The Pharma Innovation Journal 2022; 11(7): 1901-1903

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(7): 1901-1903

www.thepharmajournal.com
Received: 18-05-2022
Accepted: 21-06-2022

Bharathi V
PG Scholar, Department of Floriculture and Landscape Architecture, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Velmurugan M
Assistant Professor, Department of Floriculture and Landscape Architecture, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Rajamani K
Professor and Head, Department of Floriculture and Landscape Architecture, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Kalarani MK
Director of Crop Management, Directorate of Crop Management, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Corresponding Author:
Bharathi V
PG Scholar, Department of Floriculture and Landscape Architecture, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Growth and physiological performance of *Jasminum Sambac* under incandescent light for off-season flowering

Bharathi V, Velmurugan M, Rajamani K and Kalarani MK

Abstract
Jasmine (*Jasminum sambac* Ait.) is one of the oldest fragrant flowers cultivated India. *Jasminum sambac* Ait. Produces good yield during the months of March to August. The prices are high during the religious and auspicious days and the demand is constant throughout the year. The flower production is reduced during the cooler months leading to hike in price during December to March which is almost ten times higher than the normal parts of the year that can be termed as "off-season" in Jasmine cultivation. Experiment was attempted to study the effect of incandescent light on growth and physiological parameters of *Jasmine sambac*. The findings of the research revealed that modifying the temperature and heat units provided significant improvement in the growth and physiological parameters as highest plant height (100.31cm) was found in plant covered with low cost protective structure (T_{10}), highest plant spread N-S (123cm) was observed in T_4, maximum plant spread E-W (127.57 cm) was observed in T_7, highest leaf area (38.97cm²) and leaf dry weight (0.39g) was observed in T_8, highest total phenols (1.816 mgg^{-1}) was found in T_8 and maximum Total Soluble Protein (11.89mgg^{-1}) was found in T_6.

Keywords: Incandescent light, *Jasminum sambac*, off-season, vegetative, physiological

1. Introduction
Jasmine is one of the most important fragrant flowers in the Oleaceae family and is renowned as the "Queen of the Night" in India due to the enticing aroma. It is commonly produced in warm environments throughout southern Asia, Europe, Africa, and the Pacific. In India it is cultivated in Tamil Nadu, Andhra Pradesh, and Karnataka (Kiritikar *et al.* 2003 and Swati Sabharwal *et al.* 2013) [6, 13]. *Jasminum sambac* gives a significant yield from March to August and the price is higher religious and auspicious days. The yield of flower is reduced during the winter months, resulting in a price increase from December to March that is over 10 times greater than the rest of the year, which is considered "off season" in jasmine production (Krishnamoorthy, 2014) [7]. For blooming, jasmine needs 27–32°C during the day and 21–27°C at night. Flowering is inhibited for a week if the temperature drops between 15 and 17°C at night (Leonhardt and Teves, 2002) [8]. Low winter temperatures produce ultra-structural cellular alterations in single whorled *Jasminum sambac* cultivars, as well as decreased growth and production (Su *et al*., 2001) [11]. Raman (1973) [10] found that as the day length and temperature increased the rate of development of the floral primordia in jasmine. In order to circumvent the low flower yield during off season, the experiment was conducted to study the effect of photo thermal regulation using incandescent light on growth and physiological parameters of Gundumalli (*Jasminum sambac*).

2. Materials and Methods
The present study has been conducted at a progressive farmer's field in Annadasampalayam village, Coimbatore district, Tamil Nadu, India during the year 2021-22. The experiment was formulated using incandescent light bulb (100W and 200W) at two duration levels along with low-cost protective structures during the winter season. The experiment was framed with ten treatments comprising 100W at 5 hours (7 pm to 12 am) and 10 hours (7 pm to 5 am), 200W at 5 hours (7 pm to 12 am) and 10 hours (7 pm to 5 am), low-cost protective structures compared with the farmers practice (control). All the plants were pruned to height of 60 cm from the ground level 40 days before imposing the treatment. The treatment details are *viz.*, T_1 - Control (Farmers practice), T_2 - Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 100W light, T_3 - Exposure of light for 10 hours (7:00 P.M. to 5:00 A.M.) with 100W light, T_4 -

Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 100W light and cost effective protective structure for heat accumulation, T_5 - Exposure of light for 10 hours (7:00 P.M. to 12:00 A.M.) with 100W light and cost effective protective structure for heat accumulation, T_6 - Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 200W light, T_7 - Exposure of light for 10 hours (7:00 P.M. to 5:00 A.M.) with 200W light, T_8 - Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost effective protective structure for heat accumulation, T_9 - Exposure of light for 10 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost effective protective structure for heat accumulation and T_{10}– Cost effective structure for heat accumulation. The data obtained from the field observations were analyzed using SPSS (Statistical Package Social Sciences) software for significance.

3. Result and Discussion

3.1 Growth parameters

Plant growth is typically a good indicator of plant vitality, which includes increased yields. It is used as a reference to select the best plant variety for optimum output. The plant covered with Cost effective structure for heat accumulation (T_{10}) recorded the highest plant height (100.31 cm) and the lowest plant height (74.69 cm) in Control (Farmer's practice). The maximum plant spread in N-S direction (123 cm) was observed in exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 100W light and cost-effective protective structure for heat accumulation (T_4) and the minimum plant spread in N-S direction (90.11 cm) was recorded in Control (Farmer's practice). The plant spread in N-S direction was on par among the treatments T_7 (Exposure of light for 10 hours (7:00 P.M. to 5:00 A.M.) with 200W light) and T_9 (Exposure of light for 10 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost-effective structure for heat accumulation). The highest plant spread in E-W direction (127.57 cm) was observed in the treatment with exposure of light for 10 hours (7:00 P.M. to 5:00 A.M.) with 200W light (T_7) and the lowest plant spread in E-W direction (78.44 cm) was recorded in Control (Farmer's practice) as shown in Table 1. The rate of plant development is primarily influenced by temperature. The temperature around a plant determines its rate of growth and development. As temperatures reach their optimum value, vegetative growth accelerates and most of the plant species have a higher optimal temperature for vegetative development than for reproductive development. The use of incandescent light caused an increase in temperature during winter period which might be responsible for the better growth performance of *Jasminum sambac*. Similar findings have been reported by Utami *et al.* (1990) [15], Dalal *et al.* (2009) [3], Hatfield (2015) [4] and Thakur and Grewal (2016) [14].

3.2 Physiological parameters

Leaves are the functional unit for photosynthesis and flower yield depends greatly on photosynthesis. The highest leaf area (38.97cm²) and leaf dry weight (0.39 g) was observed in exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost-effective protective structure for heat accumulation (T_8) and the lowest single leaf area (26.02 cm^2) and leaf dry weight (0.2556 g) was recorded in exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 100W light and cost-effective protective structure for heat accumulation (T_5). The highest total phenols (1.816 mgg^{-1}) was observed in exposure of light for 10 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost-effective protective structure for heat accumulation (T_8) followed by exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 100W light (T_2) and the lowest (1.25 mgg^{-1}) was recorded in Control (Farmer's practice). The maximum total soluble protein (11.89 mgg^{-1}) was observed in exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost-effective protective structure for heat accumulation (T_6) followed by exposure of light for 10 hours (7:00 P.M. to 5:00 A.M.) with 200W light and the lowest (7.50 mgg^{-1}) was recorded in Control (Farmer's practice) as shown in Table 2. Increase in temperature to optimum level increases the leaf area of the plant. Decrease in temperature affects the leaf growth and size which in turn affects the photosynthetic activity. The present finds are in corroboration with the findings of Cockshull (1966) [2], Armitage (1995) [1] and Li *et al.* (2019) [9].

Table 1: Influence of different treatments on growth parameters of *Jasminum sambac* (2 months after pruning)

Treatments	Plant Height (cm)	Canopy Spread N-S (cm)	Canopy Spread E-W (cm)
T_1 - Control (Farmers practice)	74.69	90.11	78.44
T_2 - Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 100W light	77.87	108.03	88.64
T_3 - Exposure of light for 10 hours (7:00 P.M. to 5:00 A.M.) with 100W light	77.23	111.54	89.27
T_4 - Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 100W light and cost effective structure for heat accumulation	81.65	123.00	89.43
T_5 - Exposure of light for 10 hours (7:00 P.M. to 12:00 A.M.) with 100W light and cost effective structure for heat accumulation	76.88	104.11	91.78
T_6 - Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 200W light	87.23	109.39	90.44
T_7 - Exposure of light for 10 hours (7:00 P.M. to 5:00 A.M.) with 200W light	79.80	108.11	127.57
T_8 - Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost effective structure for heat accumulation	94.13	111.11	90.21
T_9 - Exposure of light for 10 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost effective structure for heat accumulation	88.90	108.47	90.52
T_{10} – Cost effective structure for heat accumulation	100.31	112.75	95.70
S.Ed	0.15	0.12	0.32
CD (P=0.05)	0.26	0.22	0.55

Table 2: Influence of different treatments on physiological parameters of *Jasminum sambac* (1st flush after pruning)

Treatments	Single Leaf Area (cm^2)	Leaf Dry Weight (g)	Total Phenols (mgg^{-1})	Total Soluble protein (mgg^{-1})
T_1 - Control (Farmer's practice)	29.48556	0.2798	1.25	7.5000
T2 - Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 100W light	29.98111	0.2868	1.7056	9.2222
T3 - Exposure of light for 10 hours (7:00 P.M. to 5:00 A.M.) with 100W light	31.03889	0.3076	1.5333	7.7778
T4 - Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 100W light and cost-effective structure for heat accumulation	32.70333	0.3231	1.5	8.7222
T5 - Exposure of light for 10 hours (7:00 P.M. to 12:00 A.M.) with 100W light and cost-effective structure for heat accumulation	26.02333	0.2556	1.6	8.7222
T6 - Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 200W light	35.52	0.3559	1.5389	11.8889
T7 - Exposure of light for 10 hours (7:00 P.M. to 5:00 A.M.) with 200W light	28.16333	0.2688	1.6111	11.6667
T8 - Exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost-effective structure for heat accumulation	38.97444	0.3887	1.4778	10.2222
T9 - Exposure of light for 10 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost-effective structure for heat accumulation	27.26333	0.2614	1.8167	10.5000
T10 – Cost-effective structure for heat accumulation	37.45	0.3394	1.4	8.7778
S.Ed	0.133	0.0082	0.042	0.204
CD (P=0.05)	0.231	0.142	0.074	0.354

4. Conclusion

The results of the research showed that the use of incandescent light was suitable for the induction of off-season *Jasminum sambac*. The plant covered with Cost effective structure for heat accumulation (T_{10}) recorded the highest plant height (100.31 cm). The maximum plant spread in N-S direction (123 cm) was observed in exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 100W light and cost-effective protective structure for heat accumulation (T_4) and highest plant spread in E-W direction (127.57 cm) was observed in the treatment with exposure of light for 10 hours (7:00 P.M. to 5:00 A.M.) with 200W light (T_7). The highest total phenols (1.816 mgg-1) was observed in exposure of light for 10 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost-effective protective structure for heat accumulation (T_8) and maximum total soluble protein (11.89mgg-1) was observed in exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost-effective protective structure for heat accumulation (T6). Out of all the treatments, exposure of light for 5 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost-effective structure for heat accumulation (T_8) has the highest leaf area. Therefore, based on the experiment it was inferred that exposure of plants to light for 5 hours (7:00 P.M. to 12:00 A.M.) with 200W light and cost-effective structure for heat accumulation (T_8) is found to be successful for induction of off-season flowering in *Jasminum sambac*.

5. References

1. Armitage, Allan M. Photoperiod, irradiance, and temperature influence flowering of Hamelia patens (Texas firebush). Hort Science. 1995;30(2):255-256.
2. Cockshull KE. Effects of night-break treatment on leaf area and leaf dry weight in *Callistephus chinensis.* Annals of Botany. 1966;30(4):791-806.
3. Dalal SR, Somavanshi AV, Karale GD. Effect of gibberellic acid on growth, flowering, yield and quality of gerbera under polyhouse conditions. Int. J Agric. Sci. 2009;5(2):355-356.
4. Hatfield, Jerry L, John H. Prueger. Temperature extremes: Effect on plant growth and development. Weather and climate extremes. 2015;10:4-10.
5. Jennoah B. Standardization of techniques for off-season flowering in Jasmine species under poly house. M.Sc. Thesis, Tamil Nadu Agricultural University, Coimbatore, 2012.
6. Kiritikar KR, Basu BD. Indian medicinal plants with illustrations. Oriental Enterprises. 2003;2(7):2093-2096.
7. Krishnamoorthy V. Enhancing flower productivity during off season in Jasmine (*Jasminum sambac*). J Krishi Vigyan. 2014;3(1):88-90.
8. Leonhardt KW, Teves GI. Pikake. Honolulu (HI): University of Hawaii, 2002, 4. (Ornamentals and Flowers; OF-29).
9. Li Fan, Shenchong Li, Qinli Shan. The effect of temperature on plant growth in four Gerbera hybrida cultivars. Hort Science. 2019;54(7):1164-1167.
10. Raman KR. Studies on jasmine with particular reference to flowering. Ph.D. Thesis, Tamil Nadu Agricultural University, Coimbatore, 1973.
11. Su JW, Wang XP. Ultra cytochemical localization of ATP-ASE activity in the cells of *Jasminum sambac* L. seedlings and its relation to chilling tolerance. Acta Hort. 2001;28(6):544-550.
12. Sujatha AN, Sujatha K, Venugopalan R. Influence of pruning time on enhancing the yield and quality of *Jasminum sambac* flowers during off-season. Indian J. Agri. Sci. 2009;79(11):857-60.
13. Swati Sabharwal, Swati Sudan, Vadi Ranjan. *Jasminum sambac* L. (Motia): A Review. Int. J Pharma. Res. Bio Sci. 2013;2(5):108-130.
14. Thakur Tanya, Grewal HS. Effect of duration of night interruption on growth and flowering of Chrysanthemum cv. Kikiobiory. Journal of Applied and Natural Science. 2016;8(2):894-898.
15. Utami, Liliek, *et al.* Effect of supplemental and photoperiodic lighting on flowering of satin flower. Hort Science. 1990;25(9):1090c-1090.