Effects of Indole-3-butyric Acid on the Rooting Ability of Semi-hardwood *Bougainvillea sp*. Cuttings

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Abstract

The experiment was carried out to investigate the effect of different concentration of Indole-3-butyric acid (IBA) on the rooting ability of semi-hardwood *Bougainvillea* flower. The treatments were control (without IBA), 2000, 3000 and 4000 ppm IBA. The cuttings were treated with IBA solution for 7 seconds and immediately transferred to the rooting medium. Perlite was used as a rooting substrate. Treatment was evaluated in a completely randomized design (CRD) with 3 replications. According to the obtained results, there was no significant difference between IBA treatment and control on rooting percentage. The best effect of different levels of IBA on the number of root (8.67 roots per plant) was obtained at 2000 ppm IBA. The highest root length (151.42 mm) was observed at control and there was no significant difference between control and 2000, 4000 ppm IBA. It can be concluded that using perlite as a rooting substrate without using IBA (control) affected rooting ability in bougainvillea flower.

Keywords: *Bogainvillea*, indole-3-butyric acid, rooting, IBA

1. Introduction

The genus *Bougainvillea*, in the Nyctaginaceae (Four-o'clock) family of plants, has 14 species, with three that are horticulturally important. *Bougainvillea* is used to decorate fences and arbors with explosions of color in the house corridor, office and play ground. A bougainvillea tree can make guarding the entry or framing a window. *Bougainvillea* is a great vine for large containers to decorate hot patios and plazas. *Bougainvillea* is also used to create beautiful flowering bonsai specimens (Sharif Hossain et al., 2007). *Bougainvillea* is native to South America. The name comes from Louis Antoine de Bougainville, a French navigator and military commander who was the first European to take note of the plant, in Brazil, in 1768 (Kobayashi et al., 2007). Softwood terminals, maturing green wood, and matured intermediate wood stem pieces can be used for propagation of *Bougainvillea* flower (Hacket et al., 1972). Softwood terminals of easy-to-root cultivars do not require a rooting hormone. With more mature wood, a rooting hormone such as IBA (3-indolebutryic acid) at 2000-6000 ppm is commonly used (Kobayashi et al., 2007). Higher concentrations may be needed with more difficult-to-root cultivars (Gilman, 1999).

Moalemi and Chehrazi (2005) reported that high percentage of rooting were for leafy cutting. In that study, the highest number of roots was obtained in leafless cutting (9.23 roots per plant) at 2000 mg L^{-1} IBA. The best effect of different levels of auxin on root length (5.79 cm) was obtained leafless cuttings at 1000 mg L^{-1} NAA. In other study, under the influence of 0.2-0.4% of IBA the cutting rooted in 66-88%. In control treatment, without auxins, the cuttings rooted 22.5-93% but their root system was very poorly developed. In the former report, rooting medium has not been said, but in the latter one, rooting medium was sand (Czekalski, 1989)

The purpose of this study is to improve rooting ability with more difficult-to-root cultivars of *Bougainvillea* flower.

2. Materials and Methods

This study was carried out at Department of Horticultural Science, Islamic Azad University of Maragheh Branch, Maragheh, Iran in 2009.

Treatment was evaluated in a completely randomized design (CRD) with 3 replications. Each replication consisted of 10 cuttings. Semi-hardwood *Bougainvillea* cuttings used in this study were taken in December.

Shoots originating from branches with flower were not taken as cutting since the presence of flower on cutting prevents rooting (Hartman et al., 1990).

Perlite was used as a rooting substrate. Auxins are widely used for promoting rooting of hardwood cuttings (Leaky et al., 1982; Smith, 1986; Hartman et al., 1990), so IBA was used as a rooting hormone. The formulations were prepared by dissolving the pure compound in 95% ethanol and adding distillated water. Cutting prepared after discarding the non-hardened upper parts bearing 4-5 buds. In order to reduce the transpiration, the leaf area was reduced 50-80%. The basal end of cuttings were dipped briefly in a fungicide solution (0.1% w/v Captain) prior to treatment with IBA solutions.

During the rooting period, the mean temperature was registered as 20^{o}C and the mean moisture was registered at 45% in the greenhouse.

To evaluate the rooting of the cutting, a 22-weeks period was taken as a basis. Czekalski (1989) indicated in his study that the rooting process lasted 10-22 weeks. After 22 weeks, root counting and measurements were performed after removing cuttings from the rooting environment. In the measurements, rooting percentage, mean root number and the mean of the longest 4 roots (mm) were recorded. The collected data were evaluated with the statistical program SAS and the means were compared using Duncan's multiple rang tests.

3. Results

The results of this experiment are summarized in Table 1. According to the results, there was no significant difference between IBA treatment and control on rooting percentage. There was significant difference between IBA treatment and control on the number of main roots per cutting. The best effect of different levels of IBA on the number of main roots per cutting (8.67 roots per cutting) was obtained at 2000 ppm IBA.

Table 1. Effect of different concentration of IBA on rooting percentage, number of main root per cutting and root length of bougainvillea flower

Treatments	Rooting percentage	Number of main root per cutting	Root length (mm)
IBA (ppm)			
Control	66.67 ^{a}	6.31 ^{ab}	151.42 ^{a}
2000	76.19 ^{a}	8.67 ^{b}	113.00 ^{a}
3000	66.67 ^{a}	4.72 ^{b}	28.69 ^{b}
4000	42.86 ^{a}	8.94 ^{ab}	107.58 ^{a}

Means in each column with same letters are not significantly different at 5% level

Also, IBA affected significantly the root length. The highest root length (151.42 mm) was observed at control (without IBA), and there was no significant difference between control and 2000, 4000 ppm.

4. Discussion

Although auxins have been successfully used to promote rooting of hardwood and semi-hardwood cuttings, (Halle & Hanif-Kamil, 1981; Leaky et al., 1982; Smith, 1983a, 1986b) rooting of easy-to-root cultivars of *Bougainvillea* cuttings has been previously reported (Kobayashi et al., 2007). Even in these cultivars with more mature wood, a rooting hormone such as IBA is commonly used. Cuttings used for this experiment were taken from semi-hardwood branches of Juvenile stockplants. Juvenility may be an important factor in the rooting potential in different plants (Momose, 1978, Halle & Hanif-kamil, 1981; Smith, 1983a, 1986b). Juvenile tissues of woody plants tend to have higher levels of endogenous auxin and are less differentiated and therefore more prone to dedifferentiated (Hackett, 1985, Hartman et al., 1990). Haissig (1974) postulated that phenols in juvenile tissues of certain plants tend to be higher than their mature forms. Also, cuttings were prepared including the apical meristems of stock plants, the region where auxins are synthesized in plants (Kramer & Kozlowski, 1979). Furthermore, rooting substrate used for this experiment was perlite. In previous studies with bougainvillea flower, has not been used perlite as a medium. Perhaps perlite has affected rooting ability. Perlite has many characteristics similar to sand and is commonly used as a low- weight replacement for sand (Dole &

Wilkins, 1999). Perlite, like sand has low water retention but excellent aeration. It is essential that the different media be compared for determining the best medium for *Bougainvillea* flower.

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