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EFFECT OF LIGHT VARIABLES TREATMENTS ON GROWTH AND FLOWERING OF SAINTPAULIA (*SAINTPAULIA IONANTHA WENDI*)

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ABSTRACT

Saintpaulia is one of the most popular flowering houseplants that need a proper growing medium for optimal vegetative and reproductive growth. It has been proved that the application of supplementary fertilizers, appropriate growing medium, and the use of hormonal treatments and artificial light could provide more favorable growth and flowering conditions for most plants. For this purpose, five separate experiments were carried out to study the factors affecting the growth and flowering of this plant. The fourth experiment was carried out to investigate light intensity treatments and the use of three light levels (4000, 8000 and 11000 lux) using a fluorescent lamp. The experiment to investigate the light intensity treatment was carried out using LED lamps at four levels (red light (650-665 nm), blue light (460-475 nm), the combined light of red and blue with equal ratio and white light (380-760 nm)], 16 hours in daylight and 8 hours in darkness. All experiments were performed as a factorial experiment in a completely randomized factorial design with 5 replications. Most of the measured traits were significantly affected by the treatments of these three experiments.

1. INTRODUCTION

Saintpaulia is a modern ornamental product and has high economic importance. This plant has a rosette growth habit with fluffy and egg-shaped leaves. The flowers in this plant are formed on five round petals on short stems. The petals have no trichomes on the surface but have trichomes at the back surface and on the edges. The color of the flowers is usually blue, pink, purple, blue-purple, colorless or almost white. The flowers have two stamens with large, kidney-shaped and yellow

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flowers. The ovary is short, conical and a long style with egg-shaped fruit. This plant is a day-neutral plant and its flowering is controlled by the temperature and intensity of the light (Doll, 1999).

1.1 SAINTPAULIA FAMILY AND CLASSIFICATION

This plant belongs to the Gesneriaceae family. There are approximately 125 genera and more than 2000 species in this family (Larson, 1992). This family includes many popular houseplants. Other plants of this family that are commercially cultivated include Achimenes, Sinningia, Streptocarpus (Doll and Wilkins, 2006).

1.2 USE OF ARTIFICIAL LIGHT TO IMPROVE THE PLANTS' GROWTH PROPERTIES

Hildrum and Christopher (1968) investigated the effect of light intensity on Saintpaulia flowers. They observed that with increasing light intensity up to 12000 lux, chlorosis and necrosis are created on the leaves. The leaves can also become frizzy and fragile and prevent plant growth. In 8000 or 4000 lux light treatments, no physiological complication was observed. By applying4000 and 8000 lux light intensity, the highest number of flower stems was produced.

Jala (2011) studied the effects of different light treatments on the germination of *Nepenthes mirabilis*. Under yellow light, seedlings were the most vigorous with the highest germination index. Seedlings under yellow light and white light exhibited the highest average number of roots and light green leaves as well as greatest root length, but seedlings under green light had few roots and pale green leaves.

A study by Abbas Nejad et al. (2017) investigated the effect of light intensity on some morphological and physiological traits of Matthiola flowers. The light intensity 150 µmoles / m2 / s was considered as a control and the light intensities 225, 300, 375 and 450 µmoles / m2 / s considered as treatments. The measured indicators included plant height, leaf area, and number, leaf and stem fresh and dry weight, total chlorophyll, carotenoids, anthocyanins and total soluble sugars. The results showed that the area and number of leaves increased by 30 and 19%, respectively, by increasing the light to 300 µmoles/m^2/s, and then, decreased significantly relative to light conditions. Additionally, the fresh and dry weight of leaf and stem increased significantly by more than 25% with increasing light intensity up to 300 µmoles/m^2/s. In this study, plant height decreased with increasing light, and this decrease was significant at a light intensity of 450 µmoles/m^2/s. The value of anthocyanin increased significantly by adding light. This investigation also showed that increasing light to tolerance threshold of the plant increased photosynthetic pigments and total soluble sugars compared to the control.

2. METHODOLOGY

2.1 EXPERIMENT TIME

This experiment was conducted in a 21-month period from November 2016 to July 2018.

2.2 EXPERIMENT IMPLEMENTATION LOCATION

This project was carried out in Noshahr city of Mazandaran province, with the latitude of 35 ° and 37 minutes in the north and a longitude of 35 ° and 42 minutes in the east and a height of 2.9 meters above sea level.

2.3 EXPERIMENT DESIGN

In order to investigate the effect of light variables, this study was carried out in the form of 5 experiments as follows.

2.4 EFFECT OF LIGHT INTENSITY ON GROWTH AND FLOWERING OF SAINTPAULIA SEEDLINGS

This experiment was conducted as a factorial experiment in a completely randomized design with 3 treatments including 1-4000 lux, 2- 8000 lux and 3- 11000 lux, on two cultivars of Rapsody and Tong wensis with 5 replications for each treatment. For applying light intensity treatments, fluorescent lamps were used at the top of the floor of the pot-containing classes with 16 hours of light and 8 hours of darkness. The growing medium for this experiment was Peat moss: Perlite (Equal ratio). We also used solid fertilizer 20:20:20 to feed it.

2.5 PLANT MATERIALS

Seedlings resulting from tissue cultivation of three cultivars of Optimara, Rapsody and Tong wensis in the 6 to 7-leaf stage with a 0.7 cm diameter, which were produced in the tissue cultivation laboratory of Noshahr, were used in this study.

2.6 THE CONTROL OF ENVIRONMENTAL FACTORS

Based on the temperature of the laboratory environment recorded, the maximum temperature was set at 25 ° C in day and 18 ° C at night. The relative humidity of the environment was set on 45-55%.

2.7 MEASUREMENT OF MORPHOLOGICAL TRAITS

The number of days to flowering per plant was carried out with repeated notetakings during the plant growth period and until the end of the experiment period. The longevity of flowers in each plant was recorded by frequent notetaking during the flowering period since observing the full-opened flower until flower full beauty maintaining. The diameter of flowers was measured by using calipers and the mean diameter was used in statistical analysis. The leaf area was measured using the Digimizer software. The root of plants was exposed to the oven at 70 ° C for 48 hours and their dry weight was measured. The number of flowers in each inflorescence in each plant was counted separately. The time distance between observing the first bud and the appearance of the last flower on the plant was measured. The time distance between flowering periods since the end of each flowering period until the beginning of the next period was measured. The height of each plant was measured with a ruler from the surface of the potting soil. The length of each inflorescence in each plant was measured using a ruler.

3. STATISTICAL ANALYSIS

Statistical analysis was performed with Minitab®16 software and the comparison of the means was performed based on Tukey's test at 5% probability level. The charts were also plotted with Excel software.

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4. RESULTS AND DISCUSSION

Examining the effect of light intensity treatments on growth and flowering of Saintpaulia seedlings

The results of the analysis of variance and comparison of mean values of the data showed that light intensity treatments had a significant effect on all traits. The effect of cultivar on all measured traits of Saintpaulia was significant except for the number of flowers in the inflorescence (Table 1). The results of analysis of variance and comparison of mean values of data showed that the interaction effects of light intensity and cultivar treatments on all traits except the number of days to flowering, longevity of flower, root dry weight, flower number in inflorescence, flowering period and distance between flowering periods were significant (Table 1).

Table 1: Analysis of variance (mean square) and the effect of light intensity on morphological traits of Saintpaulia.

Source of variations	df	Number of leaves	Number of flowers	Number of buds	Number of flowering branches	Number of days to flowering	Flower longevity	Flower dia.	Leaf area	Root dry weight	Number of flowers in inflorescences	Flowering period	Dist. between flowering periods	Plant height	Inflorescence length
Light intensity	2	7.85**	0.131**	3.122**	3.13**	7.1233**	9.20**	4.5**	7.23**	5.4**	1.8**	4.298**	7.1092**	8.28**	5.24**
cultivar	1	1.16*	1.496**	1.464**	5.7**	3.288**	8.20**	1.22**	8.24**	0.7**	1.0ns	1.90**	8.2000**	5.0**	2.6**
Interaction effect of light intensity and cultivar	2	9.140**	4.14**	1.12**	5.2**	4.6ns	9.8**	2.2**	5.0*	0.0ns	1.0ns	2.2ns	4.4ns	4.1**	1.9**
error	24	3.3	0.1	8	3	5.4	5	3	1	2	0	0.2	7.5	8	0

ns, *, and **, respectively, are non-significant, significant at a probability level of 5% and 1% based on the Tukey's test

Table 2: Results of comparison of the effect of light intensity on morphological traits of Saintpaulia

Light intensity	Number of leaves	Number of flowers	Number of buds	Number of the flowering branches	Days to flowering	Flower longevity (day)	Flower diameter (cm)	Leaf area (cm2)	Root dry weight (g)	Number of flowers in the inflorescence	Flowering period (day)	Distance between flowering	Plant height (cm)	Inflorescence length (cm)
4000 lux	8.18c	5.10c	4.12c	9.2b	1.74a	5.5a	6.2b	4.11c	1.3c	8.3a	7.25a	6.68a	5.8a	5.7a
8000 lux	6.24a	5.17a	2.19a	6.4a	7.63b	7.5a	0.3a	2.13b	7.3b	0.3b	9.20b	6.58b	0.7b	7.7a
11000lux	4.22b	4.12b	4.14b	4.2b	9.51c	1.3b	6.1c	4.14a	5.4a	0.2c	8.14c	7.47c	2.5c	9.4b

The means that have one shared letter in each column have no significant difference at the 1% probability level according to Tukey's test

Table 3: Results of the comparison of the mean effect of cultivar on the morphological traits of Saintpaulia in light intensity treatments.

cultivar	Number of leaves	Number of flowers	Number of buds	Number of the flowering branches	Number of days to flowering	Flower longevity (day)	Flower diameter (cm)	Leaf area(cm2)	Root dry weight (g)	Flowering period (day)	Dist. between flowering periods	Plant height (m)	Inflorescence length (cm)
Rhapsody	2.21b	5.17a	2.19a	8.3a	1.60b	6.5a	2.3a	1.12b	3.3b	2.22a	1.50b	8.6b	2.6b
Tong wensis	22.a	4.9b	4.11b	8.2b	3.66a	9.3b	5.1b	9.13a	3.4a	7.18b	4.66a	0.7 a	1.7a

The means that have at least one common letter in each column have no significant difference according to the Tukey's test at 1% probability level.

4.1 NUMBER OF LEAVES

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar was significant at 5% probability level. Interaction effect of cultivar and light intensity treatments was significant at 1% probability level (Table 1). The results of the mean comparison of the data also showed that the highest number

of leaves was observed in the light intensity of 8000 lux and in Tong wensis cultivar with a mean of 27.47 leaves, which did not show a significant difference with 1100 lux in Rhapsody, but it had a significant difference with other treatments. The lowest leaf number was observed in 4000 lux light intensity treatments and in Rhapsody cultivar with a mean of 15.8 leaves, which was not significantly different with Rhapsody cultivar (11000 lux), but it had a significant difference with other treatments (Figure 1).

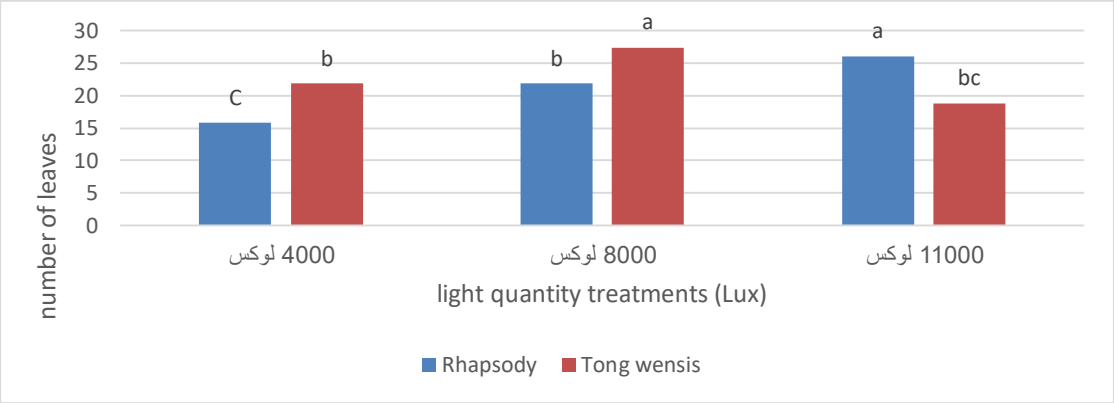

Figure 1: Interaction effect of light intensity and cultivar treatments on the number of leaves in Saintpaulia.

(a) Rapsody (b) Tong wensis

Photo 1: African violet varieties

In general, plants need adequate light to grow properly, Photo 1. Proper light improves growth

and also increases the number of leaves in the plant with the supply of energy for plant growth. These results are consistent with the results of the research conducted by Hildrum and Christopher (1969) on Saintpaulia. By increasing the intensity of light and subsequently increasing the absorption of carbon dioxide by the plant, photosynthesis increases due to increased stomatal opening and more stabilization of carbon dioxide and the number of leaves of plants increases in order to make use of the conditions. These results are consistent with the results of the research conducted by Abbasnejad et al (2017) on Matthiola plant. Lab study is shown in Photo 2.

Photo 2: Some lab photos in this study.

4.2 NUMBER OF FLOWERS

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar and light intensity, as well as the interaction effect of cultivar and light intensity, were also significant at 1% probability level (Table 1).

The results of the comparison of the mean values of the data also showed that the highest number of flowers was observed in the 8000lux light treatment and in the Rhapsody cultivar with a mean of 22.8 flowers, which had a significant difference with other light treatments. The minimum number of flowers was observed in light intensity 4000 lux and Tong wensis cultivar with a mean of 7.7 flowers, which showed no significant difference with light intensity 11000 lux and Tong wensis cultivar, but it showed significant difference with other light treatments (Figure 2). Increasing the

light intensity increases carbon dioxide and photosynthesis. As a result of increased photosynthesis, vegetative and reproductive growth increases in the plant, so the number of flowers in plants increases. These results are consistent with the results of the research conducted by Abbasnejad et al. (2017).

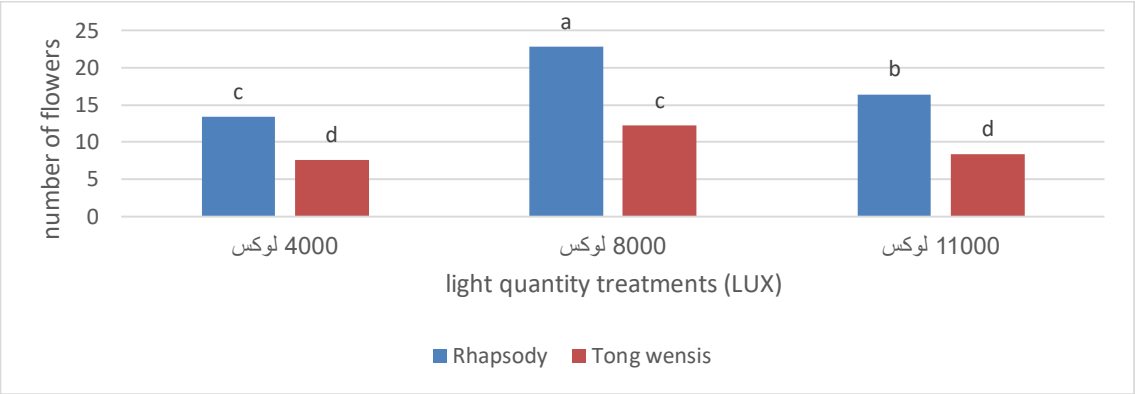

Figure 2: Interaction effect of light intensity and cultivar treatments on the mean number of Saintpaulia flowers

4.3 NUMBER OF BUDS

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar and light intensity, as well as the interaction between cultivar and light intensity, were significant at 1% probability level (Table 1). The results of the comparison of the mean values of the data also showed that the highest number of buds was observed at light intensity 8000 lux and in the Rhapsody cultivar with a mean of 24.24 buds, which had a significant difference with other treatments. The lowest number of buds was observed at light intensity 4000 lux and in Tong wensis cultivar with a mean of 9.6 buds, which had a significant difference with the treatment of 11000 lux in Tong wensis, but it had a significant difference with other treatments (Figure 3).

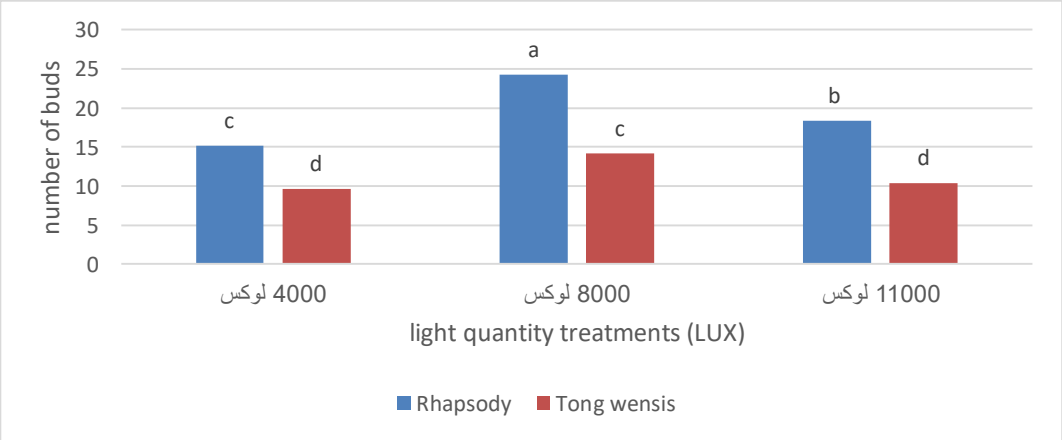

Figure 3: Interaction effect of light intensity and cultivar treatments on the mean

4.4 NUMBER OF FLOWERING BRANCHES

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of the cultivate and light intensity as well as the interaction effect if cultivar and light intensity were significant at 1% probability level (Table 1). The results of the comparison of the mean values of the data also showed that the highest number

of flowering branches was seen in the light intensity 8000 lux and in the Rhapsody cultivar with a mean of 5.5 numbers, which had a significant difference with other treatments. The lowest number of flowering plants was observed at 11000 lux in light intensity and in the Tong wensis cultivar with a mean of 2.4 numbers, which was not significantly different with 4000 lux treatment in the same cultivar and 11000 lux treatment in Rhapsody cultivar, but had a significant difference with other treatments (Figure 4).

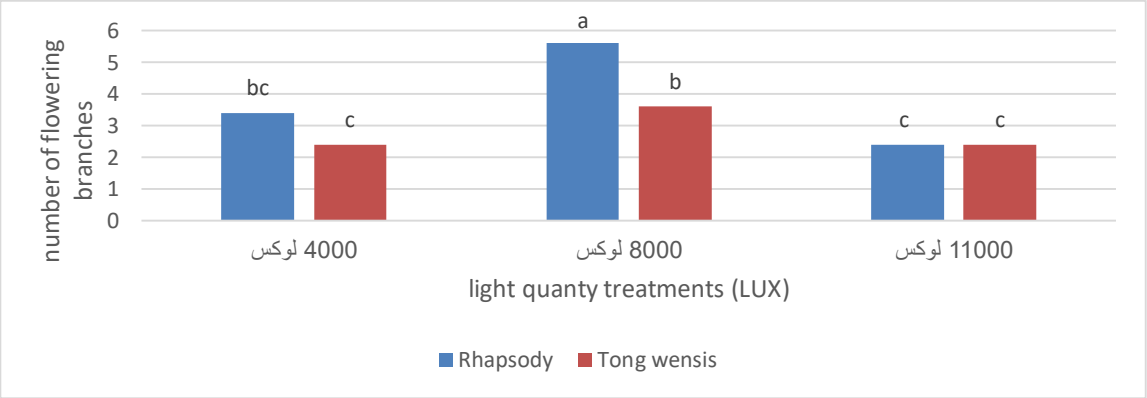

Figure 4: The effect of light intensity and cultivar treatments on mean number of flowering branches of Saintpaulia

4.5 NUMBER OF DAYS TO FLOWERING

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar and light intensity was significant at 1% level, but the interaction effect of cultivar and light intensity was not significant at the probability level of 1% and 5% (Table 4-10). The results of the comparison of the mean values of the data in investigating the simple effect of light intensity indicate that the highest number of days to flowering was observed in the treatment of 4000 lux light intensity with a mean of 74.1 days, which had a significant difference with other treatments. The lowest number of days to flowering was observed in the treatment of 11000 lux light intensity with a mean of 51.9 days, which had a significant difference with other treatments (Table 2). The results of the comparison of the mean values of data in investigating the simple effect of cultivar showed that the highest number of days to flowering was observed in Tong wensis cultivar with a mean of 66.3 days, which had a significant difference with another cultivar. The lowest number of days to flowering was observed in Rhapsody cultivar with a mean of 60.1 days, which had a significant difference with another cultivar (Table 3). Increasing the light causes that plant to enter the reproductive phase earlier. These results are consistent with the results of the research conducted by Abbasnejad et al. (2017) on the Matthiola plant.

4.6 LONGEVITY OF FLOWERS

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar and light intensity, as well as the interaction effect of cultivar and light intensity, were significant at 1% probability level (Table 1). The results of the comparison of the mean values of data also showed that the maximum flower life was observed at 4000 lux light intensity and Rhapsody cultivar with a mean of 7.4 days, which had a significant difference with other treatments. The lowest flower life was observed in 11000 lux light

intensity and Tong wensis cultivar with a mean of 2.6 days, which showed no significant difference with the same light treatment in Rhapsody cultivar and 4000 lux treatments in Tong wensis cultivar, but it had a significant difference with other treatments (Figure 5). Increasing the light intensity by increasing the temperature of the plant and also increase the temperature of the leaves area decreases the longevity of the plants. These results are consistent with the results of the research conducted by Hildrum and Christopher (1969) on Saintpaulia.

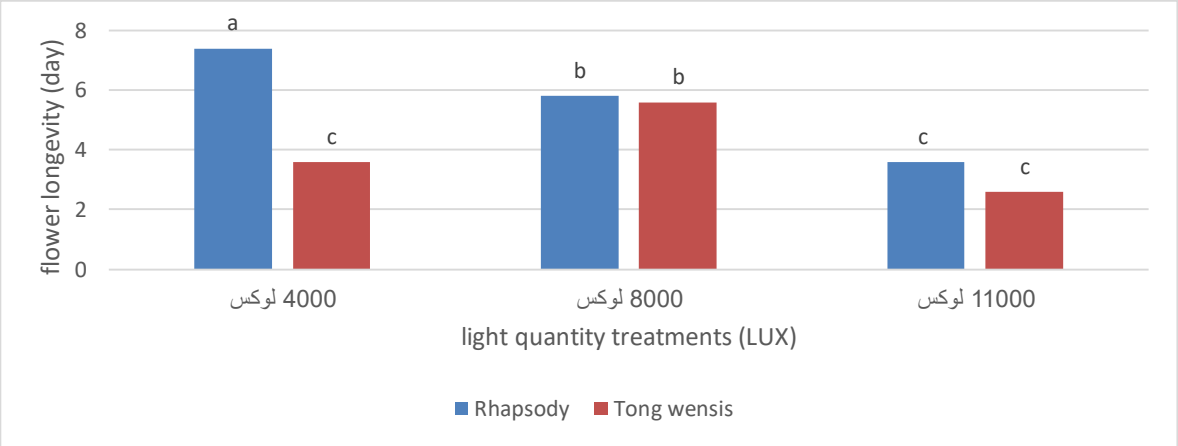

Figure 5: Interaction effect of light intensity and cultivar treatments on the mean longevity of Saintpaulia flowers

4.7 DIAMETER OF FLOWERS

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar and light intensity, as well as the interaction effect of cultivar and light intensity, were significant at 1% probability level (Table 4-10). The results of the comparison of mean values of data also showed that the highest flower diameter was observed in 8000 lux light intensity and in Rhapsody cultivar with a mean of 4.4 cm, which was significantly different with other treatments. The lowest flower diameter was also observed in 11000 lux light intensity and in Tong wensis cultivar with a mean of 0.9 cm, which showed a significant difference with other treatments (Figure 6).

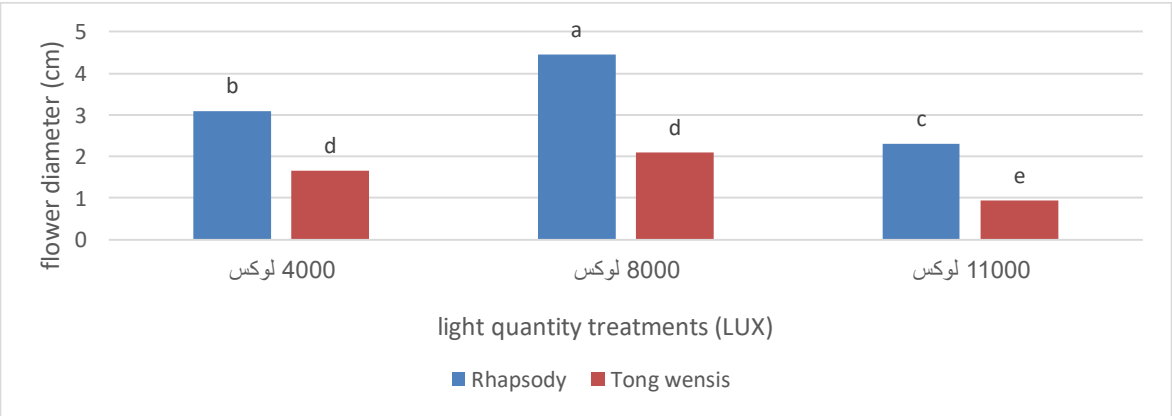

Figure 6: Interaction effect of light intensity and cultivar treatments on mean diameter of Saintpaulia flower

4.8 LEAF AREA

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar and light intensity were

significant at 1% probability level, but the interaction effect of cultivar and light intensity was significant at 5% probability level (Table 1). The results of comparison of mean values of data also showed that the highest leaf area was observed in 11000 lux light intensity and in Tong wensis cultivar with a mean of 15.4 cm2, which had a significant difference with other treatments. The minimum leaf area was also observed in 4000 lux light intensity and in Rhapsody cultivar with a mean of 10.2 cm2, which showed a significant difference with other treatments (Figure 7). The leaf area and leaf thickness are influenced by the amount of light, so that by increasing the light intensity, leaf area, leaf thickness and biomass of the plant also increase. When the plant is exposed to increased light by artificial light, it will have more growth and biomass than normal light treatment. Moreover, under conditions of photosynthetic materials shortage, in the absence of light conditions, the speed of leaf area expansion is lower and the amount of carbohydrate reserves decreases relative to the leaf area, but the amount of carbohydrate required for continuous plant growth increases. These results are consistent with the results of the research conducted by Abbasnejad (2017) on the Matthiola plant.

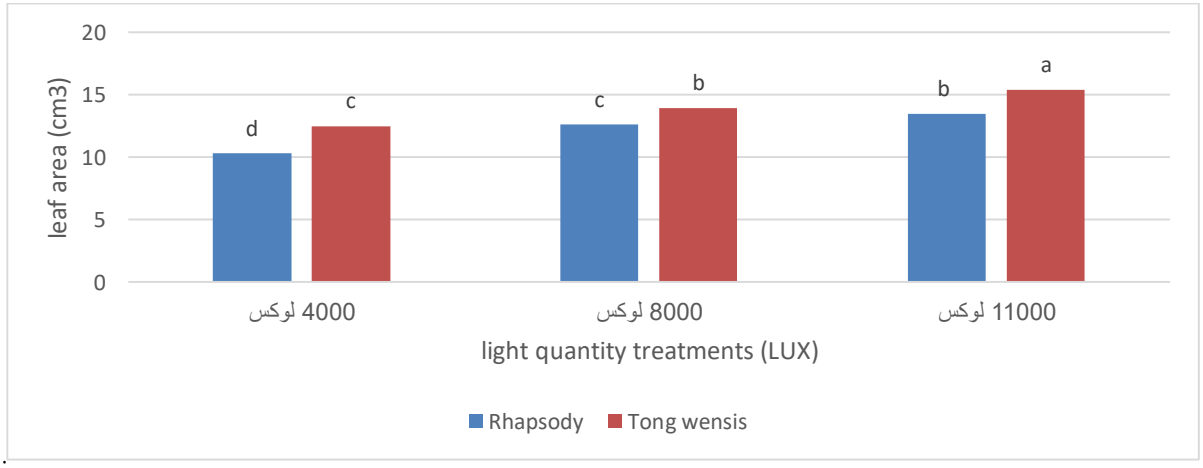

Figure 7: Interaction effect of light intensity and cultivar treatments on the mean leaf area of Saintpaulia.

4.9 ROOT DRY WEIGHT

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar and light intensity were significant at 1% level, but the interaction effect of cultivar and light intensity was not significant at the probability level of 1% and 5% (Table 4-10). The results of the comparison of the mean values of the data in investigating the simple effect of light intensity indicate that the highest root dry weight was observed in the 11000 lux light intensity with a mean of 4.5 g, which had a significant difference with other treatments. The lowest root dry weight was observed in 4000 lux light intensity with a mean of 3.1 g, which had a significant difference with other treatments (Table 2). The results of the comparison of mean values of data in the simple effect of cultivar showed that the highest root dry weight was observed in Tong wensis cultivar with a mean of 4.3 g, which had a significant difference with other cultivars. The lowest root dry weight was observed in Rhapsody cultivar with a mean of 3.3 g, which had a significant difference with another cultivar (Table 3). The root grows in proportion to branch growth. The roots depend on the branches in terms of carbohydrate intake, and the branches depend on the roots to absorb water and nutrients. Therefore, when the total amount of light received

in the plant increases, with the growth of branches, the roots of the plant also increase. These results are consistent with the results of the research conducted by Abbasnejad et al. (2017) on the Matthiola plant.

4.10 NUMBER OF FLOWERS IN INFLORESCENCES

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. However, the simple effect of cultivar and the interaction effect of cultivar and light intensity were not significant at the probability level of 1% and 5% (Table 1). The results of comparison of the mean values of data showed that the highest number of flowers in inflorescence was observed in 4000 lux light intensity with a mean of 3.8 numbers, which had a significant difference with other treatments. The lowest number of flowers in inflorescence was observed in 11000 lux light intensity with a mean of 2 numbers, which had a significant difference with other treatments (Table 2).

4.11 FLOWERING PERIOD

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar and light treatment were significant at 1% probability level, but the interaction effect of cultivar and light intensity was not significant at 1% and 5% probability level (Table 1). The results of the comparison of mean values of the data in investigating the effect of light intensity treatments showed that the highest flowering period was observed in 4000 lux light intensity with a mean of 25.7 days, which had a significant difference with other treatments. The lowest flowering period was also observed in 11000 lux light intensity with a mean of 14.8 days, which had a significant difference with other treatments (Table 2).

The results of the comparison of the mean values of data in investigating the effect of light intensity treatments showed that the highest flowering period was observed in Rhapsody cultivar with a mean of 22.2 days, which had a significant difference with another cultivar. The lowest flowering period was observed in Tong wensis cultivar with a mean of 18.7 days, which had a significant difference with another cultivar (Table 3).

4.12 THE DISTANCE BETWEEN FLOWERING PERIODS

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar and light intensity was significant at 1% probability level, but the interaction effect of cultivar and light treatment was not significant (Table 1). The results of the comparison of the mean values of the data in investigating the effect of light intensity treatments showed that the highest distance between flowering periods was observed in 4000 lux light intensity with a mean of 68.6 days, which had a significant difference with other treatments. The lowest distance between flowering periods was observed in 11000 lux light intensity with a mean of 47.7 days, which had a significant difference with other treatments (Table 1). The results of the comparison of the mean values of data in the simple effect of cultivar showed that the maximum distance between flowering periods was in Tong wensis cultivar with a mean of 66.4 days, which was significantly different with other cultivars. The lowest distance in flowering periods was

observed in Rhapsody cultivar with a mean of 50.1 days), which had a significant difference with other cultivars (Table 3).

4.13 PLANT HEIGHT

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar and light treatment and the interaction effect of cultivar and light intensity were significant at 1% probability level (Table 4-10). The results of comparison of the mean values of data also showed that the highest plant height was observed in 4000 lux light intensity and in Rhapsody cultivar with a mean of 8.8 cm, followed by 4000 lux light intensity and Tong wensis cultivar, which had a significant difference with other treatments. The lowest plant height was observed in 8000 lux light intensity and in Rhapsody cultivar with a mean of 4.7 cm, which had a significant difference with other treatments (Figure 8). The high light intensity thickens the leaves and causes the plant to be dense and short. However, in low light intensity, the stems have rapid growth and have long nodes, because, in these conditions, the division of mitosis is done rapidly due to the abundance of auxin. These results are consistent with the results of the research conducted by Abbasnejad et al. (2017) on the Matthiola plant.

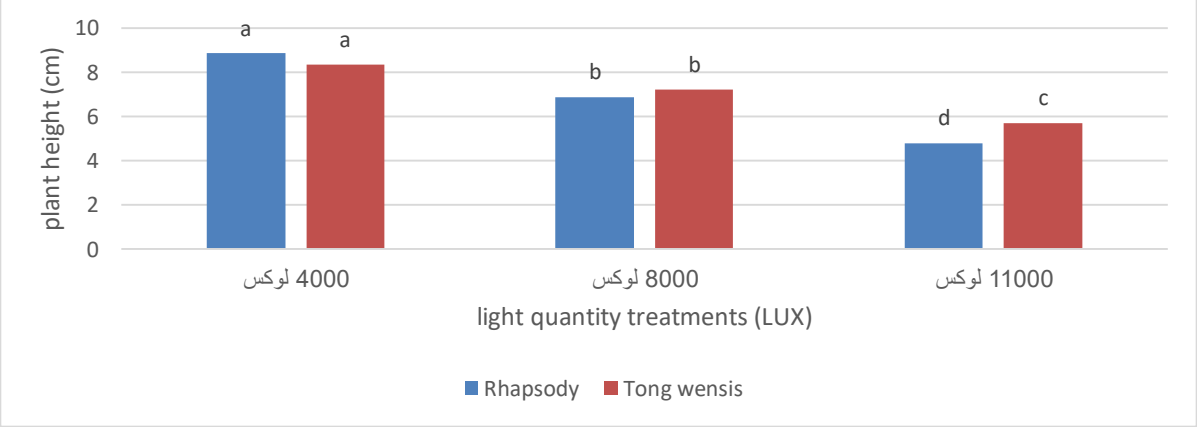

Figure 8: Interaction effect of light intensity treatments on mean plant height of Saintpaulia

4.14 INFLORESCENCE LENGTH

The results of the analysis of variance showed that the simple effect of light intensity treatments was significant at 1% probability level. The simple effect of cultivar and light intensity and the interaction effect of cultivar and light intensity were significant at 1% probability level (Table 1). The results of comparison of the mean values of the data also showed that the highest inflorescence length was observed in 4000 lux light intensity and in Tong wensis cultivar with a mean of 9.0 cm, which had a significant difference with other treatments. The lowest inflorescence length was also observed in 11000 lux light intensity and Rhapsody cultivar with a mean of 4.7 cm, followed by 11000 lux light intensity and Tong wensis cultivar, which had a significant difference with other treatments (Figure 9).

By reducing light intake and non-degradation of auxin light, the internodes become thinner so that the plants have a lower stem diameter, less firmness, are weaker and more sensitive in less light conditions. In addition, the length of the flowering stem becomes longer. These results are consistent with the results of the research conducted by Abbasnejad et al (2017) on Matthiola plant.

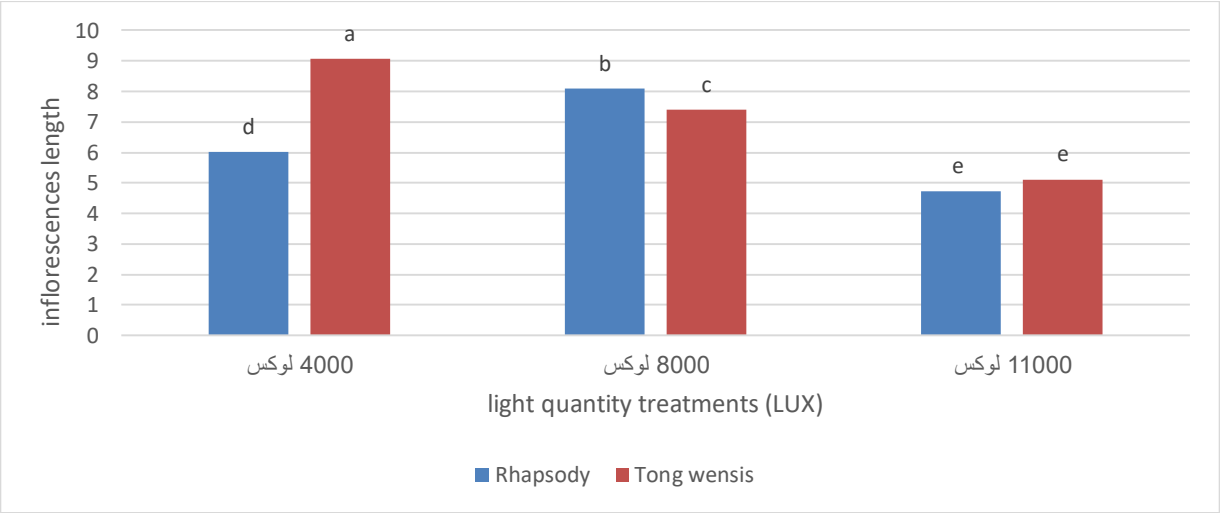

Figure 9: Interaction effect of light intensity treatments on mean inflorescences length of Saintpaulia

According to the results of this experiment, the 11000 lux treatment plants flowered earlier than the other treatments but had a lower number of flowers and flower longevity. Additionally, all the flowers and buds of these plants were affected by leaf complexity and burn due to higher leaf temperatures. By measuring the leaf area temperature in this experiment, it was observed that in the 11000 lux treatment, the mean leaf area temperature reached 26.54 ° C, while the mean leaf area temperature in 8000 lux was 24.32 ° C. It seems that this slight difference in temperature causes burn in the plant so that with increasing light intensity up to 11000 lux, chlorosis and necrosis are created on the leaves. The leaves also become frizzy and fragile and prevent plant growth. In the 4000 and 8000 lux light intensity treatments, no physiological complication or damage was observed. By applying light intensities of 4000 and 8000 lux, the highest number of flower stems was produced, but in 8000 lux, all the growth and flowering characteristics of Saintpaulia were better than those of other treatments. These results were consistent with those of the research conducted by Hildrum and Christopher (1969).

5. CONCLUSION

In investigating the light intensity experiment on Saintpaulia plant, it was observed that with increasing light intensity, the growth and flowering process of this plant followed an increasing trend and by measuring and controlling the leaf temperature in this plant, favorable growth can be achieved by increasing the light intensity. In the 4000 lux light intensity treatment, the lowest growth and flowering was observed, and in the 11000 lux light intensity treatment, the highest growth was observed. However, it should be noted that the plants flowered earlier and had lower longevity in this light intensity treatment. Moreover, in 11000 lux light intensity, the leaves have a complex and dense form. Therefore, the best growth and best phenotypic condition in growth and the flowering morphology occurred in the 8000 lux light intensity treatment.

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