24.940e	139.133i	4.660ab	51.220d
Citric Acid 300	4.667 bc	1.780ef	27.687bc	157.533gh	5.057ab	54.405c
Citric Acid 450	5.000 ab	1.870 bcde	25.573 de	178.130 cd	4.560 b	53.784 c
Salicylic acid 150	4.867 abc	1.849 cde	27.283 bc	180.867 c	4.802 ab	54.915 c
Salicylic acid 300	4.867 abc	2.008 a	24.602 e	214.000 a	5.293 a	60.952 a
Salicylic acid 450	5.333 a	1.967 ab	28.403 b	166.933 ef	5.269 a	51.047 d
licorice root 5	5.267 ab	1.907 bcd	29.940 a	176.533 cd	4.579 b	53.643 d
licorice root 10	4.333 c	1.923 abcd	26.517 cd	155.400 h	4.884 ab	57.193 b
licorice root 15	4.867 abc	1.890 bcd	26.570 cd	162.667 fg	4.908 ab	54.347 c

The same letter within column indicate non-significant difference between treatments according to the Duncan multiple test at the 0.05 level.

Root Growth

As related with root parameters, cuttings treated with 300 $mg.L^{-1}$Salicylic acid and 10 or 15 $g.L^{-1}$ licorice root extract significantly increased root number per cutting as compared with other treatments (Table2). The results in the same table show that the maximum root diameter was noted in cuttings treated with 5 $g.L^{-1}$ licorice root extract, which is did not differ significantly from some of the other treatments, whilst the minimum root the diameter was observed in cuttings treated with 10 $g.L^{-1}$ licorice root extract.

Among the different concentrations of antioxidant and licorice root extract, application of 15 $g.L^{-1}$ licorice root extract resulted in significantly highest root length over the other treatments except for the cuttings treated with 450 $mg.L^{-1}$ of Salicylic acid. As regarding the percentage of root dry matter weight, cuttings treated with 450$mg.L^{-1}$citric acid significantly superior over other treatments except cuttings treated with 150$mg.L^{-1}$Salicylic acid, while the minimum percentage was observed in cuttings treated with 150$mg.L^{-1}$citric acid (Table2).

Standardi and Romani, (1990) indicated that some physiological and biochemical aspects of the rooting stay unknown. This investigation clearly reported that antioxidants and licorice root extract with their concentrations which were studied have negatively or positively influence on shoot and root properties.

Although some studies reported that ascorbic acid have non-significant influence on rooting of different types (Lis-

Balchin, 1989; Standardi and Romani, 1990). While Vasar, (2001) noticed promote the ex vitro rooting by using ascorbic acid of sweet cherry microshoots. Our results show that the ascorbic acid clearly enhanced some parameters of vegetative growth and root. The increasing of diameter and length shoot, leaf area and vegetative dry weight in cuttings treated with 450 mg.L^{-1} may be come back to its role to increase the length and dry weight of root, consequently, led to the formation of the vigorous root system (Table 2), so raised nutrients uptake which enhanced the vegetative growth, and obverse. Li *et al*., (2007) reported that ascorbic acid enhances catalase and superoxide dismutase activities, which were associated to the rooting of cuttings. Also, found that ascorbic acid works as a cofactor of many enzymes involved in the biosynthesis of gibberellin and ethylene that reported by (Prescott and John, 1996). In addition, consider ascorbic acid as an important factor of the progression in the cell cycle during cell division, impacts meristem expansion that found by (Liso *et al*., 1984; Kato and Esaka, 1999).

Concerning increasing the number and length of root in cuttings treated with 300 mg.L^{-1}Salicylic acid, maybe due to its role to the increasing of vegetative growth (leaves number and leaf area) (Table1) which led to producing the nutrients more through the photosynthesis process, Which was consumed to increasing the number and diameter root rather than storing it as dry matter in the root, so caused to reducing the percentage of root dry matter weight (Table 2), and inversely

.

Table 2 : Effect of some antioxidants and licorice root extract on number, diameter and length ofroot and root dry weight of Salakhani pomegranate cutting.

Treatment	Root number	Root diameter (mm)	Root length (mm)	Root dry weight (%)
Control	34.200 c	0.700 a	12.596 de	52.671 d
Ascorbic Acid 150	31.867 d	0.560 bc	11.663 f	53.643 cd
Ascorbic Acid 300	28.933 e	0.590 bc	13.103 de	53.792 cd
Ascorbic Acid 450	28.800 e	0.589 bc	13.583 cd	60.468 b
Citric Acid 150	27.203 f	0.573 bc	12.887 de	51.503 d
Citric Acid 300	33.733 c	0.650 ab	13.203 de	59.469 b
Citric Acid 450	26.333 f	0.587 bc	13.473 cde	62.947 a
Salicylic acid 150	32.000 d	0.599 bc	12.497 ef	60.797 ab
Salicylic acid 300	44.533 a	0.685 a	13.140 de	52.976 d
Salicylic acid 450	31.400 d	0.690 a	14.557 ab	51.855 d
licorice root 5	31.933 d	0.723 a	14.327 bc	53.152 d
licorice root 10	38.467 b	0.521 c	12.710 de	59.904 b
licorice root 15	38.267 b	0.697 a	15.283 a	55.662 c

The same letter within column indicate non-significant difference between treatments according to the Duncanmultiple test at the 0.05 level.

Enhancing the characteristics of the vegetative growth and root in cuttings were immersed in licorice roots extract, could become back to its contain the vital part of gibberellin that is the Mevalonic acid which leads to the expansion of the leaf cells. Moreover, the increase in the leaf area is due to the presence of salts and sugars in the extract which stimulated vegetative growth. Also, this extract contains nutritional elements such as N, Fe, Zn, Mg, and Cu, these minerals have a major effect of chlorophyll formation a specially nitrogen (Marschner, 1995). Consequently, caused to increasethe root number and the percentage of root dry matter weight (Table 2).

Conclusion

Our results indicated that this cultivar sensitivity differ upon the antioxidants and concentrations maybe due to its effects on the peroxidase activity that has a good role for rooting consequently, influenced on shoot and root properties. However, the results of study Standardi and Romani, (1990) reported that utilize antioxidants to minimize peroxidase activity during induction inhibits rooting, whilst utilize antioxidants to minimize peroxidase activity during the initiation and elongation of roots enhances rooting.

According to the results of this study can be conclude that most of the concentrations of antioxidants and licorice root extract improved the length of shoots and roots, vegetative and roots dry weight and leaf area compared with control treatment.

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