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Improving the rooting of honeysuckle (*Lonicera japonica*) cuttings by using of Indole-butyric acid treatments and different substrates

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ABSTRACT

This research was conducted for vegetative propagation of ornamental shrubs, Honeysuckle (*Lonicera Japonica*) by cuttings under greenhouse condition in institute of agricultural research, university of Zabol on February 2013. The experiment was performed on Factorial in a completely randomized design with three replications. Treatments were containing the Indole-butyric acid hormone in 5 levels: 0, 1500, 2500, 3500 and 4500 $mg.l^{-1}$ in 3 substrates including soil, sand, soil+sand. The results of this experiment showed the effect of indole butyric acid hormone was significant on the number, length, fresh and dry weight of roots ($P \leq 0.01$), but the substrate had no significant effect on fresh and dry weight of root. The level of 4500 ppm of indole butyric acid had the most number of roots than others. The best numbers of roots was obtained in sand substrates. The highest number and length of roots was observed from soil + sand mixture and treated with 3500 ppm indole butyric acid. The results of this study showed the application of indole butyric acid hormone and different medium had caused improving the measured characteristics in honeysuckle plant.

KEY WORDS: *Lonicera japonica*, vegetative propagation, substrates, IBA

INTRODUCTION

Honeysuckle (*Lonicerajaponica*) is native of Japan, Korea, China and Taiwan (Bravo, 2003). It is known as yellow and Chinese jasmine, and its flowers are abloom in the late afternoon and remain abloom for three days (Nuzzo, 2003). This ornamental shrub in grows in a wide range of soils nicely, with a few exceptions, such as coarse sand and poor peat soils (Munger 2002). The cuttings are the most important method of asexual reproduction of plants. The cuttings are vegetative division of plant which was made complete plants after separating from the parent plant in a good condition. Cuttings are provided from leaves, roots, stems, or a combination of different parts of plants such as leafy stems of plant. Cuttings should be selected from healthy trees with desirable characteristics (Dewayne *et al.,* 1991). The environmental conditions such as temperature, light, humidity and substrate are important for the success of rooting (Moe and Andersen, 1989). It can easily transferred to the next generation the desirable characteristics of parent plant such as flower color, leaf shape, plant size and resistance to environmental stress and resistance to pests and plant diseases in vegetative propagation until avoided the dispersion of characteristic that was occurred in sexual propagation (Hartmann *et al.,* 1997). The main role of auxin has been established in the induction of rooting and root formation, Auxin had effect on speed and increasing the rooting of cuttings. The plants are produced natural auxin in branches and young leaves, but it should use the synthetic auxin for improving the rooting to prevent the death of cuttings (Kasim and Rayya, 2009). The effect of nutrition containing auxin especially indole butyric acid was significant on number of roots, the survival percentage of cuttings, fresh and dry weights of roots, this researcher expressed application of 4000 ppm IBA in perlite media had the best effect on rooting of cuttings (Saffari and Saffari, 2012). The application of 6000 ppm IBA had the greatest effect on root number and length, fresh and dry weight of roots in propagation of ornamental shrub, *Ficusbenjamina* (Karimiyan*et al.,* 2013). The effect of NAA, IAA and IBA has been proved on rooting of hardwood cuttings of apple, and root length, shoot length, root dry weight and the percentage of rooting cuttings of wood apple 'cutting were increased by these hormones (Faghihi et al., 2013). The rooting percentage and roots number were increased in semi-hardwood cuttings of *Callistemon citrinus* by increasing the amount of IBA from 1000 ppm to 4000 ppm (Singh, 1992). The using of IBA (6000 ppm) had caused the most roots length in Norway spruce (Picea spp) cuttings (Safdari and Shariat-panahi, 2000). The cutting of *Callistemon citrinus* treated by IBA (4000 ppm) in mist condition had the most rooting percentage and roots number (Motahhari, 2012). It was expressed during the investigation of two different ways in application of auxin hormones on rooting of shaddock (*Durantarepens* L.) cuttings that traditional ways in fast immergence of cuttings into the rhizogenic solution were more effective in rooting amount of shaddock cuttings (Sedaghat-kish and et al., 2012). Application of intermitted mist systems for rooting of cuttings is widely common. In this method, a layer of water is placed above the cuttings and planting media which water losses in cutting has reduced significantly by reduction of leaf temperature and increasing

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the environment 'relative humidity (Moss and Dalgleish, 1985). Using of mist on rooting of cuttings in Hibiscus Rosasinensis, rosa, peach, plum, apple and some tropical ornamental shrubs has positive results (Mudge *etal.,* 1995). Between auxin hormones, IBA and NAA have the maximum effect in stimulating of adventitious roots production and IBA is probably the best between them (Blythe *et al.,* 2007). The most success was obtained in plants such as kiwi fruit, fig and apple from IBA hormone that it is necessary for softwood and hardwood cuttings (Suriyapananont, 2009). The goal of this study is the selecting of suitable auxin and media treatment on rooting of *Callistemon citrinus* cuttings.

MATERIAL AND METHODS

This study was performed in ornamental plants greenhouse in Institute of Agricultural Research, University of Zabol on 2013. The greenhouse had the heating and cooling system and equipped with a mist irrigation set. Institute of Agricultural Research is in geographical location of 61° 41' of eastern longitude and 30° 54' north longitude and altitude of 495 meters from the sea and is located 35 kilometers southeast of the Zabol city. It was conducted factorial experiment on completely randomized design with three replications. Treatments were containing the Indole-butyric acid hormone in 5 levels: 0, 1500, 2500, 3500 and 4500 $mg.l^{-1}$ in 3 substrates including soil, sand, soil+ sand. The cuttings were provided in a length of 20 cm from Japanese honeysuckle (*Lonicera Japonica*) in University of Zabol. They were disinfected 10 cm in the end of cuttings in Benomyl fungicide (1:1000 ratios) after preparing the medium. Sodium hydroxide solvent with a concentration of 3000 mg per liter had been ready and to solve any of the hormone indole butyric acid treatments 30 mg of these solvents were used. Afterwards the end of cuttings had located in IBA hormone 5 seconds and the cuttings were planted in the pots containing different media. Mist system exists in a distance of 100 cm above the media which mist each 5 seconds periodically. Ten cuttings planted in each pot. The Sands used in design was without nutrients and organic matter and pH=5.7.

Table 1: Physical and chemical properties of used soil in the pots

percentage			**Soil texture**	**Soil organic matter (%)**	**Electrical conductivity ($ds.m^{-1}$)**	**Acidity**	**Nitrogen(%)**	**Potassium ppm**	**Phosphorus ppm**
Clay	Silt	Sand							
10	50	40	Loam	1.28	1.43	7.5	0.06	127	8.5

Characteristics measurement : It was elute the media in each treatment by water. After exiting the cuttings from their substrates the washing carried out again. After 20 minutes those cuttings roots were dried, selected cuttings were transferred to the laboratory. Number of roots were enumerated, roots length were measured by ruler in centimeter, roots fresh weight (gram) were measured by balance AND model made by Japan country to a sensitivity of 0.00001. Afterwards samples were placed in oven (74°c), dry weight of roots were measured after 24 hours.

Statistical calculation : It is used SAS software version 9.1 for data analysis. Comparison of mean had done by Duncan test. It is used Excel software for drawing the charts.

RESULT AND DISCUSSION

Number of roots : The result of data analysis showed the effect of auxin hormone (IBA) was significant on number of roots characteristics (Table 1). Application of auxin hormone was caused increasing the roots number, qua 4500 ppm treatments increased number of roots than control sort of 39.6%. (Table 3).It was added rooting percentage and number of roots in each cutting by adding the amount of IBA from 1000 to 4000 ppm in semi-hardwood cuttings of *Callistemon citrinus* (Singh, 1992). Media had significant effect on number of roots according to analysis of variance' table (Table 2). Mean comparison of data ($P \leq 0.05$) showed the maximum number of roots (30 roots) was measured in sand substrates (Table 4). Investigation of IBA hormone and media on rooting of Yaghouti grape showed the maximum roots number were obtained in farming soil + sand media (Galavi et al., 2013). Interaction effect of hormone application and media on number of roots showed the maximum numbers of roots were observed in 3500 ppm IBA and farming soil+ sand media (figure 1). Application of IBA hormone (5000 ppm) and sphagnum peat: perlite (1:3) media were effective on rooting of cuttings for propagation of evergreen trees *xylosmacongestum* (Kubo, 1995).

Table 2: The results of analysis of variance on number of roots, roots length, fresh and dry weight of *Callistemon citrinus* plants cuttings

Variation source	df	Roots number	Roots length (cm)	Roots fresh weight (g)	Roots dry weight (g)
Auxin	4	240.078**	2166.938**	0.089**	0.056**
Media	2	122.689**	2276.5**	0.002 ns	0.003 ns
Media × Auxin	8	57.828**	641.24*	0.028**	0.025**
error	30	5.911	99.25	0.001	0.001
Variation Coefficient (%)	-	8.98	10.19	10.74	9.08

ns, *, ** are non-significant and significant at (P≤0.05) and (P≤0.01)

Table 3: Mean Comparison in auxin effect on rooting characteristics of ***Lonicera japonica***

Treatment	Number of root	Roots length (cm)	Root fresh weight (g)	Root dry weight (g)
control	19.67 d	78 c	0.166 c	0.057 c
IBA (1500 mg/l)	24.45 c	89 bc	0.175 c	0.067 c
IBA (2500 mg/l)	27.89 bc	93.98 bc	0.249 b	0.123 b
IBA (3500 mg/l)	31 ab	114.4 a	0.414 a	0.253 a
IBA (4500 mg/l)	32.57 a	97 b	0.251 b	0.141 b

The means containing same words hasn't have significant differences (P≤0.05) in each column

Table 4: Mean comparison at effect of media on rooting characteristics of ***Lonicera japonica***

treatment	Root number	Roots length (cm)	Root fresh weight (g)	Root dry weight (g)
Farming soil	20.5 c	71.26 c	0.243 a	0.116 a
sand	30 a	89.18 b	0.25 a	0.137 a
Farming soil + sand	24.93 b	111.9 a	0.261 a	0.141 a

The means containing same words hasn't have significant differences (P≤0.05) in each column

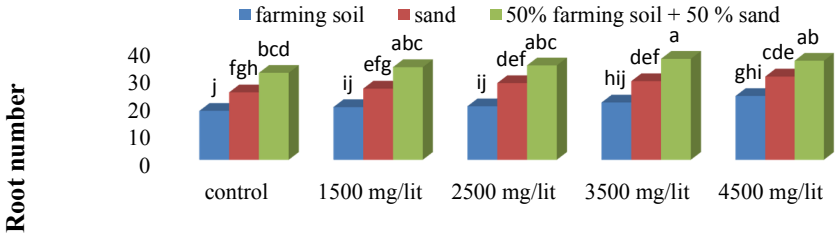

Figure 1: Interaction effect of IBA hormone and media on number of roots in *Lonicerajaponica*

Roots length : The result of statistical analysis showed IBA hormone showed significant effect on the length of roots characteristics (Table 2). Comparison of data mean showed IBA hormone caused increasing the roots length. The treatment 3500 ppm IBA increased roots length 31.81% than control (Table 3). In investigation the effect of zinc sulfate, IBA and NAA on rooting of semi-hardwood cuttings of Aralia spp. plant and it's bio-environment' effect, the best roots length had gotten in cuttings that treated by 2000 ppm IBA (Rahdari et al., 2010). The media had significant effect on roots length characteristics (Table 2). Mean comparison of data showed (P≤0.05) the best roots length (111.9 cm) got in media containing farming soil + sand (Table 4). Effect different treatments on rooting of *Juniperusexcelsa* showed sand media particulate (0.02-0.2 mm) sit in a group (Khoshnevis et al., 2007). Interaction effect of IBA and media were significant on roots length (Table 2). The most roots length was observed by application of 3500 ppm IBA and in the media containing farming soil + sand (figure 2). Application of 5000 ppm IBA in *Accasia spp*. cuttings increased roots length, rooting percentage and roots number in February month than August month significantly (Singh, 1993).

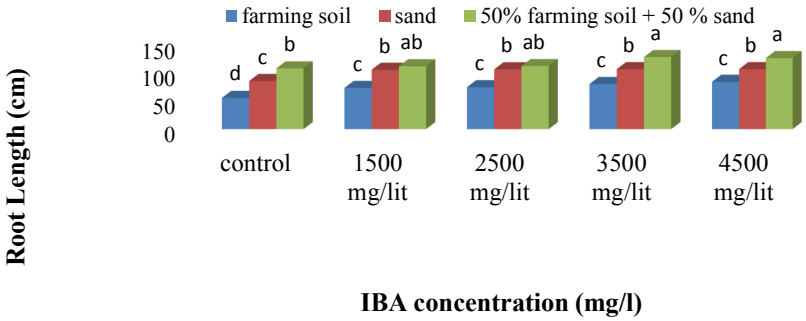

Figure 2: Interaction effect of IBA and media on root length of *Lonicera japonica* cuttings (The means containing same words hasn't had significant differences (P≤0.05) according to Duncan test

Root fresh weight : Result of statistical data analysis showed IBA hormone had significant effect on root dry weight (P≤0.01) (Table 2). Mean comparison of data showed application of IBA (3500 ppm) increased (59.9%) root fresh weight than control (Table 3). Application of IBA (3000-4000 ppm) had positive result in propagation of ornamental plants such as *Rosa* and *Rosa chinensis* (Al-Sagri and Alderson, 1996). The media hadn't had significant effect on roots fresh weight statistically. Interaction effect of IBA hormone and media was significant on roots fresh weight, too (Table 2). The maximum roots fresh weight in treated cutting had gotten in 3500 ppm concentration of IBA and in the media containing farming soil + sand (Figure 3).

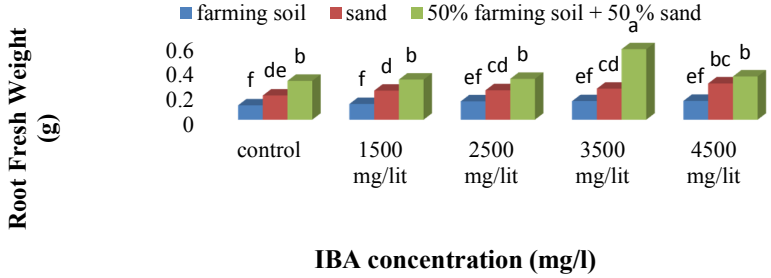

Figure 3: Interaction effect of IBA and media on roots fresh weight in *Lonicera japonica* cuttings(The means containing same words hasn't had significant differences (P≤0.05) according to Duncan test

Roots dry weight : Application of auxin hormone had significant effect on roots dry weight (Figure 2). Means comparison of data showed usage of IBA (3500 ppm) increased (77.47%) roots dry weight than control (Figure 3). The effect of different concentration of IBA (in concentration of 3000-4000 ppm) eventuated to increasing the dry weight of roots in *Neriumoleander* L. (Habibicotenaii, 2010). The effect of different media treatment hadn't had significant effect on roots dry weight in *Lonicera japonica* cuttings (Figure 2). Investigation of different media (sand, sand + peat moss + common soil) had significant effect on rooting of *Rhuscoriaria* L. cuttings (Figure 2). The maximum dry weight of roots got in usage of IBA (4500 ppm) and the media containing farming soil + sand (Figure 4). Effect of nutrition medium containing auxin specially IBA was significant on number of roots, survival percentage of cuttings, roots fresh and dry weight. These researchers concluded that IBA (4000 ppm) in perlite media was suitable on rooting of cuttings (Saffari and Saffari, 2012).

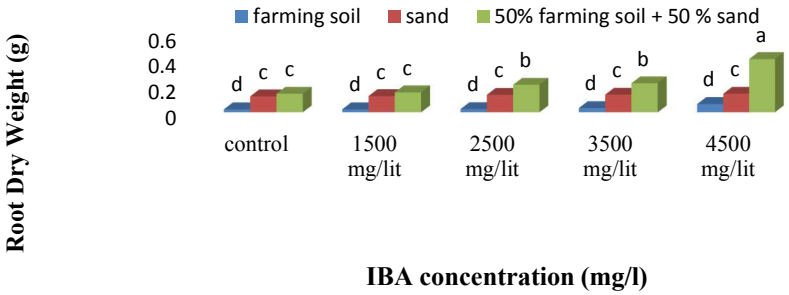

Figure 4: Interaction effect of IBA hormone and media on dry weight of roots in *Lonicera japonica* cuttings (The means containing same words hasn't had significant differences (P≤0.05) according to Duncan test

The result of this research showed application of IBA hormone and suitable media was effective in enhancement of rooting characteristics of *Lonicera japonica* cuttings together mist system and were produced more rooted cuttings for propagation of this ornamental plants.

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