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Influence of Light Intensity on Lucky Bamboo Growth (*Dracaena sanderiana*)

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Abstract

This research had conducted to investigate light intensity effects on the lucky bamboo growth in Islamic Azad University, Abhar Branch. The experiment arranged as a complete randomized block design with five treatments (0.75, 1.14, 1.89, 2.29 and 4.09 µmol m^{-2} s^{-1}) in ten replications. Results showed that 1.89 µmol m^{-2} s^{-1} had significant differences than other treatments. The higher level of root number, shoot length and total weight of plants were obtained under 1.89 µmol m^{-2} s^{-1}. Number of shoot, shoot length and number of leaves per shoot were different in different nodes and were highest in uppermost node.

Keywords: *Dracaena*, Light intensity, Lucky bamboo, Vegetative propagation.

INTRODUCTION

Plant characteristics and the primary growth duration are crucial factors in determining the ultimate fate of the plants. Therefore, it is necessary to be tried always seedlings have suitable condition. Seedling growth and quality influenced by environmental factors including light intensity (Lavendar, 1984). The change in environmental factors such as light intensity changes and other factors caused to change in final quality of seedlings (Chaar *et al.,* 1997). Seedling producers can regulate the seedlings growth, development, and plant vegetative quality by changing and optimizing the light intensity (Lavendar, 1984).

Lucky Bamboo (*Dracaena sanderiana*) belongs to Dracaenaceae. The species does not belong to real bamboos of the Poaceae family. This plant is popular because beautiful leaves and robustness to apartment conditions. This plant needs indirect and low light intensity (Brown, 2008).

Brown (2008) reported that different plants have different light intensity requirement and low light intensity plants need 50-250 foot candles. Even some plants tolerated 10-foot candle artificial light intensity. Blackman & Wilson (1951) reported that leaf area and growth rate in different species is affected by light intensity. The results of previous experiments, is confirming the positive effects of light on plant growth. So that West *et al.,* (1996) reported that shade is a major factor for the elongation growth of some oak species. The purpose of this study is determination the best light level for Lucky bamboo cuttings growth.

MATERIALS AND METHODS

To study of light intensity effects on growth and health on lucky bamboo cuttings without leaves, a pot experiment carried out in 2008 at the Islamic Azad University, Abhar branch. This trial conducted as randomized complete block design and with five treatments of light intensity (0, 0.75, 1.14, 1.89, 2.29 and 4.09 µmol s^{-1} m^{-2}) in 10 replications. Light intensity was measured by photometer machine (Mastech MS6610 model). To light treatment performance, high-pressure sodium lamps were used at one-meter distance of plants. Difference of treatments was the result of difference in the used lamps and on-light time (Barzegar & Yadegari, 2010). Cuttings obtained with 93.6 cm length and 23 nodes. Upper part of the cuttings were covered with wax for prevent of fungi infection. Then cuttings placed individually in Plastic bottles containing distilled water and different light intensities. The average daily temperature, mean night temperature and average moisture content of trial laboratory were 27.4º C, 24.4º C and 50%, respectively. Pots were irrigated at intervals of five days. The desired traits include shoots length, root number, leaf area via handheld area gauge devices and total weight of plant were recorded. The number of shoots, length of shoots and number of leaves recorded and evaluated statistically according to the nodes (of upper part the plant). Data analyzed using MSTATC software and comparison of means performed by Duncan test.

RESULTS AND DISCUSSION

Shoot length: The results showed that the highest shoot length (8.41 cm) obtained under 1.89µmols^{-1}m^{-2} treatment (Table 1), that had not significant differences with 2.29µmols^{-1}m^{-2} treatment. More and lower of light intensity reduced the shoots length. It seems that cuttings of lucky bamboo need to average light intensity for shoots growing. West *et al.,* (1996) and Cutini & Nocentini (2000) found similar results.

Total root: This trait affected by different light treatments, so moderate light treatments 1.89 and 2.29 µmols^{-1}m^{-2} resulted in further number of roots with mean of 16 and 14 roots per cutting (Table 1). Reduce light intensity to 0.75 µmol s^{-1}m^{-2} caused grave loss is the number of roots that probably is due reduce levels of plant photosynthesis and carbohydrate store. According results the Lavendar (1984) changing the environmental conditions were actually effective on the quality of cuttings. The results indicated that appropriate level of light is a main factor on the lucky

bamboo number of cuttings roots. As the increase or decrease of optimum light level could be seen significant reduced roots number.

Leaf area and plant total weight: Results showed that 1.89 $\mu mols^{-1}m^{-2}$ of light intensity produced the maximum leaf area and plant weight (Table 1) that is accordance with the results of Cutini & Nocentini (2000) on oak. It appears to be generally that moderate light levels increase the plants cuttings biomass. Since, it resulted in keeping a balance of transpiration and optimizing in photosynthesis level. Finally, it can be increase efficiency of plant biomass production (Cutini & Nocentini, 2009).

Generally, 1.89 $\mu mols^{-1}m^{-2}$ of light treatment is the best treatment to increase the number of roots, shoots length, leaf area and plant total weight in Lucky Bamboo. Light intensity also is effective in cuttings healthy life. Therefore, we observed the maximum healthy of plants (100%) between 1.89 – 4.09 $\mu mols^{-1}m^{-2}$ of light intensity. Most deaths (45%) achieved with 0.75 $\mu mols^{-1}m^{-2}$ of light intensity. Thus, 1.89 $\mu mols^{-1}m^{-2}$ is best treatment for increasing the quality of cuttings vegetative growth. In addition, study on the number of shoots per node showed that the first node effect on increasing the length and number of shoots and leaves number per shoot was more than second and third node (Table 2). Blackman & Wilson (1951) reported that plant's growth rate is different according to the species and different lights intensity. In other words, any plant species requires a certain light intensity that should be determined during experiments. The results of this experiment showed that Lucky Bamboo is one of plants that required too little light intensity. High light intensity can be cause yellowing of leaves. Based on our results, a general recommendation for keeping these plants in apartments is:

The total amount of light produced by sodium lamps (400 w) at 3 meters distance is equivalent to 19 $\mu mols^{-1}m^{-2}$. Therefore, use of a sodium or fluorescent lamp (40 w) can provide power equal to 1.9 $\mu mols^{-1}m^{-2}$ for the plant (Barzegar & Yadegari, 2010). Consequently, the best treatment of light intensity for the optimum growth in Lucky bamboo is equivalent energy to 1.89 $\mu mols^{-1}m^{-2}$. This light can provide using a 40 w incandescent lamp at a three meters distance for shade-ornamentals.

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Tables

Table 1. Data mean comparison based on Duncan test (p<1%)

Light Intensity ($\mu mols^{-1}m^{-2}$)	Shoot length (cm)	Root number	Leaf area (cm2)	Total fresh weight (g)
4.09	6.77 b	11.18 b	7.66 b	37.59 b
2.29	7.94 a	14.6 a	8.58 b	35.29 b
1.89	8.41 a	16 a	10.96 a	62.57 a
1.14	7.32 b	11 b	7.87 b	17.57 c
0.75	4.82 c	8.4 c	4.75 c	12.49 c

Table2. Data mean comparison of experimental traits in different nodes (of upper part) based on Duncan test (p<1%)

Node	Shoot no. in node	Shoot length (cm)	Leaf no.
1	8 a	10.61 a	8.8 a
2	7.8 a	6.04 b	6.14 b
3	1.2 b	1 c	0.84 c