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Effect of IBA and Soil mixture on rooting of (*Hibiscus rosa*- sinensis)

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ABSTRACT

Hibiscus rosa-sinensis is a native plant of tropical and southeastern Asia. The variety of 'yellow double hybrid' is a difficult to root. For evaluation of plant rooting were Indole Butyric Acid was used in four levels of 0, 1000, 2000 and 4000 mg l^{-1} in sand-perlite and peat-perlite beds by a completely randomized design in three replications. The cuttings were selected when their heights were 12-10 cm and they had 6-8 buds. After sterilization and hormonal treatment, cuttings were planted in 3 cm depth of beds. In this study, factors such as callus time, beginning rooting, number of buds, percentage of rooting, number of root and root length were determined. The results showed that with increase in levels of rooting hormones, callus induction time and time of start of root was been reduced. On the other hand, percentage of rooting and number of root in cuttings and length of roots produced in each cutting was increased. According to the measured factors, treatment of 4000 mg l^{-1} was better treatment in increasing percentage of rooting and other affecting factors on the quality of cuttings in both mixture beds.

Keywords: Rooting, Indole Butyric acid, Sand-perlit, Peat-perlit, *Hibiscus rosa-sinensis*.

INTRODUCTION

Most of *Hibiscus* plant propagated with cutting. This plant is native to tropical and southeastern Asia (China), this plant is commonly found throughout the tropics and as a house plant throughout the world. Most ornamental varieties are hybrids [1]. Many species of Hibiscus are grown for their showy flowers or used as landscape shrubs. Hibiscus has also medicinal properties and takes part as a primary ingredient in many herbal teas. This plant is popular landscape shrub, creates a bold effect with its bed-textured, glossy dark green leaves and with 4-6 inch wide and up to 8 inch long, showy flowers, produced throughout the year and grows up to

7-12 feet [2, 3]. Essential oil of this plant has antifungal activity and one of its constituents was found to be active against human cancer cell lines in several stages of cellular division [4]. The leaves are useful inhaling of ulcers and promoting hair growth activity [1]. There are many differences between plant species and cultivars in rooting potential of cuttings and it is very difficult to forecast easy and hard to rooting of cuttings in the plants. Specific concentrations of IBA are required to start production in rooting cutting of plant.

Bhatt and Tomar examined different levels of IBA (0., 500, 1000, 1500 ppm) on rooting of *Citrus auriantifolia* Swingle (Kagzi-lime) [5]. They found that treatment of 500 ppm IBA performed the best in all aspects, as root formation, length of root, thickening of root and leaf sprouting in shoot [5]. Owais examined different levels of IBA 3000, 6000, 9000, 12000 ppm and quick dip (10 sec) on five *Jordanian pomegranate* varieties. He concluded that increasing dose of IBA can be useful in increasing rooting potential and other root characteristics [6]. Pandey et al. examined the effects of auxins including ABA and NAA on root of cuttings of *Ginkgo biloba* L. they found that the treatment of IBA have morphologically healthy in terms of their shoot height, diameter of shoot, number of nodes per cutting, number of leaves/node and number of branches per cutting than the control plants and this treatment improve the subsequent growth and survival rate of the plantlets of *G. biloba* [7]. The results of Sulusoglu and Cavusoglu showed that maximum rooting rates were obtained with 2 or 4 g/l IBA for most of the types of cherry. 1 or 2 g/l IBA obtained the maximum root length and increased the rooting length and root quality in compared with control. The average number of roots increased in 2 g/l IBA [8]. Kumari et al with effect of IBA on rooting in Cuttings of *Jatropha Curcus* L Strain DARL-2 found that applied of IBA is useful for improved rooting for vegetative propagation of Jatropha [9].

Rooting of cuttings is an active process and the root formation of cutting differentiates for every cutting. Most varieties of *Hibiscus* are easy to root. Variety of 'yellow double hybrid' is hard to root. consequently, study of achieve methods such as the use of hormones and Co-factors of rooting of cuttings, control of environmental conditions, select the appropriate planting bed and etc for increase rooting of cuttings in these variety are necessary. The results of this study cause to speed, quality and production performance. Thus, it has better economic efficiency for producers and more satisfaction for consumer.

MATERIALS AND METHODS

The cuttings were selected from middle of developed shoots in *Hibiscus rosa-* sinensis 'yellow double hybrid'. They had 8-6 buds and all sizes of cuttings were 12-10 cm. After sterile with Captan fungicides and hormonal treatment (quick dip, 5 seconds) cuttings planted in the depth of 3 cm on planting bed. Environment temperature of cuttings was 24-27 °C and bed temperature was usually 24-22 °C. Light intensity in the environment of cuttings was 5000 luxe. Greenhouse humidity was maintained in the range of 95-85 percent. Growth bed was sand-perlite and peat-perlite that usually are used for rooting of semi hardwood and hardwood cuttings in the greenhouses. Three concentrations of IBA hormone 1000, 2000, 4000 mg l^{-1} with control (without ABA) were used in this experiment. This experiment including 4 treatments, each of treatment in three replicates, each replication consisted of five cuttings and totally, 12 experimental units were for each bed. In the end of experiment, traits such as root diameter, root

length, number of root, percentage of rooting, percentage of green cuttings, number of buds, rooting start, callus induction were investigated. All cuttings were excluded from beds at the end of experiment after (70 days) and sampling was completed. The cutting samples were removed to observe the variation of cutting properties. Variance analysis of data was carried out and from Least Significant Difference was used in the comparison of mean data at 5% probability level.

RESULTS AND DISCUSSION

In sand-perlite bed, treatments of 2000 and 4000 mg l^{-1} IBA and in peat-perlite bed, treatment of 4000 mg l^{-1} IBA had fast time of callus induction with 43 and 28 days, Respectively In sand-perlite bed, 2000 mg l^{-1} IBA and peat-perlite bed, treatment of 4000 mg l^{-1} IBA had fast time of beginning rooting with 60 and 45 days, respectively. In sand-perlite and peat-perlite beds, 4000 mg l^{-1} of IBA treatment had maximum number of buds (Tables 1, 2).

Table 1: The effect of IBA on rooting traits on sand- perlite bed

Treatments	Root diameter (mm)	Root length (mm)	Number of root	Rooting (%)	Green cuttings (%)	Number of buds	Beginning Rooting	Callus induction
0 (control) mg l^{-1}	0	0	0	0	20	0.33	71.67	60.33
1000 mg l^{-1}	1.03	1.27	1.67	13.33	26.67	0.66	70.33	50
2000 mg l^{-1}	1.76	1.99	2.67	33.33	60	1.67	63	43
4000 mg l^{-1}	1.38	3.87	2.67	33.33	60	2	60	43

Values followed by the same letters in each row are not significantly different ate the 0.05 level (Least significant Difference).

Table 2: The effect of IBA on rooting traits on peat-perlite bed

Treatments	Root diameter (mm)	Root length (mm)	Number of root	Rooting (%)	Green cuttings (%)	Number of buds	Beginning Rooting	Callus induction
0 (control) mg l^{-1}	0	0	0	0	25	0.32	69.33	58.33
1000 mg l^{-1}	1.57	2.45	2.33	26.67	55.33	1.67	60	43
2000 mg l^{-1}	2.09	3.98	4	66.67	86.67	2.33	46	29
4000 mg l^{-1}	2.13	4.87	4.33	66.67	86.67	2.67	45	28

Values followed by the same letters in each row are not significantly different ate the 0.05 level (Least significant Difference).

In sand-perlite bed, the treatment of 2000 and 4000 mg l^{-1} IBA had the largest percent of green cutting (with 60%). The highest green cutting in peat-perlite bed is related to 2000 and 4000 mg l^{-1} IBA. In sand-perlite bed, treatment of 2000 and 4000 mg l^{-1} IBA with 33.33 percent had highest Percentage of rooting. In peat-perlite bed, treatment of 2000 and 4000 mg l^{-1} of IBA with 66.67 percent had highest Percentage of rooting (Tables 1, 2).

In sand-perlite bed, treatment of 2000 and 4000 mg l^{-1} IBA with 2.67 and in peat-perlite bed treatments of 4000 mg l^{-1} IBA with 4.33 had maximum number of root. Both sand-perlite bed and peat-perlite bed, treatment of 4000 mg l^{-1} IBA with 3.87 and 4.87 had maximum root diameter. In sand-perlite and peat-perlite bed, maximum root length observed to 4000 mg l^{-1} IBA with 1.38 and 2.13 mm, respectively (Tables 1, 2).

The rooting rate and root quality of cuttings changes pay attention to type of plant. Auxins plays principal role in the process of root formation. For successful rootting induction, plants should be contained a certain quantity of IBA [8]. The application of IBA may have an indirect influence by enhancing the speed of transformation and movement of sugar to the base of cuttings and consequently rooting. Obtained Results had a conforming to the results of Pandey et al. [7]. According to results, callus induction days and beggining rooting decreased with increase in IBA concentrations in two beds (sand-perlite and peat-perlit). Similar results have been reported by Kumari et al. [9]. They believed that auxins can control cell enlargement, bud formation and root initiation and also promote the production of other hormones [9].

Habibi Kotenaei reported that the increase of auxin concentrations tend to increase in oleander plant rooting (*Nerium oleander* L.) and subsequent increase in IBA decreased plant rooting. This result was also obtained in peat-perlite bed, but the rooting percent remained constant with increasing IBA concentrations in sand substrate [10]. Govinde- Soulange et al. reported that IBA increased the number of root in every cutting, but it decreased root number at the higher amounts [11]. They concluded that IBA has a positive effect on the cutting number of *H. sabdariffa*, significantly [11]. At present study, IBA had the same effect on root number. In sand-perlite bed, with increasing concentrations of IBA, root length increased, about root length our results in sand-perlite bed are similar with results of Habibi Kotenaei, but in peat-perlite bed, can be observed difference between these two results [10]. Kesari et al. investigative effect of auxin on rooting of *Pongamia pinnata* and concluded that auxin concentrations affects the beginning rooting, umber of roots and length of roots [12]. The increase in length of cuttings and increase in diameter seemed to be due to the use dry matter for the shoot growth that auxinmakes it [11]. Bhatt and Tomar believe that with increased auxin levels, root diameter also increased. This phenomenon might be attributed due to greater metabolic activity and maximum utilization of sugar and starch after hydrolysis from stem [5].

In an experiment, increase concentration in IBA from 1000 to 2000 mg l^{-1}, increased the root length, number of root, root fresh weight and root dry weight in cuttings that seems to be due to the effect of this regulator on stimulation of rooting [13]. Akinyele concluded that auxine and substrate are effective on characteristics such as root length, number of root, percentage of survivability of plants [14]. In plant roots, auxin is critical for patterning and morphogenesis. It regulates cell elongation and division, the development and maintenance of root apical and other processes [15].

CONCLUSION

This study provides preliminary results about cutting propagation of *Hibiscus rosa- sinensis*. The best result was actually obtained in cuttings with 4000 mg l^{-1} IBA and peat-perlite bed. The results of this investigation are expected to effective in commercial cutting propagation of *Hibiscus rosa- sinensis.*

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