**SOME HINTS IN VEGETATIVE PROPAGATION OF *ROSA CANINA***

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**Abstract**

Roses are one of the most economically important ornamental plants. Iran has a good climate for commercial production of most kinds of roses and many wild types of roses can be found in different parts of the country. Current research performed with the goal of investigating latest vegetative propagation of Dog rose (*Rosa canina*) which mainly uses as rootstock for some hybrids varieties. Measured factors including effect of cutting length, rooting media (including perlite and mixture of cocopeat and perlite ) and effect of IBA on grafting portion in stenting method were been examined. Analyze of data showed that effect of rooting media on rooting number and rooting length were not significant however in cocopeat­­-perlite media rooting percentage was more than perlite alone. Effect of cutting size on rooting and subsequent growth of cuttings was significant. Effect of IBA treatment on grafting portion was significantly effective in success of grafting work.

**Key words**: rose, rooting media, cutting length, stenting, IBA

**INTROUDUCTION**

The genus Rosa comprises hundreds of species and thousands of cultivar. Roses are, undoubtedly, one of the most economically and favorite flowers in the floriculture industry. Millions of rose bushes are planted in garden or pots and billions of rose cut flowers are sold annually over the world (Khosh-khui and Teixeira da Silva, 2006). Rose plants are propagated by seed, stem cutting, grafting, budding, cutting-graft (stenting), cutting-budding, root grafting and tissue culture (Salehi and Khosh-khui,1997a,b; Dole and Wilkins, 2005). The vast majority of greenhouse rose cultivars are budded or grafted on rootstocks, and seldom grown on their own roots. Various studies have shown rootstock is the main important factor, which cause the apparent superiority of grafted rose plants(Cabreva, 2002). In grafted plants vigour of the genotype used as stock is transferred to the scion and thus influences its grown and productivity (Vries and Dubois, 1990). Dog rose is the most important rootstock for the Dutch cut rose industry (Vries and Dubois, 1983). This study focused on effect of some factors (cutting size, rooting media, auxin treatment on the grafting portion) on the Dog-rose cutting and stenting success. Most Dog-rose seedling, obtained from the seed displays varied horticultural characteristics due to high degree of heterogeneity present within rose species. So, vegetative propagation might be easier and economical more important. There are many physiological and environmental factors that influence adventitious root formation (Couvillon,1988). One of the most important factors on successful rooting of cuttings is having good rooting-medium. Rooting quality and percentage are related to propagation medium. Different medium and their mixture are uses for rooting bed. Physical structure of the medium is directly or indirectly effective on rooting. In a research effect of medium on rooting of *Petunia* and *Taget patula,* result showed that in a medium composed of cocopeat (80%) and perlite (20%), both plants were taller and heavier (Michael and Stamps, 1996). Another research focused on the effect of ventilation and temperature on Rose, Euphorbia and Hydrangea cuttings, showed that in the media with low oxygen, rooting and root growth were affected. Rooting is correlated to appropriate content of oxygen in the medium. Cutting length, node position and leaf area were considered to be the important factors affecting rooting (Raza-ul-Haq,1992). Investigating effect of cutting size on rooting of Rubrum Acer showed that three node cuttings had greater number and root length, while there were not significant differences in the percentage of viability and percentage of rooted cuttings (Smalley and Dirr, 1988). Phytohormon auxins influence the cell division and development of vascular tissues (Fukuda, 2004). Part of current study has been focused on the effect of using exogenous auxin on the grafting portion. IAA treatments, however, reportedly stimulate secondary growth in Flax stem (El-shourbagy and et al, 1995; Ayala-Silva et al, 2005). In the last step of graft formation It appears that the formation of functional vascular connections is essential for successful grafts in herbaceous plants, in woody plants (Mosse, 1962; Hartmann et al, 1997). The relationships between scion and stock are affected by growth regulators. An important substance involved in the development of compatible union is auxin, which is released from vascular strands of the stock and the scion and induces the differentiation of vascular tissues, functioning from the as morphogenic substance (Moor, 1984; Aloni, 1987 and Mattsson et al, 2003).

**MATERIALS AND METHODS**

The project consisted of three experiments. Two commercially important specie of rose: Dog rose and Dolcevita (cut flower and greenhouse rose) were used for experiments. All experiments were performed about late September 2011, in experimental greenhouse of the Gorgan University of Agricultural Sciences and Natural Resources. Experiment was based on a completely randomized design with three replication which each replication was consist of 15 cuttings under mist system.

**Experiment1.** Effect of media on rooting of cuttings (perlite and cocopeat-perlite in 1:2 ratio)

Shoots cut from the stock plant in the morning, immediately placing them in the bucket was filled with fresh water. Then cuttings were prepared with 10cm long and 4mm diameter with at least 2 leaves. Bottom of the cuttings were wounded by clipper on opposite sides of the base of the cuttings. The cuttings were treated for 5 seconds with 5000 ppm indol-3-butric acid (IBA) dissolve in 50% ethanol. After treatment, cuttings were inserted in mixture of cocopeat- perlite (in 1:2 ratio) and perlite media under mist system. in order to protect from fungus disease, cutting and media were treated with solution of a general fungicide at 3000ppm concentration. The experiment had three replications, each one consists of 15 cuttings. Intermitted mist which operated 2 minute every 45 minute from 7:00 AM to 8:00 PM daily and twice operation around midnight. Throughout the experiment period, the humidity and temperature of the greenhouse were measured using a digital thermometer and hygrometer. The mean temperature and humidity during the study period were 30°c and 70% respectively. cuttings were harvested and evaluated for rooting percentage, root number and root length after 25 days. All cuttings with roots longer than 0.5cm were included in measurement.

**Experiment2.** Effect of cutting size on rooting

Another part of the current experiment were focused on the effect of cutting size on rooting aspects. Cuttings were prepared in two sizes: 5 and 10 cm length; these cuttings were prepared without leaf and were planted in perlite media. After 25 days mentioned factors were measured.

**Experiment3.** Effect of auxin on the grafting portion in stenting method

The semi-hardwood material with at least two nodes and 4mm diameter of Dog-rose were used for rootstock. The Scions with one node and one leaf (including 2 leaflet) provided from a cut rose cultivar called Dolcevita when mother plant were in faded flower stage. Then selected scions were then appropriated to the thickness of rootstock. Scions then were grafted (omega grafting method) onto 4cm length cuttings of the rootstocks. Scions and rootstocks with acceptable smooth cut, could be grafted together with the maximum overlap of the cambium layer. The end of rootstock and grafting portion were treated with IBA at 5000 ppm concentration. Plastic tape were used for wrapping the grafted portion. Immediately after grafting work, all cut surface thoroughly covered by grafting wax. Stentlings[[1]](#footnote-1) rooted in the cocopeat-perlite (in 1:2 ratio) medium. Temperature, humidity and all other conditions of the greenhouse were the same as the above experiments. The grafting union took place around 57 days in the mentioned condition and in control cuttings, however this was seen for about 37 days in treatments receiving IBA in grafting portion. Root number, root length, rooting and healing percentage were measured. SAS software was used for the analysis of data. Comparing means were done with Duncan test.

**RESULT AND DISCUSSION**

**Experiment1.**

Analysis of data showed that rooting media had not significant effect on the root length and root number at 5% level, but significant effect on rooting percentage(table. 1). Media influenced the percentage of Dog-rose cutting that rooted, as Copes reported for a number of woody ornamental species. So, rooting medium is an important factor in successful propagation of cuttings. The medium can influence the percentage produced roots and type of root system, develop later (Copes, 1977). Intermittent mist system is commonly used to reduce transpiration and water loss from cuttings during the propagation. A problem with this system is over wetting the rooting medium. Water and air compete for pore space in medium (Loach, 1985), and oxygen availability may be reduced as the volume of water in the medium is increased. Studies of various media have revealed that physical characteristics of media, such as; particle size, are less deterministic of rooting performance than are air and water content (Long, 1933). The primary element seems to be the oxygen which is requires for aerobic respiration thus, the lack of oxygen in an over wet medium may cause propagation failure (William and et al, 1991). In addition to oxygen, many other elements like N, P, Ca, Mg, Mn, B, Zn are shown to be necessary in the process of rooting (Anderson,1986; Blazich, 1988). Although the effect of mineral elements on dedifferentiation and root initiation has remained unclear Cocopeat is considered as a good growing media component with acceptable pH, electrical conductivity(EC), enough amount of carbon/nitrogen and other chemical attributes, although in current research mineral element content of the rooting medium wasn't tested, however the lowest concentration of N, P and K is related to perlite substrate (Blazich,1988), but cocopeat has been recognized to have high water holding capacity which causes poor air-water relationship, leading to low aeration within the medium, thus affecting the oxygen diffusion to the roots. Incorporation of coarser materials into cocopeat could improve the aeration statues of media (Avang, 2009). It seems a mixture of organic and mineral material could prepare good condition for rooting of the cuttings. Although there aren’t significant different between root length and root number of two applied media but mixture of cocopeat - perlite helps to increase rooting percent of Dog rose cutting.

**Experiment2.**

Investigation of cutting size on rooting of Dog rose showed that effect of treatment on number of root, percentage of rooting at the 5% level was significant but treatment hasn't significant effect on rooting(table. 2).

In this experiment cuttings were provided without leaf. During this investigation it was observed that cuttings with 10 cm size produced root and their vegetative bud became active and produced leaf whereas 5cm cuttings were produced only root, without leaf grow. It seems in higher length of cutting, there was enough nutritional material reserve for both process of rooting and leaf bud activation. The original leaf area of cuttings can be considered a good indicator of root growth of cuttings (fuchs, 1986). Effect of leaf on rooting can be related to photosynthesis, producing carbohydrate and phytohormone. The rooting capacity of many cuttings have been correlated to their carbohydrates content as several researchers indicated that storage carbohydrates were important to root formation because they are providing energy and structural materials of cells to initiate root primordial (Delrio et al.1991; Bartolini et al. 2008**).** Costa and Challa (2002) showed that root growth is only affected by current photosynthesis and not by reserves, formed previously in leaves (Lopez and Runkle, 2006). In addition to carbohydrate, leaf synthesizes auxin. The auxin (indol-3- acetic acid; IAA) controls or influences most aspects of plant development and physiology (Keller and et al, 2007). Auxin influences cell division and root initiation so, cuttings which were treated with IBA promote rooting number and percentage. More root number and growing shoots on cuttings with 10cm length could cause significant yield.

# Experiment3.

# Results of analysis of variance and mean comparison showed the significant treatment effect on measured root traits including; root number, root length, success of graft work. Result indicated that the samples which were treated with IBA in their graft portion, having maximum root and the highest percentage of rooting in contrast to control plants. Treatment of IBA on grafting portion, had no significant effect on the number of leaves (table 3). 37 days after grafting, 68% of samples that were treated with IBA in grafting portion, their healing process were completed whereas at this time only 25% of control plants were healed. In other hands treatment of graft portion with IBA increases callus formation, so that this part was swollen and their connection were more powerful than control plants. Sequence of union healing process which follows successful grafting in many plants including: contact or isolation layer formation, cell enlargement, callus formation, phellogen formation, and vascular cambium formation (Copes, 1969). Vascular formation between stock and scion is main important stage for success of grafting work. It seems using auxin in grafting portion helps the vascular formation. Auxin is often considered as the main phytohormon involved in the regulation of cambial activity and its promontory effect on cambial cell division has been known for more than 50 years. Auxin is mainly present in zones where cambial activity is necessary such as in young growing stems. Mitoses occurred in cambial cells when the auxin level is higher than a threshold value and cell production is correlated to auxin concentration. Cambium sensitivity to auxin appears directly linked to the ability of cambial cell to polar transport of the regulator (Lachaud and et al,1999). It seems in current study, vascular contact occurred in IBA treated samples earlier than control, whereas in scions containing leaf, auxin and carbohydrate produced in leaf, moves to grafting portion and base of stock. It helps unity of grafting and interaction of endogenous IAA with exogenous applied IBA in the base of the stock for the emergence of root primordial. Stentlings which were rooted in the cocopeat-perlite media could absorb water and mineral element and therefore transfer carbohydrate and mineral elements to grafting portion, so helping the unity the grafting. This could be because of cocopeat contents including minerals and carbohydrates. Therefor stentlings with IBA treated in grafting portion were more successful than control plants and caused to transplant them to soil medium, 20 days earlier.

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**Literature Cited**

Khosh-khui.M., Teixeira da Silva. J.A. (2006). In vitro culture of Rosa species. In: Teixeira da Silva, J.A. (Ed.), Floriculture, ornamental and plant Biotechnology, 2: 514-526.

Copes,D.L. (1977). Influence of rooting media on root structure and rooting percentage of Douglas-fir cuttings. Silvae Genetica, 26: 2-3.

Dole, J.M., Wilkins, H.F. (2005). Floriculture Principles and Species. Prentice Hall. INC., USA, p. 1023.

Cabreva, R.I. 2002. Rose yield, dry matter partitioning and nutrient status responses to rootstock selection. Scientia Horticulture, 95: 75-83.

Salehi. H., Khosh-Khui. M. (1997a). A simple procedure for disinfection of 'Baby Masquerade' miniature rose explants. Sci. Hortic, 68:145- 148.

Salehi. H., Khosh-Khui. M. (1997b). Effects of explant length and diameter on in vitro shoot growth and proliferation rate of miniature roses. J. Hortic. Sci, 72: 673- 676.

Vries. D.P., Dubois. L.A.M. (1990). Shoot production of 'sonia' on hybride tea rootstock clines of different vigour. Gartenbauwissenschaft. 55: 268-271.

# Vries. D.P., Dubois. L.A.M. (1987). Variation for plant characters and for performance of softwood cuttings of Rosa Canina 'Inermis' seedlings. Institute for Horticultural Plant Breeding. 36: 407- 412.

# Michael. R. E. and Stamps. R.H. (1996). Growth of bedding plants in sphagnum peat and coir dust based substrates. Journal of Environmental Horticulture, 14: 187- 190.

# Raza-ul-Haq. (1992). Effect of light and weed competition on survival and growth of Abies pindrow seedlings of various ages In different soils media in the moist temperate forests of Pakistan. Pakistan Journal of Forestry, 42: 148-162.

# Smalley. T.J., Dirr, M. A. (1987). Effect of cutting size on rooting and subsequent growth of Acer Rubrum red sunset cuttings. Journal of environmental horticulture, 5(3).

# Loach, K. (1985). Rooting of cuttings in relation to propagation medium. Proc. Intl plant Prop. Soc, 35: 472-485.

# William, H. R., Wright, R.D. and Seiler, J. (1991). Propagation medium moisture level influences adventitious rooting of woody stem cuttings. J.AMER. Soc. Hort. SCI, 116: 632- 636.

# Anderson, A.S. (1986). Environmental influences on adventitious rooting in cuttings of non-woody species. MB. Jackson .P.233- 253. In: M.B. Jackson(ed). New root formation in plants and cuttings. Martinus Nijhoff publisher, Boston.

# Blazich, F.A. (1988). Mineral nutrition and adventitious rooting, p. 61- 69. In: I. D. Davis, BE. Haissig and No Sankhla(ed s). Adventitous root formation in cuttings. Dioscorides press, Portland, ore.

# Awang, Y., Shaharom, A. Sh., Mohamad, R.B., Selamat, A. (2002). Chemical and physical characteristics of cocopeat based media mixtures and their effects on growth and development of celosia cristata. American Journal of Agricultural and Biological Sciences, 4: 63-71.

# Fuchs, H.W. (1986). Root regeneration of rose plants as influenced by applied auxins. Acta Hort, 189: 101-107.

Bartolini G, pertrucceli R, and Pestelli, P. (2008). Preliminary study on in vivo rooting of two Olea europaea L. genotypes. Acta Hort, 791: 191- 195.

Cosat, J.M. and Challa, H. (2002). The effect of the original leaf area on growth of original leaf softwood cuttings and planting material of rose. Sci. Hort, 95: 111-121.

Lopez, R.G., Runkle, E. S. (2006). Daily light integral influences rooting and quality of petunia cuttings. Acta Hort, 711.

Keller,Ch.P., Grundstad, M.L., Evanoff, M.A., Keith, J.D., Lentz, D.S.,Wagner, S.L., Culler, A.H., Cohen, J.D. (1997). Auxin induced leaf blade expansion in Arabidopsis expansion in

Arabidopsis requires both wounding and detachment. Plant signaling & Behavior 6: 12.

Copes, D. (1969). graft union formation in Douglas-Fir. Amer. J. Bot , 56: 285- 289.

Lachaud, S, Catesson, M.A., Bonnemain, J.L. (1999). Structure and function of the vascular cambium. C.R. Acad. SCI. Paris,sciences de la vle/ life sciences, 322: 633-650.

Couvillon, G. A. (1988). Rooting response to different treatments. Acta. Hort, 227: 187-196.

Fukuda, H. (2004). Signals that control plant vascular cell differentiation. Molecular cell Biology, 5: 379- 391.

Ayala Silva. T., Akin, D., Foulk, J. Dodd, R.B. (2005). Effect of two growth regulators on yield and fiber quality and quantity in Flax(Linum usitatissimum L.). plant growth regulation society of America quarterly, 33: 90- 100.

EL-Shourbagy,M.N., Abdel-Ghaffar., EL-Naggar, R.A, B.A. (1995). Effect of IAA and GA3 on the anatomical characteristics, straw and fiber yield and quality of Flax. Journal of Agronomy and Crop Science, 174: 21-26.

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| --- | --- | --- | --- |
| Rooting percentage | Root length  (*cm*) | Root number | treatment |
| a %84 | a 3.56 | a 8.04 | Cocopeat-perlite |
| b %79 | a 2.55 | 10.26a | perlite |

Hartmann,H.T., Kester, D.E., and F.T.Davies, Jr. (1990). Plant propagation principles and practices. Prentice Hall, Englewood Cliffs, N.J.

J.Mattsson, W. ckurshumova, T. Berleth. (2003). Auxin signaling in Arabidopsis leaf vascular development. Plant physiol, 131: 1327- 1339.

R.Moore. (1984). Amodel for graft compatibility-incompatibility in higher plants. Am. J. Bot, 71: 751- 758.

A loni.R. (1987). Differentiation of vascular tissues. Plant physiology. 38: 179-20.

|  |  |  |  |
| --- | --- | --- | --- |
| treatment | Number of root | Length of root  (*cm*) | Percentage of root |
| Cutting with 5 cm size | 1.3917b | 0.68139a | 59%b |
| Cutting with 10 cm size | 2.1508a | 1.31211a | 82%a |

Table1- an investigation of rooting media on root length, root number and rooting percentage (nonsimillar letter at table showed there are significant different at the 5% level using the Duncan's test).

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Table2- effect of cutting size on root length, number of root, percentage of root (nonsimillar letter at table showed there are significant different at the 5% level using the Duncan's test(

Table3- effect of IBA on grafting place (nonsimillar letter at table show there are significant different at the 5% level using the Duncan's test)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Grafting take(%) | Number leaflet | Root length | (*cm*)Root number | |  |
| 68.7%a | 1.6944a | 1.6701a | 2.0958a | Treated sample | |
| 25%b | 1.5666a | 1.2527b | 0004b.1 | Control sample | |

1. Stentling is the plant that propagated with cutting – grafting method [↑](#footnote-ref-1)