ROOTING IN HIBISCUS ROSA- SINENSIS (YELLOW DOUBLE HYBRID’) BY INDOLE BUTYRIC ACID AND ROOTING SUBSTRATES

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ABSTRACT: Hibiscus belongs to Malvaceae family. Conventionally, it is cultivated by stem cutting. For study on effect of IBA and different Substrates on Hibiscus rosa- sinensis, a factorial experiment arranged based on RCB design with two factors: 1. four levels of Indole Butyric Acid (IBA) (0, 1000, 2000 and 4000 mg l\textsuperscript{-1}) and 2-four substrates as growth media (Sand, Coco peat, Sand-perlit and peat-perlit) in three replications. Root diameter, root length, root number, rooting, green cuttings, number of buds, root beginning and callus induction. Results showed that the effect of Indole Butyric Acid and substrates were significant on all of traits (p≤ 0.01 and 0.05) and interaction effects of IBA and substrates were significant on root length, root number, rooting, number of buds, root beginning and callus induction. The highest root diameter (2.13 mm), the highest number of root (4.33) but the highest buds numbers obtain in sand-perlit substrate and same concentration of 4000mg l\textsuperscript{-1} IBA and peat-perlit substrate. The lowest root beginning (45 days) and the lowest callus induction (28 days) were observed in same concentration of IBA and peat-perlit substrate.

Key words: Hibiscus rosa-sinensis, IBA, Rooting Substrates, Rooting.

INTRODUCTION

Hibiscus rosa- sinensis belongs to Malvaceae family. Conventionally, it is cultivated by stem 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 [3]. This plant useful in landscape with medium-textured. The characteristic of this plant are glossy dark green leaves with 4-6 inch wide and up to 8 inch long, showy flowers that produced throughout the year and grows up to 7-12 feet [6, 7]. This plant have medicinal and industrial application and has a resistance to fungal pathogens [12]. Specific concentrations of IBA are required to start production in rooting cutting of plant. 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. Bhatt and Tomar (2010) examined different levels of IBA (viz., 500, 1000, 1500 ppm) on rooting of Citrus auriantifolia Swingle (Kagzi-lime). 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 [2]. Owais (2010) 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 [11]. Kumari et al (2010) 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]. 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 [15]. Pandey et al. (2001), [13] 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 [13].
Most varieties of Hibiscus are easy to root, but variety of *Hibiscus rosa-sinensis* ‘yellow double hybrid’ is hard to root. Rooting of cuttings is an active process and the root formation of cutting differentiates for every cutting. The rooting rate and root quality of cuttings changes pay attention to type of plant. Therefore, studying for achieve methods and skills such as the use of hormones and Co-factors of rooting of cuttings, control of environmental conditions, select the appropriate planting media and etc for increase rooting of cuttings in these variety are necessary. The results of this study cause to speed, quality and production performance. Consequently, it has greater economic efficiency for producers and more satisfaction for consumer.

**MATERIALS AND METHODS**

Hardwood dormant cuttings of *Hibiscus rosa-sinensis* ‘yellow double hybrid’ were prepared from vigorous shoots of this plant. All sizes of cuttings were 12-10 cm and they had 8-6 buds. After sterile and hormonal treatment (quick dip, 5 seconds), cuttings planted in the depth of 3 cm on different rooting substrates. Environment temperature of cuttings in the greenhouse was 24-27 °C and substrates temperature was usually 24-22 °C. Light intensity in the environment of cuttings was 5000 luxe. Greenhouse and environment humidity was maintained in the range of 95-85 percent.

Growth medium was sand and coco peat that usually are used for rooting of semi hardwood and hardwood cuttings in the greenhouses in north of Iran. Three concentrations of IBA hormone (1000, 2000, 4000 mg l\(^{-1}\)) with control (without ABA) and four rooting substrates (Sand, Coco peat, Sand-perlit and peat-perlit) were used in this experiment. This experiment including 16 treatments, each of treatment in three replicates, each replication consisted of five cuttings and totally, 48 experimental units.

At the end of experiment, traits such as root diameter, root length, number of root, percentage of rooting, percentage of green cuttings, number of buds, root beginning, callus induction were investigated. All cuttings were excluded from medium at the end of experiment after (70 days) and sampling was completed. Variance analysis of data was carried out and from Least Significant Difference was used in the comparison of mean data at 5% and 1% probability level.

**RESULTS AND DISCUSSION**

The overall results of the effects of IBA and different substrates on root diameter, root length, root number, rooting, green cuttings, number of buds, root beginning and callus induction are summarized in Table 2. Based on analysis of variance (Table 1), the effect of IBA and different substrates on the root diameter, also the interaction effect of IBA and different substrates on the root diameter was significant at 0.05 level of probability. Both IBA concentrations and different substrates significantly affected root number (p<0.05). Cuttings in coco peat-perlite substrate and 4000 mg l\(^{-1}\) IBA had highest root number. IBA treated cuttings gave highest roots than control cuttings in all substrate types (Table 2). Rooting substrates and IBA concentrations statistically affected number of buds per cuttings (Table 1 and 2). More personage of rooting were produced by cuttings in coco peat-perlite than the other Rooting substrates (p<0.05). All IBA treated cuttings gave more percentage green cutting than the controls (p<0.05). 4000 ppm IBA has the best treatment in root beginning and callus induction for all of substrates (Table 2). There were differences between rooting substrates and IBA concentrations in root diameter, but this different is not significant (Table 1 and 2).

<table>
<thead>
<tr>
<th>S.O.V.</th>
<th>df</th>
<th>Root Diameter</th>
<th>Root Length</th>
<th>Root Number</th>
<th>Rooting</th>
<th>Green Cutting</th>
<th>Number Of Buds</th>
<th>Root Beginning</th>
<th>Callus Induction</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBA</td>
<td>3</td>
<td>6.57*</td>
<td>2.61*</td>
<td>0.52*</td>
<td>0.35*</td>
<td>0.52*</td>
<td>0.74*</td>
<td>0.49*</td>
<td>0.52</td>
</tr>
<tr>
<td>Substrates</td>
<td>4</td>
<td>1.22*</td>
<td>0.83*</td>
<td>0.13*</td>
<td>0.00*</td>
<td>0.25*</td>
<td>0.00*</td>
<td>0.25*</td>
<td>0.00</td>
</tr>
<tr>
<td>Error</td>
<td>19</td>
<td>0.20*</td>
<td>0.49</td>
<td>0.77</td>
<td>206.11</td>
<td>202.77</td>
<td>0.004</td>
<td>17.52</td>
<td>45.31</td>
</tr>
</tbody>
</table>

*: significant level at 1%
*: significant level at 5%
*: no significant
The results obtained in this study indicated that root length, root number, rooting, number of buds, root beginning and callus induction were significantly affected by rooting substrates and IBA concentrations. Auxins plays main role in the process of root formation. For successful rooting induction, plants should be contained a certain quantity of IBA [15]. According to results, callus induction days and start rooting decreased with increase in IBA concentrations in all rooting substrates. Similar results have been reported by Kumari et al. (2010). They believed that auxins can control cell enlargement, bud formation and root initiation and also promote the production of other hormones [9].

Habibi Kotenaei (2010) 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 all rooting substrates. In all rooting substrates, with increasing concentrations of IBA, root length increased. About root length our results in sand substrates are similar with results of Habibi Kotenaei (2010), but in other substrates can be observed difference between these results. The increase in length of cuttings and increase in diameter seemed to be due to the use dry matter for the shoot growth that auxins makes it [4]. Kesari et al. (2010) 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. 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. (2011). Govinde- Soulange et al. (2009) reported that IBA increased the transformation and movement of sugar to the base of cuttings and consequently rooting. Obtained Results had a positive effect on the cutting number of H. sabdarifff, significantly. At present study, IBA had the same effect on root number.

Akinbile (2010) concluded that auxine and substrate are effective on characteristics such as root length, number of root, percentage of survivability of plants [1]. 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 [10]. In an experiment, increase concentration in IBA 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 [14]. Bhatt and Tomar (2010) 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 [2].
CONCLUSION AND RECOMMENDATION

This research showed that the choosing an appropriate concentration of IBA and rooting substrates was effective on balanced increasing of rooting traits by 4000 mg l\(^{-1}\) IBA and Coco peat- perlite substrate. Increasing IBA levels caused to decrease in root beginning and callus induction. The best treatment for this study is I\(_4\)S\(_4\) (with 4000 mg l\(^{-1}\) IBA and Coco peat- perlite substrate)

REFERENCES


