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Role of photoperiod on some growth characters of Amaryllis (*Hippeastrum johnsonii*), a Bulbous plant

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ABSTRACT

Day length is an important factor effective on plant growth and development. The present study describes the effects of different photoperiods (16-8, 14-10 and 12-12 h light/dark) on some growth characters of Hippeastrum johnsonii using bulblets cultured on MS basal medium. Explants were bulblets. In all cases, 16-8 h light/dark was more effective. Maximum bulblets diameter (3.15 cm), leaf length (9.80 cm), root number (2.25), root length (2.18 cm) and longest root length (2.70 cm) were observed in explants treated with 16-8 h light/dark.

Keywords: Amaryllidaceae, Bulbous plants, Light, Bulblets diameter, Leaf length, Root number and length.

INTRODUCTION

Amaryllis (*Hippeastrum johnsonii*) is an ornamental bulbous flowering plant belongs to the family Amaryllidaceae. They are native to Central and South America [6]. Propagation can be done by seed, offset bulblets and twin scaling [9]. These conventional propagations of *Hippeastrum* are slow, seasonal and variable [8]. There are only a few reports on the role of light and photoperiod on micropropagation of bulbous plants. Pati et al. [7] showed that usually 16 h photoperiod is suitable for tissue culture experiments. Perusal of literature indicates that light intensity plays an important role for satisfactory micropropagation [1, 2, 7]. Ebrahimzadeh et al. [7] observed that Anthurium explants grown under darkness did not produced any roots. Burger et al. [1] found that longer light duration proved to be the better than shorter that for rooting. Studies of Khan and Zaidi [4] on *Polianathes tuberosa* showed that longer photoperiod induced more bulb diameter. El-Shamy [3] studied the effect of plant growth regulators on micropropagation of *Hippeastrum vittatum* under continuous darkness. The purpose of current work was to improve some growth characters of Amaryllis (*Hippeastrum johnsonii*) under different photoperiods (16-8, 14-10 and 12-12 h).

MATERIALS AND METHODS

Bulbs of *Hippeastrum johnsonii* were obtained from a greenhouse in Abasabad city, Mazandaran province, Iran. Bulbs were sterilized by soaking in sodium hypochlorite solution at 10% for 20 min along with some drops of Tween-20. Bulbs were thoroughly rinsed with sterile distilled water for 15 min. Then, bulbs were transferred in the aseptic condition under a laminar air flow cabinet and immersed into ethanol 70% for 10 sec. followed by soaking in 1% mercuric chloride solution for 12 min, then transferred to 20% sodium hypochlorite solution for 10 min. Finally,

bulbs were washed by double distilled water and then separated into so-called twin scales, consisting of a basal plate and two to four scales. The twin scales of size 15 mm was used as explants. In this study, MS [5] medium was used. The medium pH was adjusted to 5.7 before autoclaving at 121°C, 1.2 kg cm^{-2} for 20 min. Cultures were incubated in a growth chamber at 25±2°C, 70-80% relatively humidity under different photoperiods (16-8, 14-10 and 12-12 h light/dark). Bulblets diameter, leaf length, root length, longest root and root number were recorded after 6 wk from the first inoculation. The statistical analysis was completely randomized block design (R.C.B.D). The recorded data were statistically analyzed using SPSS software, and the means were compared using the Least Significance Difference Test (LSD) at 5% level.

RESULTS AND DISCUSSION

Based on Table 1 (analysis of variance), significant ($p \leq 0.01$) differences were found among various photoperiods in increasing bulblets diameter, leaf length, root length and longest root length. Table 1 show that no photoperiod effect on root number was significant. Differences of bulblets diameter in explants grown under photoperiods of 16-8 h (6.70 cm), 14-10 h (6.23 cm) and 12-12 h (6.10 cm) are not noticeable (Table 2). Data presented in Table 2 shows that photoperiods of 16-8 and 14-10 h increased leaf length more than 12-12 h. Evaluation of the role of photoperiod on leaf length revealed that the maximum (9.80 cm) and minimum (7.95 cm) leaf length were obtained in explants incubated in photoperiods of 16-8 and 12-12 h, respectively (Table 2). Differences of root number in explants grown under photoperiods of 16-8, 14-10 and 12-12 h are not noticeable (Table 2). Data presented in Table 2 shows that photoperiods of 16-8 and 14-10 h increased leaf length more than 12-12 h. Evaluation of the role of photoperiod on root length revealed that the maximum and longest length (2.18 and 2.70 cm) and minimum and shortest length (1.56 and 1.90 cm) root length were obtained in explants incubated in photoperiods of 16-8 and 12-12 h, respectively (Table 2). There is no significant difference between photoperiods of 16-8 and 14-10 h. Current study revealed that rooting and bulbs diameter is affected by photoperiod. There are only a few reports on the role of light on rooting and bulb formation. Pati et al. [7] showed that usually 16 h photoperiod is suitable for tissue culture experiments. Perusal of literature indicates that light intensity plays an important role for satisfactory micropropagation [1, 2, 7]. Ebrahimzadeh et al. [2] observed that Anthurium explants grown under darkness did not produced any roots. These explants produced roots following exposure to light. Burger et al. [1] found that longer light duration proved to be the better than shorter that for rooting. Studies of Khan and Zaidi [4] on *Polianathes tuberosa* (a bulbous plant) showed that longer photoperiod induced more bulb diameter. These findings confirmed our findings about the effect of photoperiod on bulb diameter. The present investigation revealed that the medium supplemented with certain concentrations of 2-iP and NAA and suitable photoperiod influenced on most characters of multiplication and root formation of *Hippeastrum johnsonii*.

Table 1. Analysis of variance (ANOVA) for the effect of different photoperiod on some growth characters of *Hippeastrum johnsonii.*

Source of variation	df	Root length (cm)	Longest root length (cm)	Root number	Bulblets diameter (cm)	Leaf length (cm)
Photoperiod	2	4.6653^{**}	8.7101^{**}	5.6736^{ns}	0.5700^{**}	38.3060^{**}
Error		0.4315	0.7077	0.7587	0.6270	4.1310
CV (%)		35.45	38.08	44.32	27.41	22.93

**: Significant at α = 1%, ^{ns}=Not significant

Table 2. Mean comparison of the effect of different photoperiod on some growth characters of *Hippeastrum johnsonii.*

Photoperiod (light/dark)	Root length (cm)	Longest root length (cm)	Root number	Bulblets diameter (cm)	Leaf length (cm)
16-8	2.18^{a}	2.70^{a}	2.25^{a}	3.15^{a}	9.80^{a}
14-10	1.81^{b}	2.05^{b}	1.97^{b}	2.87^{b}	8.83^{b}
12-12	1.56^{c}	1.88^{b}	1.94^{b}	2.63^{b}	7.95^{c}

In each column, means with the similar letters are not significantly different at 5% level of probability using LSD test

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