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ORIGINAL ARTICLE

Effects of Different Collecting time and Different Medium on Rooting of Pomegranate " *Malas torsh* cv." Cuttings

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ABSTRACT
As developing pomegranate cultivation in Iran, demand for suitable and commercial varieties is increasing. An experiment was conducted to study the influence of seven collecting times (Nov-Feb) with fifteen days interval and six different media (Perlite, cocopeat, vermiculite, sand and equal mixes) on rooting characteristics of pomegranate "Malas torsh cv." cuttings in 2010-2011. Uniform sized cuttings of pencil thickness and 30 cm in length long with four buds were separated from healthy pomegranate trees in certain times and after placing under wet cleaned sand and application of rooting hormones , planted in mentioned media on 3 Feb. Rooting hormone (Naphtalene Acetic acid 4000ppm) was applied on the cuttings for (5 seconds) under bottom heat and mist system. The results showed that most rooting percent and fresh root weight were obtained in sand+vermiculite and vermiculite, respectively. Also the most freshroot fresh weight and rooting percent was observed in 21 Dec and 4 Feb, respectively. Interaction between collecting time of cuttings and media showed significant effects (p <0.001) on rooting characteristics. The most effect on rooting percentage and root numbers was obtained on 5 Jan and 4 Feb in vermiculite and 19 Feb in vermiculite + sand respectively.
Keywords : *Bottom heat ,mist system, medium, Pomegranate "Malas torsh cv.*

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INTRODUCTION

Saveh is located in south of Teheran and is a major region for Pomegranate production in Iran. Pomegranate (*Punica granatum*) is an old tree and mentioned in ancient holly books such as Bible and is cultivated in some parts of Iran with desert climatic conditions [1]. Pomegranate consumptions are as table Pomegranate, paste, juice and concentrated forms and is exported to many countries. Pomegranate is a medicinal fruit because of some antioxidants and vitamins (Niacin and Riboflavin). Propagation of Pomegranate carried out by seed, sucker, cuttings, grafting and layering [1]. Seed has variation in progeny so is used for breeding and new varieties production .Rooting of cuttings is controlled by some factors. Cutting separation date is effective in rooting [5]. Cutting separation in February (winter end) is more effective than early October (Autumn)[5].Experiments indicated that Auxin application stimulates cell division and results faster rooting [4]. Rooting percent were 49% to 73% in different Pomegranate varieties [5]. Melgarjou [6] mentioned wounding of cutting bottom and application 2000 ppm IBA is most effective in rooting percent of Pomegranate cuttings.

Singh [10] indicates separation of Pomegranate "Ganesh" cuttings in 15 Jan is more effective in rooting percent, root number and root length than 15 Dec.American Agriculture Department has introduced 2 media for rooting of Pomegranate hardwood cuttings:

1-Cultivation soil +sand+perlite (1:1:1)

2-Sand + cultivation soil (1:1)

Sheet (2004) indicates pencil diameter pomegranate hardwood cuttings with 20 cm length if separate in Feb or March will root fast and easily .

Rooting of stem cuttings of five pomegranate types selected from Delibekirli village, Kırıkhan (Antakya, Hatay-Turkey) taken in different periods under mist-propagation were investigated. The cuttings were prepared as 20-25 cm in length from wood shoots, and 1,000 ppm indolebutyric acid (IBA) was used as a rooting hormone. In the study, rooting ratio (%), root number, and root length of the cutting were measured. Among the cuttings rooted, the highest rooting percentage was observed in 31-N-01, while the lowest rooting percentage in 31-N-05. The cuttings taken at the end of February had higher rooting percentage than those taken at the beginning of October. The 1,000 ppm IBA treated cutting had a slightly

higher rooting percentage than the control. The number of roots was highest in the cutting of the 31-N-01 type and lowest in the cutting of the 31-N-05 type. There were higher roots in the 1,000 ppm IBA treated cuttings than the control cuttings for the 31-N-01, 31-N-02 and 31N-03 types whereas the 31-N-04 and 31-N-05 types had lower roots in the 1,000 ppm IBA treated cuttings than the control cuttings. 31-N-01 type when compared to others gave more favorable results in terms of root length. The 1,000 ppm IBA treatment affected positively rooting percent of cuttings and the other characteristics although it was not to the satisfactory level. It was concluded that the increasing dose of IBA could be useful [8].

The inability to induce adventitious roots is often a limiting factor in conventional cuttings and tissue culture. In an investigation, several criteria were taken into consideration in determining the best rooting treatment in olive cultivar Moraiolo. Among the indolebutyric acid (IBA) and Naphthaleneacetic acid (NAA) hormones, tested for maximum percentage of rooted shoots, root number, root length and quality of roots, IBA at 1.5 mg l-1 concentration proved to be the best one for rooting of Moraiolo cultivar of olive producing maximum root initiation in 86.67% shoots, 5.03 number of roots per rooted explant and 4.95 cm root length. The roots produced on IBA were longer with better quality shoots whereas NAA produced poor response with necrotic leaves and leaf abscission [2].

MATERIALS AND METHODS

Pencil diameter with 30 cm length hardwood cuttings were collected from five years old and healthy Pomegranate "Malas Torsh" trees in Saveh Pomegranate Research Station. Separation dates were as follow: 22 Nov, 6 Dec, 21 Dec, 5 jan, 20 Jan, 4 Feb, 19 Feb (2008). Media for planting of cuttings were as fallow: disinfected sand (with boiling water), perlite, vermiculite, and sand + vermiculite (1:1), perlite +vermiculite(1:1), sand + perlite (1:1) .Excised cuttings were placed under wet disinfected sand in outdoor until 19Feb .On 19Feb, all hardwood cuttings were placed in plastic pots filled with related media under mist and bottom heat system.The mean temperature of plastic tunnel greenhouse was 25-27˚c during the period of rooting. In early May 2009 the cuttings were taken out and some parameters such as rooting percent, root numbers, root length, root fresh and dry weights were measured. Roots were dried in 70˚ c for 48 hours. Factorial test on the basis of randomized complete blocks with 42 treatments was used as the experimental design. There were three replications in each treatment and 6 cuttings in any replication.SAS software and Duncan's multiple range tests were used for data analysis.

RESULTS

Effects of media on rooting characteristics

According to table 1 different media have significant effects on rooting properties ($p< 0.01$). Most rooting percent obtained in sand + vermiculite medium and least one was in sand. Longest roots occurred in sand and shortest obtained in sand + perlite. Most root numbers were in perlite and least one were in sand + perlite. Most root fresh weight obtained in vermiculite and least one occurred in sand medium. Most root dry weight to root fresh weight ratio obtained in sand + vermiculite medium and least one occurred in sand.

Table 1:– Comparison of media effects on rooting characteristics

Media	Rooting %		Root Length Cm		Root number		Fresh Root Weight (gr)		Root dry to fresh weight ratio	
Per+ver	66.76	a	17.62	B	21.48	a	5.05	b	83.10	b
Perlite	65.62	a	18.24	B	23.48	a	4.90	b	78.57	d
Per+sand	52.43	c	17.38	B	12.86	c	3.67	c	81.52	c
Sand	40.43	d	20.86	A	16.52	b	2.67	d	77.48	d
vermiculite	71.19	a	19.57	Ab	21.57	a	6.43	a	83.00	b
Ver+sand	72.10	a	18.67	Ab	21.81	a	6.19	a	88.76	a

Effects of cutting collecting times on rooting characteristics

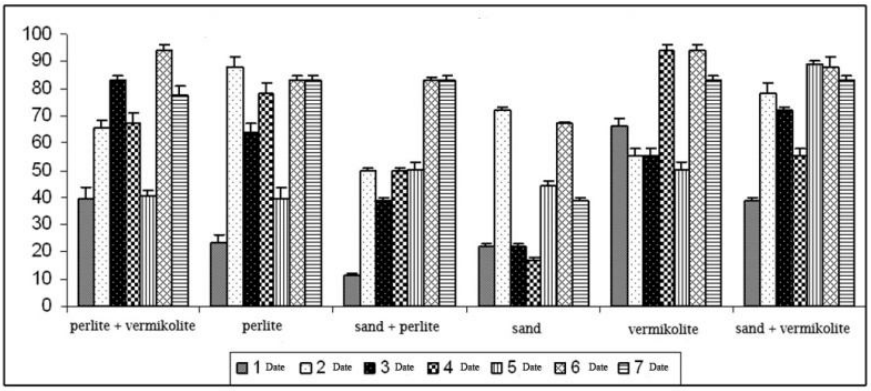
According to Table 2 there are significant differences between effects of cutting separation dates on rooting characteristics ($p<0.01$) .Most rooting percent obtained in 4 Feb and least one occurred in 22 Nov. Longest root length obtained in 5 Jan and least one occurred in 20 Jan .Most root numbers obtained in 19 Feb and least root number occurred in 22 Nov. Maximum fresh root weight occurred in 21 Dec and minimum one obtained in 22 Nov. Most root dry weight to root fresh weight ratio obtained in 22 Dec and least one occurred in 19 Feb.

Table 2 –Comparison of collecting times effects on rooting characteristics

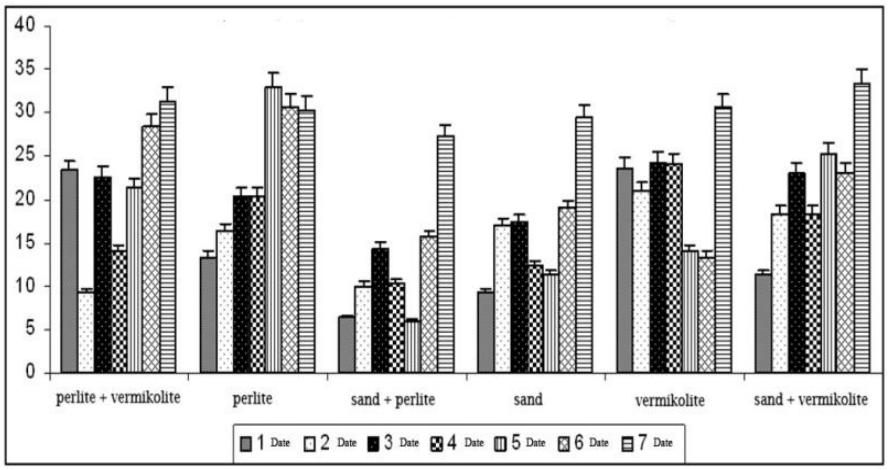
Dates	Rooting percent		Root Length (cm)		Root number		Root fresh weight (gr)		Root dry to fresh weight ratio	
Date 1	33.50	g	18.11	a	14.56	e	2.44	g	74.56	e
Date 2	68.17	c	19.61	a	15.33	e	5.28	c	89.94	b
Date 3	55.94	e	19.50	a	20.33	bc	7.11	a	86.72	c
Date 4	60.28	d	20.06	a	16.56	de	4.50	e	83.78	d
Date 5	52.22	f	17.56	a	18.50	cd	2.89	f	91.33	a
Datr 6	84.89	a	18.56	a	21.67	b	4.89	d	75.61	e
Date 7	74.94	b	17.67	a	30.39	a	6.61	b	72.56	f

Interaction effects of media and cuttings separation dates on rooting characteristics

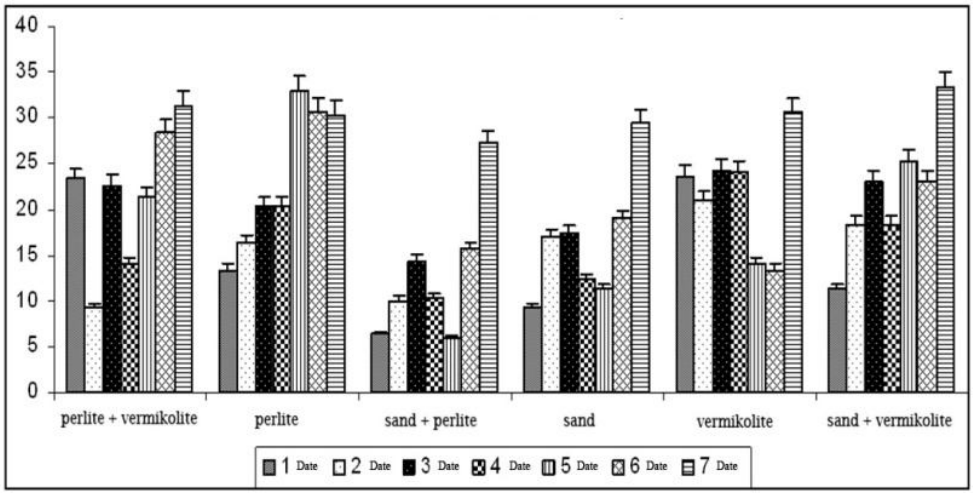
According to analysis of variance and comparison of means there are significant differences between interaction effects of media and cuttings separation dates on rooting characteristics ($p<0.01$). These are shown in graphs 1-5.Maximum rooting percent obtained in vermiculite on 5 jan and 4 Feb and least one occurred d in sand on 5 Jan .Maximum root length obtained in vermiculite + sand on 6 Dec and in vermiculite + perlite on 20Jan and minimum one occurred in perlite +vermiculite on 6Dec. Most root numbers obtained in vermiculite +sand on 19 Feb and least one occurred in perlite + sand on 20 Jan. Maximum fresh root weight obtained in vermiculite + sand on 21 Dec and minimum one occurred in perlite + sand on 20 Jan .Most dry root weight to fresh root weight ratio obtained in perlite + vermiculite on 6 Dec and least one occurred in sand on 4 Feb .



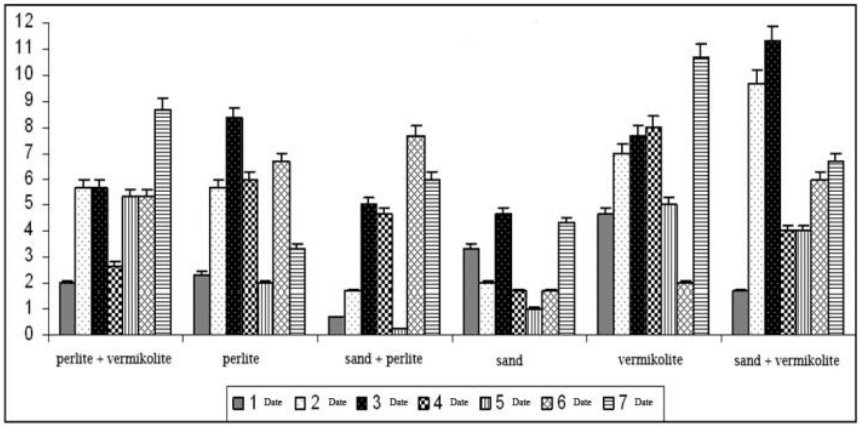
Graph 1-Interaction effect of media and dates of separation on rooting percent of pomegranate cuttings.



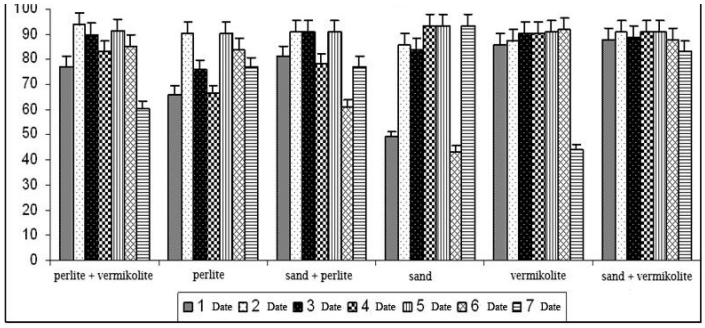
Graph 2- Interaction effect of media and dates of separation on root length of pomegranate cuttings .



Graph 3- Interaction effect of media and dates of separation on root number of pomegranate cuttings .



Graph 4- Interaction effect of media and dates of separation on fresh root weight of pomegranate cuttings



Graph 5- Interaction effect of media and dates of separation on dry root weight to fresh root weight ratio of pomegranate cuttings.

DISCUSSION

This investigation results showed different media and pomegranate cuttings separation dates have high significant effects on rooting characteristics. If suitable media are used, it is better cutting separation takes place in end of year for more rooting percent and increasing root numbers. Because more carbohydrates in cuttings end preserves that are necessary for more rooting and preparation of more chilling requirement for breaking cuttings dormancy .The view point is in agreement with that of Singh [10], Janner [5] and Young [11]. Also, among different media vermiculite and its mix with sand were best for more rooting percent and root numbers. Because vermiculite beside water holding capacity can release nutrients gradually that are use full for root growth and development. Mist system provided sufficient humidity around cuttings for preventing of cuttings drying. Bottom heat system with preparation of suitable warmness helped to cell division and cell propagation in end of cuttings that are

necessary for root formation and root elongation. Also, results showed Auxins such as NAA are effective in root formation and root elongation.

Increase in volume associated with callus and adventitious root growth must be the result of either cell division or cell enlargement, or both. Auxin, known to be involved in cell Enlargement, was long thought to be the controlling factor in the rooting process. Two types of evidence support this reasoning: (a) the increased content of endogenous auxin in the base of cutting during rooting induction [4] and (b) the rooting Response of many plants to exogenous auxin [2]. Combination of these factors resulted high rooting percent (up to 94%).

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