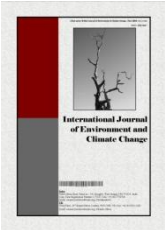

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Effect of Planting Time on Vegetative Characters of Different Varieties of Oriental Lily

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The evaluation of varieties for a particular region is an important process in order to screen the potential cultivars for any specific region or climate. Although the varieties may express a unique behaviour under certain area, but it may fail or sustain that peculiar character when grown under different location. Along with varieties, planting time significantly affect the crop production. Therefore, standardization of planting time is very important to get a good growth and excellent quality of cut flowers. By using staggered planting, the flowering period may also be extended for fetching a good price during different occasions. The present investigation comprised five oriental lily varieties along with three planting time (1st fortnight of October, 2nd fortnight of October and 1st fortnight of November) and observations were recorded for various vegetative parameters. Out of the three-planting time, the varieties planted during 1st fortnight of October performed better resulting in terms of maximum plant height, number of leaves, leaf length, leaf width etc. Among the varieties, St. Andrews performed overall best with respect to highest percentage of bulb sprouting, plant height, leaf length, leaf width etc.

Keywords: Oriental lily; planting time; cut flower; vegetative parameter.

1. INTRODUCTION

Lilium is one of the most picturesque and attractive ornamental bulbous flower crops. Lilies belong to genus *Lilium* and family Liliaceae. Lily is a symbol of purity and regality. The family Liliaceae involves more than 80 species worldwide with significant variation in flower

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shapes, sizes, colors, fragrances, plant architecture and bulb morphologies [1]. *Lilium* ranks fourth among top ten cut flowers of the world next to rose, chrysanthemum and tulip. In floral industry Oriental lilies, Asiatic hybrids and LA hybrids are widely used as cut flowers as well as potted plants. *Lilium* as cut flower is highly demanded in international flower trade due to its attractive flower shape, wide diversity of flower color, long post-harvest shelf life and having long multi-flowering stalk [2].

All species in genus *Lilium* possess great genetic diversity in its flower color, shape, size, form, persistence and as well as in growth habit. The diversity in species of agronomic traits provides opportunities for the development of healthy and hardy varieties for variable climatic conditions. Oriental lilies are known for their large fragrant flowers. The flower color is mostly white, pink and cream [3].

Lilies are grown in cool temperate and moist area of the world and cultivated in USA, Netherlands, Israel, Japan, Italy, Chile, South Africa, New Zealand and Mexico. In India, *Lilium* grown in Nilgiri Hills in southern peninsula, Himachal Pradesh, Upper Himalayan region of Uttarakhand and extending up to North–Eastern states has a potential for growing lily. In plains of India, lilies are grown in Karnataka, West Bengal, Maharashtra, Odisha, Uttar Pradesh, Punjab and Haryana under protected conditions. *Lilium* could be made to flower anywhere in the country by providing optimum growing conditions by manipulating environmental conditions.

In present scenario the demand of cut flower is increasing day by day. The year-round availability and better-quality cut flowers can be produced by growing the crop under polyhouse. So, for cultivation of flowers round the year with utilizing small and medium farms protective cultivation is the best alternative [4]. However, the performance of oriental lily cultivars depends on planting time, thus, the standardization of planting time is very important to get a good growth and excellent quality of cut flowers. Evaluation of cultivars is also important as different cultivars differ in their flower colour, number of flowers and stem length which affects the economics of cultivation to a large extent. The information regarding planting time, yield and effects of longevity on flower quality and yield is available on minor cut-flower crops such as *Allium*, *Brodiaea* and *Anemone* in the literature [5, 6] but not available on *Lilium* (Oriental lily).

2. MATERIALS AND METHODS

The experiment was conducted at the Agri-Tourism Centre, Chaudhary Charan Singh Haryana Agricultural University, Hisar. Oriental lily cultivars Casa Blanca, St. Andrews, Profundo, Donato and Calexico selected for investigation under polyhouse condition. The bulbs of all varieties were procured from the Progreen Biotech Pvt. Ltd., New Delhi. The well treated bulbs of five varieties were planted on raised beds under polyhouse condition under three different planting time i.e. First fortnight of October, Second fortnight of October and First fortnight of November. All the necessary cultural operations were carried out at regular interval. To record observations five plants per replication per treatment were randomly selected and tagged.

The data recorded for different parameters were statistically analyzed by Factorial Random Block Design in order to find out which of the treatment showed significant variation at 5% level of significant.

3. RESULT AND DISCUSSION

The days taken for sprouting of bulb were significantly influenced by the time of planting irrespective of varieties. The minimum days taken for sprouting (7.3 days) was observed under crop planted on 10th October (Table 1), which remained significantly superior to other planting dates, which might be due to the fact that the bulb planted on 10th October could get optimum soil temperature that was essentially required for bulb sprouting. However, the maximum days taken for spouting (8.8 days) was observed under crop planted on 8th November due to decrease in soil temperature. Present research findings are in conformity with result recorded by Akpinar and Bulut [7] who reported similar results in Gladiolus.

The percentage of sprouting was recorded non-significant with respect to time of planting. However, the varieties differ significantly for sprouting percentage, irrespective to the time of planting. Among the varieties, the maximum sprouting percentage was recorded in St. Andrews (100.00%), which remained

statistically *at par* with Calexico (98.89%), Casa Blanca (97.78%) and Profundo (95.56%), whereas Donato exhibit minimum sprouting percentage (87.78%), which might be due to inheritance characteristics of respective varieties (Table 2). Present research findings are in conformity with result recorded by Kumar *et al.* [8].

Plant height is mainly controlled by the genetic makeup of varieties, but it is also influenced by various environmental conditions and polyhouse management. The plant height differs significantly with respect to time of planting and varieties. Among the various planting dates, the maximum plant height (113.74 cm) was recorded under crop planted on 10th October, while minimum plant height (94.37 cm) was recorded under crop planted on 8th November. Thus, this result indicated that plant height decreases with the decrease in temperature. This research finding is in agreement with result recorded by Joshna *et al.* [9], Sharma *et al.* [10] and Swaroop *et al.* [11]. However, among the varieties, the maximum plant height was recorded in St. Andrews (122.05 cm), which was statistically *at par* with Calexico (114.17 cm). The minimum plant height (83.38 cm) was recorded in Donato (Table 3). The variation in plant height of various oriental lily cultivars is due to their different genetic constitution. Similar results were reported by Alkurdi *et al.* [12].

The number of leaves per plant differs significantly with respect to time of planting and varieties. The number of leaves ranged from 32.58 to 86.78. The maximum number of leaves was found in Calexico (86.78), while the minimum number of leaves was found in Donato (32.58). This shows that number of leaves depends upon genetic constitution of different oriental lily varieties. These results are in close

Table 1. Effect of planting time on days to bulb sprouting of different varieties of oriental lily

Time of planting	Days to bulb sprouting					
	Varieties					
	Donato	Calexico	Profundo	Casa Blanca	St. Andrews	Mean
10 Oct.	7.1	7.2	7.4	7.5	7.4	**7.3**
24 Oct.	8.0	8.3	8.3	8.4	8.3	**8.3**
8 Nov.	8.7	8.7	8.8	9.1	8.9	**8.8**
Mean	**7.9**	**8.1**	**8.2**	**8.4**	**8.2**	
CD at 5%	**Time of Planting (T) = 0.48**			**Varieties (V)= NS**		**V×T = NS**

Table 2. Effect of planting time on bulb sprouting percentage of different varieties of oriental lily

Time of Planting	Percentage of sprouting					
	Varieties					
	Donato	Calexico	Profundo	Casa Blanca	St. Andrews	Mean
10 Oct.	80.00	96.67	93.33	96.67	100.00	**93.33**
24 Oct.	90.00	100.00	93.33	96.67	100.00	**96.00**
8 Nov.	93.33	100.00	100.00	100.00	100.00	**98.67**
Mean	**87.78**	**98.89**	**95.56**	**97.78**	**100.00**	
CD at 5%	**Time of Planting (T) = NS**			**Varieties (V)= 7.32**		**V×T = NS**

Table 3. Effect of planting time on plant height (cm) of different varieties of oriental lily

Time of Planting	Plant height (cm)					
	Varieties					
	Donato	Calexico	Profundo	Casa Blanca	St. Andrews	Mean
10 Oct.	89.46	124.49	121.83	97.56	135.33	**113.74**
24 Oct.	84.60	114.80	108.47	85.40	126.27	**103.91**
8 Nov.	76.07	103.20	95.53	92.53	104.53	**94.37**
Mean	**83.38**	**114.17**	**108.61**	**91.83**	**122.05**	
CD at 5%	**Time of Planting (T) = 6.29**			**Varieties (V)= 8.13**		**V×T = NS**

proximity with the result of study conducted by Sharma *et al.* [10] and Kumar *et al.* [8]. Among the various time of planting, the maximum number of leaves was recorded under planting date on 10th October and the minimum number of leaves was recorded under plating date on 8th November *i.e*., 44.84. The possible reason of decrease in leaf number with the passage of time might be due to unfavorable weather conditions during whole life cycle of the plant. In, general it was also observed that all the varieties showed more vegetative growth when planted on earlier planting dates as compared to later planting. Similar results were obtained by Sharma [13] and Kumar *et al*. [14].

Among the various date of planting, the maximum leaf length was recorded under planting date on 10th October (12.04 cm) and the minimum leaf length was recorded under plating date on 8th November *i.e*., 9.94 cm. In general, earlier planted crop resulted in maximum leaf length as compare to the later planted crop, which may be due to the fact that earlier planted crop was exposed to a greater number of long days than the later planted crop. It has also been observed by Chourasia *et al*., [15]; Barik and Mohanty, [16]. Among the varieties St. Andrews had the maximum leaf length (12.53 cm), which was closely followed by Profundo (11.64 cm). The minimum leaf length was recorded in Calexico (9.74 cm). The difference in leaf length of different varieties can be due to their genetic makeup. Similar results have also been observed by Kumar *et al.* [8].

The data pertaining to leaf width indicated decreasing trend with delay in planting date. Among the various date of planting, the maximum leaf width was recorded under crop planted on 10th October (3.16 cm), which was statistically *at par* with crop planted on 24th October (2.99 cm) and the minimum leaf width (2.60 cm) was recorded in crop planted on 8th November. In general, earlier planted crop resulted in maximum leaf width as compare to the later planted crop, which may be due to the fact that earlier planted crop was exposed to more number of long days than the later planted crop. It has also been repored by Chourasia *et al*., [15]; Barik and Mohanty, [16]. The maximum leaf width was recorded in St. Andrews (3.46 cm), which was statistically *at par* with Profundo (3.29 cm). The minimum leaf width was recorded in Calexico (2.11 cm). The variation in leaf width among the varieties might be due to variation in their genetic makeup. These findings are in agreement with Kumar et al. [8].

Table 4. Effect of planting time on number of leaves per plant of different varieties of oriental lily

Time of Planting	Number of leaves per plant					
	Varieties					
	Donato	**Calexico**	**Profundo**	**Casa Blanca**	**St. Andrews**	**Mean**
10 Oct.	35.20	89.67	41.20	46.60	49.60	**52.46**
24 Oct.	32.00	86.54	37.40	44.13	46.82	**49.38**
8 Nov.	30.53	84.13	32.87	37.53	39.13	**44.84**
Mean	**32.58**	**86.78**	**37.15**	**42.76**	**45.18**	
CD at 5%	**Time of Planting (T) = 3.07**			**Varieties (V)= 3.96**		**V×T = NS**

Table 5. Effect of planting time on leaf length (cm) of different varieties of oriental lily

Time of Planting	Leaf length (cm)					
	Varieties					
	Donato	**Calexico**	**Profundo**	**Casa Blanca**	**St. Andrews**	**Mean**
10 Oct.	11.28	10.98	12.61	11.37	13.94	**12.04**
24 Oct.	9.99	9.37	11.45	10.26	12.66	**10.75**
8 Nov.	9.45	8.87	10.85	9.52	10.99	**9.94**
Mean	**10.24**	**9.74**	**11.64**	**10.38**	**12.53**	
CD at 5%	**Time of Planting (T) = 0.65**			**Varieties (V)= 0.84**		**V×T = NS**

Table 6. Effect of planting time on leaf width (cm) of different varieties of oriental lily

Time of Planting	Leaf width (cm)					
	Varieties					
	Donato	Calexico	Profundo	Casa Blanca	St. Andrews	Mean
10 Oct.	2.81	2.23	3.54	3.52	3.70	**3.16**
24 Oct.	2.65	2.10	3.39	3.33	3.48	**2.99**
8 Nov.	2.38	2.00	2.93	2.48	3.20	**2.60**
Mean	**2.61**	**2.11**	**3.29**	**3.11**	**3.46**	
CD at 5%	**Time of Planting (T) = 0.18**			**Varieties (V)= 0.29**		**V×T = NS**

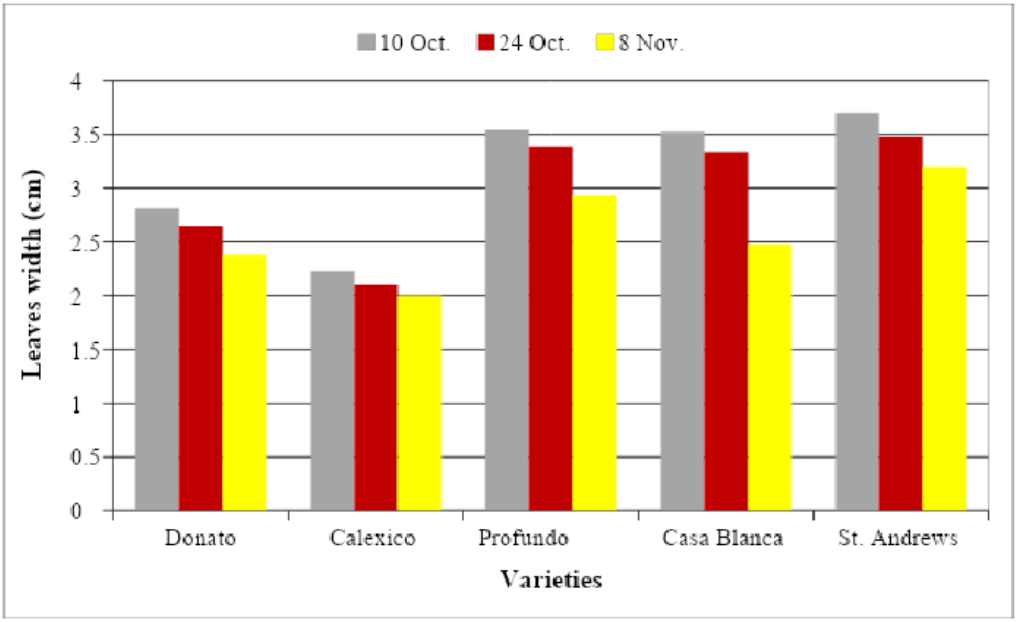

Fig. 1. Bar graph showing leaves width variation in different varieties

4. CONCLUSION

On the basis of results obtained from the investigation it can be concluded that out of the three-planting time, the oriental lily planted on First fortnight of October performed better resulting in terms of maximum plant height, number of leaves, leaf length, leaf width and minimum days of bulb sprouting. Among the varieties, St. Andrews performed overall best with respect to highest percentage of bulb sprouting, plant height, leaf length and leaf width.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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