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Research Article

EFFECT OF MEDIA AND INDOLE BUTYRIC ACID (IBA) CONCENTRATIONS ON ROOTING OF RUSSIAN OLIVE (*ELAEAGNUS ANGUSTIFOLIA* L.) SEMI-HARD WOOD CUTTINGS

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ABSTRACT
This study was conducted with the main purpose of determination of the most suitable IBA concentrations and media on rooting of Russian olive (*Elaeagnus angustifolia* L.) semi hardwood cuttings. A two factorial experiment was laid out a completely randomized design (CRD) with three replications and each replication consisted of 12 cuttings. Treatments consist of five concentrations of IBA (0, 1000, 2000, 3000 and 4000 mg L^{-1}) and two rooting media (sand and cocopeat + perlite 1:1 by volume). Results showed that significant difference of the most the experimental treatments. The highest rooting percentage (97.22%), root number (7.15) and root length (12.67 cm) were obtained in cuttings were treated with 2000, 4000 and 1000 mg L^{-1}IBA in cocopeat + perlite rooting medium, respectively. There was no significant difference in most traits between 2000 and 4000 mg L^{-1} IBA except on rooting percentage. Finally our results revealed that 2000 mg L^{-1} IBA in cocopeat + perlite rooting medium was the suitable treatment for propagation by semi-hard wood cutting.

Keywords: *Cocopeat, Perlite, Sand, Rooting Percentage*

INTRODUCTION
Russian olive, scientific name of *Elaeagnus angustifolia* L. belongs to Elaeagnaceae family. This tree is not considered greatly due to relatively limited propagation than other plants. Fruits, flowers and leaves of the tree have too many medicinal properties (Tabatabaei and Ahmadpour, 2004). Other criteria such as soil salinity, shade intolerance, and drought tolerance, etc. need to be considered during the selection of replacement plants (Stannard *et al.*, 2002). Russian olive is resistant against climate changes and soil conditions, so it is suitable for growing in cold steppe zone (Tabatabaei and Ahmadpour, 2004). Russian olive tree grows well in sandy to heavy clay and wet soils.

It can grow even in the poorest soils. It resists against strong winds and can grow in highlands, so it is commonly grown as wind-break and hedge in all west regions of the United States of America (Laursen and Hunter, 1986). Studies conducted on different species of Russian olive to investigate the level of salt tolerance showed that Russian olive had more tolerance against salt stress. It grew in sodium soil and tolerated high level of sodium (Carman and Brotherson, 1982). Kosina and Baudysova (2011), recommend treating of both softwood and hardwood cutting of sea-buckthorn and Russian olive cultivars with 2500 ppm IBA.

In Russian olive ornamental cuttings, Yanhong (2011), reported that 150 mg L^{-1} IBA for 4 hours was the best treatment. Han *et al.*, (2009), reported the exogenous hormone treatment was necessary for increasing the rooting ability of green-wood Russian olive cuttings. IBA at a concentration of 100 mg L^{-1} or 500 mg L^{-1} for 240 minutes or one minute respectively showed that good rooting effects. Kalyoncu *et al.*, (2008), stated that increased concentrations of IBA from 1500 mg L^{-1} did not increase rooting oF Russian olive.

Therefore, the aim of this study is to determine the most suitable IBA concentrations and media on rooting of Russian olive (*Elaeagnus angustifolia* L.) semi-hard wood cuttings.

MATERIALS AND METHODS

This study was conducted at Khorasan Razavi, Agriculture and Natural Resources Research Center, Mashhad, Iran. Cuttings were collected from young and free of diseases and pests trees early in the morning in late June. A two factorial experiment was laid out in completely randomized design with 3 replications and each replication consisted of 12 cuttings. Treatments included IBA at five concentrations (0, 1000, 2000, 3000, and 4000 mg L^{-1}) and two medium (sand and cocopeat + perlite 1:1). The cuttings were dipped for 10 second in each IBA concentration (up to 8-10 cm of height) and then in fungicide. After treatments, were planted in medium. The cuttings were removed from the medium after 60 days and rooting percentage, root number, root length, root fresh and dry weight were recorded. The data was analyzed using MSTAT-C software and the figures were drawn using Excel software. Data mean was compared using Duncan's multiple range tests at the level of 1 and 5 percent.

RESULTS AND DISCUSSION

Rooting Percent

Analysis of variance showed that the effect of medium and various concentrations of IBA on rooting percent were significant at 1% (Table 1). Mean comparison of different concentrations of IBA on rooting percent showed that the highest (87.5 %) and the lowest (58.3 %) obtained at the concentration of 1000 mg L^{-1} IBA and the control treatment, respectively (Figure 1).

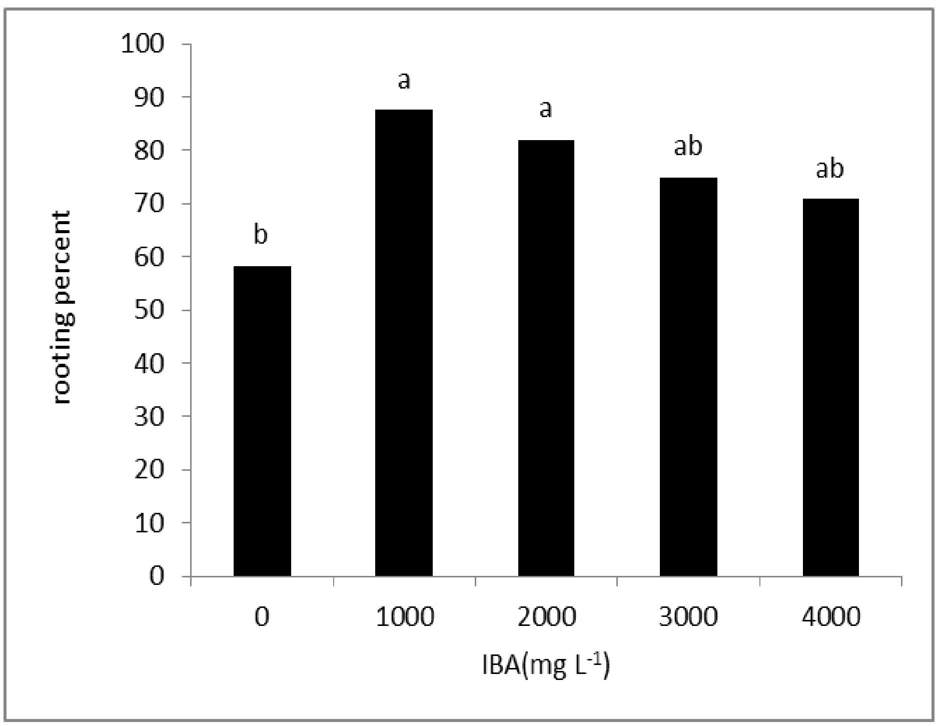

Figure 1: Effect of different concentrations of IBA on rooting percent

Mean comparison of interaction between different IBA concentrations and medium on rooting percent showed in Table 2. Our results was confirmed by Kalyoncu *et al.*, (2008) who reported positive correlation between IBA concentrations and rooting percent of Russian olive.

Root Number

Analysis of variance showed that the number of root was significant differences and data pertaining to that are presented in Table 1. The highest (6.853) and the lowest (2.443) number of roots obtained at the concentration of 4000 mg L^{-1} IBA and control treatment, respectively (Figure 2).

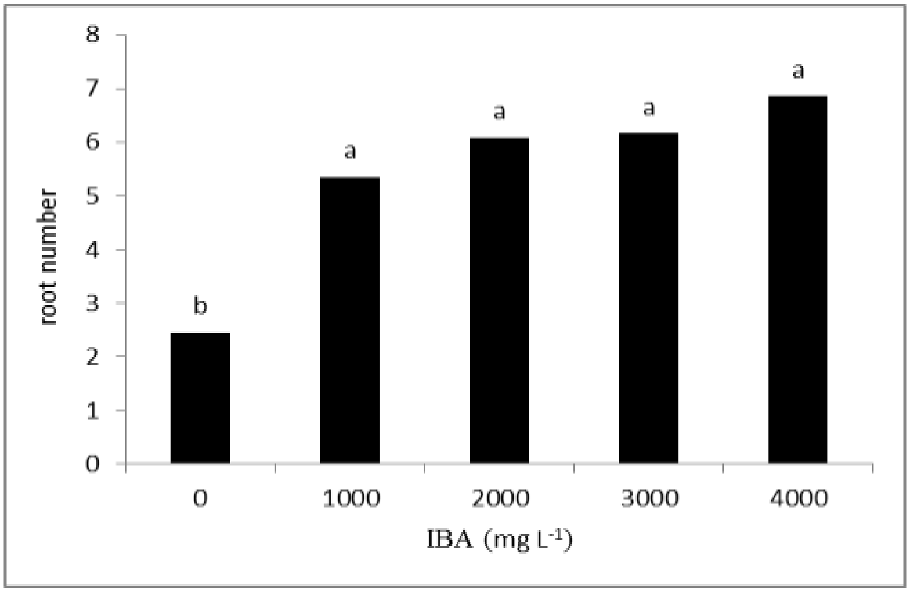

Figure 2: Effect of different concentrations of IBA on root number

The interaction between different IBA concentrations and medium on the number of roots showed that the highest number of roots (7.155) was related to the concentration of 2000 mg L^{-1} and the cocopeat + perlite medium and the lowest number of roots (2.4) was related to the control and cocopeat + perlite medium (Table 2). Our finding was confirmed by Zarin *et al.*, (2005).

Root Length

Analysis of variance showed that the effect of medium and various concentrations of IBA on root length were significant (Table 1). Mean comparison of different concentrations of IBA on root length showed that the longest (11.92 cm) and the shortest (7.525 cm) root length obtained at the concentration of 1000 and 3000 mg L^{-1} IBA, respectively (Figure 3).

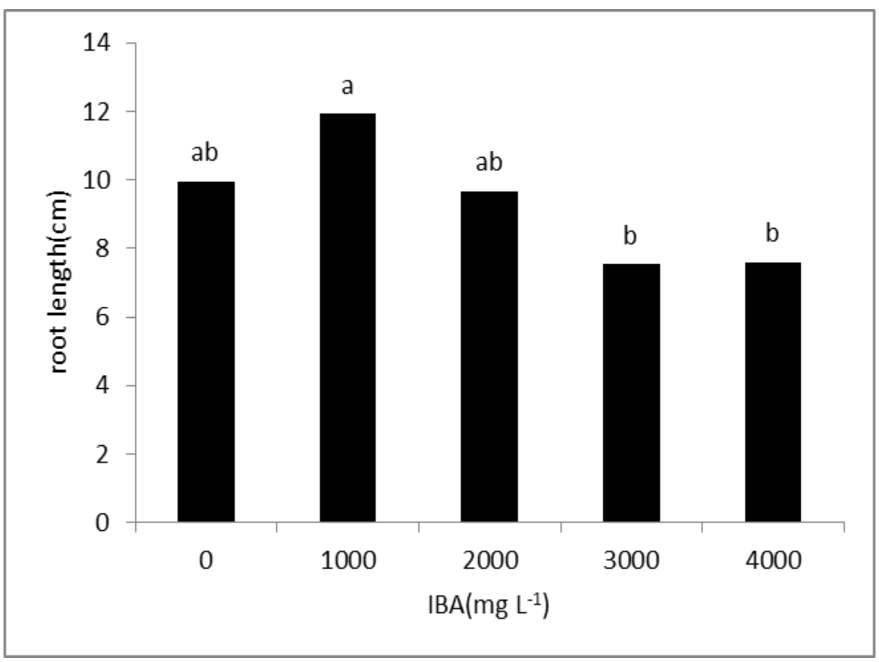

Figure 3: The effect of different concentrations of IBA on root length

The interaction between different concentrations of IBA and medium on root length showed in Table 2. Our results confirmed by Kalyoncu *et al.*, (2008), Hartmann *et al.*, (1990), who stated that high concentrations of auxin had negative effect on root elongation.

Fresh and Dry Weight of Root

Analysis of variance showed that the effect of medium and various concentrations of IBA on root fresh weight were significant (Table 1). Mean comparison they showed that the highest fresh and dry weight of roots (0.908 and 0.134 gr, respectively) and the lowest fresh and dry weight of roots (0.483 and 0.092 gr, respectively) obtained at the concentration of 2000 mg L^{-1} IBA and control treatment (Figures 4 and 5).

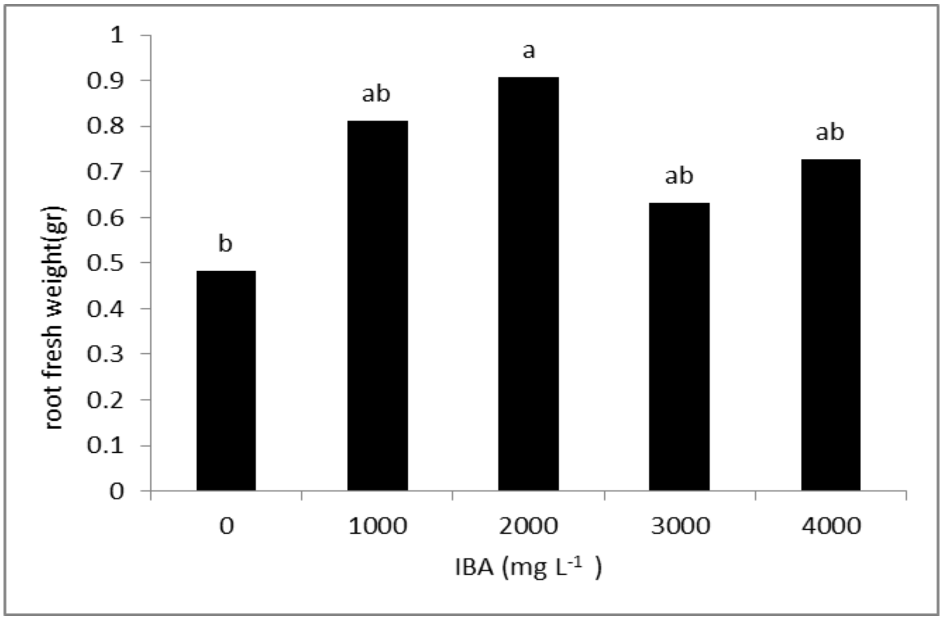

Figure 4: The effect of different concentrations of IBA on root fresh weight (gr)

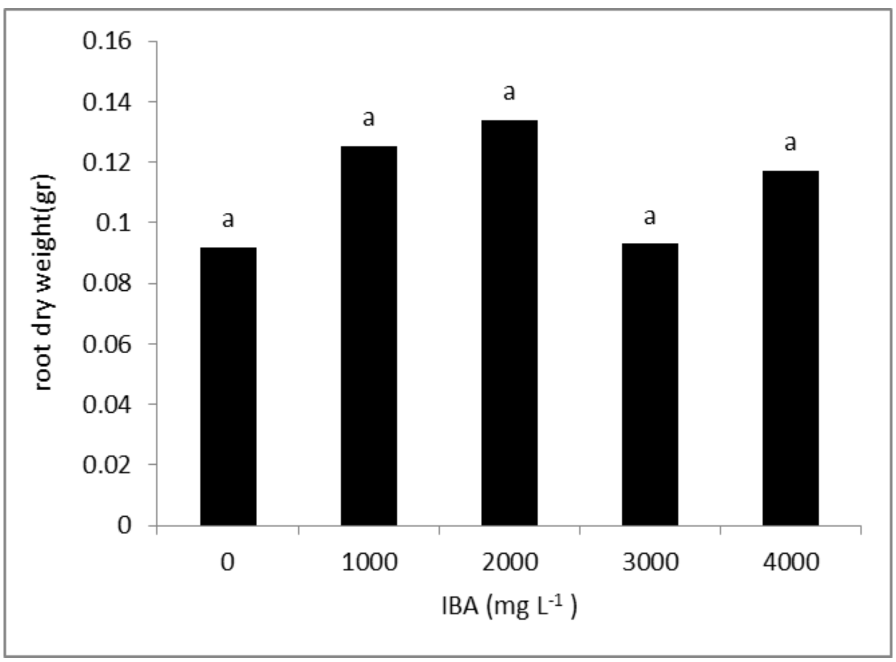

Figure 5: The effect of different concentrations of IBA on root dry weight (gr)

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Table 1: Analysis of variance of types of medium and IBA concentrations on rooting percentage, root number, root length root fresh and dry weight of *Elaeagnus angustifolia* L. semi-hard wood cuttings

Sources of Variation	Degrees of freedom	Mean squares(MS) Rooting percentage	Root number	Root length(cm)	Root fresh weight(gr)	Root dry weight(gr)
Types of medium(A)	1	2520.65**	8.592*	39.244**	0.441**	0.013**
IBA(B)	4	748.771**	17.861**	20.167**	0.161*	0.002ns
A x B	4	200.21ns	1.131ns	3.584ns	0.103ns	0.003*
Error	20	125.006	1.245	2.811	0.051	0.001
Coefficient of variability (%)		14.96	20.75	17.97	31.62	24.78

*Note: *- significant at 5 % ($P \leq 0.05$), **- significant at 1% ($P \leq 0.01$), and ns is not significant.*

Table 2: Mean comparison interaction medium and IBA concentrations on rooting percentage, root number, root length, root fresh and dry weight of *Elaeagnus angustifolia* L. semi-hard wood cuttings

IBA(mg L^{-1})+medium	Rooting percentage	Root number	Root length(cm)	Root fresh weight(gr)	Root dry weight(gr)
0+cocopeat + perlite	63.89 cd	2.4 c	11.75 ab	0.524 bc	0.095 bcd
1000+ cocopeat + perlite	88.88 a	5.885 ab	12.67 a	0.797 abc	0.128 abc
2000+ cocopeat + perlite	97.22 a	7.116 a	9.647 abc	0.967 a	0.148 ab
3000+ cocopeat + perlite	88.88 a	7.021 a	9.334 bc	0.869 ab	0.13 abc
4000+ cocopeat + perlite	80.55 abc	7.155 a	8.972 bcd	1.013 a	0.165 a
0+sand	52.77 d	2.5 c	8.153 cde	0.442 bc	0.089 bcd
1000+sand	86.11 ab	4.8 b	11.17 abc	0.828 ab	0.123 abc
2000+sand	66.66 bcd	5.055 ab	9.655 abc	0.849 ab	0.119 abc
3000+sand	61.11 cd	5.305 ab	5.717 e	0.395 c	0.056 d
4000+sand	61.11 cd	6.55 ab	6.238 de	0.443 bc	0.07 cd

Means of each category followed by a common letter are not significantly different at 0.05 level of significance

Interaction between different medium and IBA concentrations on root fresh weight was not significant, but was significant on root dry weight at the level of 5% (Table 1). The highest fresh and dry weight of roots (1.013 and 0.165 gr, respectively) obtained at the concentration of 4000 mg L^{-1} IBA and the cocopeat + perlite medium and the lowest fresh and dry weight of roots (0.395 and 0.056 gr, respectively) obtained at the concentration of 3000 mg L^{-1} IBA and sand medium (Table 2). Similar results were also reported by Habibi (2010).

Conclusion

Concentration of 2000 mg L^{-1} IBA and cocopeat + perlite medium recommended for cuttings rooting of semi-hard wood Russian olive.

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