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Study on the effect of cutting location on shoot and IBA on rooting of 'Night Jessamine' (Cestrum nocturnum) stem cuttings

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ABSTRACT: In order to evaluate of the cutting location on shoot and Indule butyric acid (IBA) on rooting of 'Night Jessamine' (Cestrum nocturnum) stem cuttings, this study was performed as factorial arrangement in randomized complete block design in mist greenhouse with 4 replications and 10 cuttings per replicate. For this purpose was prepared annual shoots of plant as cutting source and was divided from half. Then was prepared 15 cm long cuttings from each part of shoot and was treated by 0 (distilled water), 1000, 1500, 2000 and 4000 mg/L IBA for 5 seconds and was cultured in pots containing sand and peat-moss. After 75 days was recorded rooting percent; grown cutting percent; root number in each cutting; root length; root fresh and dry weight. Based on results, the cuttings of upper part of shoot significantly were better than the cutting of lower part of shoot especially in relation to rooting percent and grown cuttings percent. IBA 2000 and 4000 mg/L significantly were better than other concentrations.

Keywords*:* Above and below cuttings, Rooting, Vegetative propagation.

INTRODUCTION

'Night Jessamine' (Cestrum nocturnum) is the perennial and evergreen plant and belongs to Solanaceae family. This plant is shrub with 4 m height. It has very fragrant flowers and in many countries is used for ornamental uses because of its fragrant flowers in night time (Huang et al., 2006). Propagation by cutting is the most important method for ornamental shrubs, deciduous species and mono- and dicotyledonous evergreen types as well (Hartman et al., 1997). Stem cuttings are the most important cutting types that based on the nature of the wood is used for making cuttings, are divided to four groups: hardwood, semi-hard wood cuttings, softwood and herbal cuttings (Daneh-loueipour et al., 2006). The chemical composition of upper and lower cuttings of a plant is different (Hartman, 1997). It has been observed the changes in production of root in the cuttings of different part of shoot. In many cases, the highest root has been produced in the cuttings which have been made from lower parts of the shoot (Satisha et al., 2007) but in some species that soft wood cuttings are used, the upper shoots have better rooting. Probably the rooting ingredients have more concentration in the buds and also cell differentiation in lower cutting is less (Suxia et al., 2009). Although different components such as CO, Acetylene and Ethylene have been used for rooting of stem cuttings but commercial derivations of Auxin such as IAA, NAA and IBA have much influence on rooting of cuttings (Panwar et al., 1994). Nowadays this subject has been accepted and primary findings so many times have been confirmed that both similar Auxin materials IBA and NAA which do not find in nature, while are mote effective for rooting than IAA (Khan et al., 2006). Blythe (2004) evaluate the different concentrations of IBA and NAA for rooting of rooting of 'Cammelia japonica' cuttings and observed that 3000 mg/L IBA and 2500 mg/L IBA plus 1250 mg/L NAA increases rooting percent in the cuttings. Singh et al. (2011) reported that 4000 mg/L IBA under mist system has been greatest influence on rooting of 'Bougainvilla spectabilis' cuttings. Al-Sagri and Alderson (1996) reported that in propagation of Rose plant by leafy and hardwood cutting, 1000 and 3000 mg/L IBA increased root numbers than control treatment. Singh (2001) in study on 'Jasmine' cuttings showed that 2000 mg/L IBA

had significant different to other treatments in viewpoint of rooting percent, root length and root fresh and dry weight.
Regarding to many demand for rooted plants of 'Night Jessamine' and low rooting ability of its stem cuttings, this experiment has been performed in order to evaluate the effect of cutting location on shoot and IBA on rooting behavior of this plant.

MATERIALS AND METHODS

Plant materials were prepared from 5-years-old 'Night Jessamine (Cestrum nocturnum)' plants that have uniform vegetative growth in the winter of 2011. For preparing of Semi-woody cuttings were used annual shoots with about 130-150 cm long and about 7-9 mm diameter. The stem cuttings had 15 cm long and two buds and were prepared from upper and lower of shoot. The cuttings were disinfected by 3% sodium hypo-chloride for 5 seconds and then were washed by sterile distilled water. The cuttings were treated by 0, 1000, 1500, 200 and 4000 mg/L IBA for 5 seconds and were cultured in the pots containing sand and peat moss. Culture place was the greenhouse equipped with mist system (20 seconds time intervals in 20 minutes for day and 20 seconds in one hour for night). Greenhouse temperature was regulated on 20±1 ℃ in day and 15±1 ℃ in night. After 75 days was recorded rooting percent; grown cutting percent; root number in each cutting; root length; root fresh and dry weight. Obtained data was analyzed by using SAS 9.1 software and the means was compared by Duncan's new multiple range test in 5% level.

RESULTS AND DISCUSSION

Influence of cutting location on shoot

Results of variance analysis showed that cutting location on shoot had significant influence on rooting percent and grown cuttings percent in 1% level but had no significant effect on other evaluated characters (Table 1).

Table 1. Data analysis of variance in relation to rooting characters of 'Night Jessamine' cuttings

S.O.V	D.F	Mean Square					
		Rooting %	Grown cuttings %	Root No. in cuttings	Root length	Root fresh weight	Root dry weight
Replication	3	165.0^{ns}	58.3^{ns}	0.911^{ns}	4.218^{ns}	0.150^{ns}	0.0008^{ns}
Cutting type (A)	1	17405.0^{**}	4805.0^{**}	1.696^{ns}	13.211^{ns}	0.375^{ns}	0.0003^{ns}
IBA concentration (B)	4	3107.5^{**}	132.5^{ns}	38.079^{*}	7.642^{ns}	0.276^{ns}	0.0051^{*}
Interaction AB	4	417.5^{ns}	342.5^{ns}	28.699^{*}	4.896^{ns}	0.366^{ns}	0.0024^{ns}
C.V %		21.9	27.9	43.2	32.8	65.3	58.9

$^{ns, *, **}$ not significant, significant in 5 and 1% respectively.

Based on results of mean comparison, the greatest rooting percent (75.5%) was observed in cuttings of upper part of shoot that it had significant difference to cuttings of lower part of shoot (46.0%) in 5% level of DMRT. Beside grown cuttings percent of upper part of shoots (77.0%) significantly were higher than lower part of shoot (61.5%). In mean comparison of other measured characters was observed no significant difference between both cutting types (Table 2).

Table 2. Comparison the effect of cutting type on rooting characters of 'Night Jessamine' cuttings

Cutting type Character	upper	lower
Rooting %	46.0^{b}	75.5^{a}
Grown cuttings %	61.5^{b}	77.0^{a}
Root No. in cuttings	7.5^{a}	7.8^{a}
Root length (cm)	7.3^{a}	8.1^{a}
Root fresh weight (g)	0.711^{a}	0.550^{a}
Root dry weight (g)	0.067^{a}	0.063^{a}

Means in each column, followed by similar letters are not significantly different at 5% level of DMRT.

Results showed that upper cuttings were better that lower cuttings. In this relation, has been reported that there are the cells in younger part of shoots (upper cuttings) which in view point of metabolic activities are the more active than mature tissues and their cell wall has been fewer ligneous. This subject is leading to the more absorption of auxin, water and nutrient. Therefore rooting potential and grown cuttings percent in upper cuttings is higher than lower cuttings (Taiz and Zeiger, 2006; Suxia et al., 2009). Whereas other measured characters in both cutting types are in same statistical level, it seems these cuttings are same in viewpoint of internal nitrogen but have difference in viewpoint of carbohydrate amount (Bragt et al., 2001).

Influence of IBA concentration

Based on results of analysis of variance table, IBA had significant influence on rooting percent in 1% level and on root number in cutting and root dry weight in 5% level while had no effect on length and fresh weight of root and grown cuttings percent (Table 1). Grown cutting percent and root length in control treatment and all concentrations of IBA were in same statistical level. The greatest rooting percent was observed in 4000 mg/L IBA that had no significant difference to 2000 and 1500 mg/L IBA (68.8 and 66.2% respectively) in 5% level of DMRT. The lowest rooting percent (37.5%) obtained from cuttings of control treatment. The highest root number (10.2) was in 4000 mg/L IBA that had significant difference in 5% level to other concentrations of IBA and control treatments. The greatest root weight (0.861 g) was in 4000 mg/L IBA that had no significant difference to 1000 mg/L IBA in 5% level of DMRT. From the viewpoint of root dry weight also 4000 mg/L IBA with significant difference in 5% level of DMRT was higher than control and 1000 and 1500 mg/L IBA treatments (Table 3).

Table 3. Comparison the effect of different concentration of IBA on rooting characters of 'Night Jessamine' cuttings

IBA concentration Character	0	1000	1500	2000	4000
	mg/L				
Rooting %	37.5^{c}	58.8^{b}	66.2^{ab}	68.8^{a}	72.5^{a}
Grown cuttings %	65.0^{a}	71.2^{a}	67.5^{a}	71.2^{a}	71.2^{a}
Root No. in cuttings	6.4^{b}	7.0^{b}	6.7^{b}	7.8^{b}	10.2^{a}
Root length (cm)	6.5^{a}	8.2^{a}	7.6^{a}	7.8^{a}	8.2^{a}
Root fresh weight (g)	0.470^{b}	0.687^{ab}	0.520^{b}	0.613^{b}	0.861^{a}
Root dry weight (g)	0.043^{c}	0.066^{b}	0.054^{bc}	0.071^{ab}	0.090^{a}

Means in each column, followed by similar letters are not significantly different at 5% level of DMRT.

Attentive to low rooting percent of cuttings in control treatment can be concluded that probably internal auxin amount is low for rooting induction of 'Night Jessamine' cuttings. It has been reported that auxin existence is necessary for induction of the root starter cells (Hartman et al., 1990). Obtained results in relation to influence of IBA ion rooting is according to findings of Moalemi and Chehrazi (2003) on 'Bougainvilla spectabilis'.

Interaction of cutting type and IBA concentration

Based on results of analysis of variance table, there was no significant interaction between cutting type and IBA concentration in rooting percent and root length. There was significant interaction on grown cuttings percent and root dry weight in 5% level and on root number and root fresh weight in 1% level (Table 1). The greatest rooting percent (87.5%) was in upper cuttings treated by 2000 and 4000 mg/L IBA that had significant difference with lower cuttings. Grown cuttings percent in upper cuttings was more than lower cuttings. The highest root number (11) obtained from lower cuttings that treated by 4000 mg/L IBA but it had no significant difference to this same treatment in upper cuttings. Excluding control treatment in lower cuttings, root length in other treatments was in same statistical level. Generally root fresh and dry weight of lower cuttings was higher than upper cuttings (Table 4).

Table 4. Comparison the interaction of cutting type and concentration of IBA on rooting characters of 'Night Jessamine' cuttings

Cutting type×IBA	Character	Rooting %	Grown cuttings %	Root No. in cuttings	Root length (cm)	Root fresh weight (g)	Root dry weight (g)
Lower cuttings	0	22.5^{f}	57.5^{c}	4.1^{d}	5.1^{b}	0.360^{e}	0.031^{e}
	1000	40.0^{e}	60.0^{c}	8.0^{bc}	7.9^{a}	0.981^{a}	0.088^{ab}
	1500	60.0^{cd}	67.5^{bc}	6.4^{cd}	7.4^{a}	0.628^{bcde}	0.056^{cde}
	2000	50.0^{de}	62.5^{bc}	8.0^{bc}	7.8^{a}	0.678^{bcd}	0.066^{bcd}
	4000	57.5^{d}	60.0^{c}	11.0^{a}	8.1^{a}	0.908^{ab}	0.093^{a}
Upper cuttings	0	52.5^{de}	72.5^{ab}	8.8^{abc}	7.9^{a}	0.581^{cde}	0.054^{bcd}
	1000	77.5^{ab}	82.5^{a}	5.9^{d}	8.4^{a}	0.393^{de}	0.045^{de}
	1500	72.5^{bc}	67.5^{bc}	7.0^{bc}	7.7^{a}	0.412^{de}	0.052^{cde}
	2000	87.5^{a}	80.0^{a}	7.6^{bc}	7.9^{a}	0.548^{cde}	0.076^{abc}
	4000	87.5^{a}	82.5^{a}	9.5^{ab}	8.4^{a}	0.814^{abc}	0.087^{ab}

Means in each column, followed by similar letters are not significantly different at 5% level of DMRT.

Based on results of table 4, the more measured characters in upper cuttings significantly were higher than lower cuttings. In fact, there are distinct differences between lower and upper of shoot in viewpoint of chemical composition. Furthermore it can be concluded that probably in hardwood cuttings of 'Night Jessamine' increase rooting inhibitors and disturb carbohydrate/nitrogen (C/N) ration. It has been reported that C/N ratio has important role on rooting and growth of stem cuttings (Dewayne et al., 2003). Generally, for achieving to maximum rooting and growth of cutting in 'Night Jessamine' cuttings can be recommended prepare from upper part of shoot and treated with 4000 mg/L IBA.

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