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Effect of Different Growing Conditions and Genotypes on Growth and Bulb Parameters of Asiatic Lily

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ABSTRACT

Background: The present investigation was carried out during the cropping season of year 2019-20 to find out the most suitable growing condition as well as variety of Asiatic lily for the production of bulbs/bulblets under Hisar (Haryana) conditions.

Methods: The experiment was laid out in RBD (factorial) with three replications and twelve treatment combinations, comprising of three growing conditions (polyhouse of 200 µ, green shade-net of 50% shade and open field) and four varieties (Courier White, Tresor, Nova Lux and Red Stone).

Result: These varieties of Asiatic lily when grown under polyhouse performed better in some parameters resulting in early bulb sprouting, maximum plant height and number of leaves/plant and the minimum days upto harvesting of bulbs, however, in other parameters *viz*. leaf length and width, weight of bulbs/plant, diameter of bulb and number of bulblets/plant, the shade-net condition was observed to be better than polyhouse. Overall, Tresor performed better, resulting in early bulb sprouting (5.11 days), minimum days (236.56) upto harvesting of bulbs and the maximum plant height (89.01 cm), number of leaves/plant (64.08), leaf length (9.50 cm), diameter of bulb (3.91 cm) and number of bulblets/plant (2.99) and it was followed by Red Stone which produced maximum weight of bulbs/plant (59.03 g) and observed next to Tresor in most of the parameters. Tresor grown under polyhouse took minimum days (231) upto the harvesting of bulbs, produced maximum plant height (115.13 cm) and number of leaves/plant (69.67) and it was closely followed by Red Stone grown under same condition. Further, under the shade-net, Red Stone produced maximum weight of bulbs/plant (65.30 g) followed by Tresor (63.93 g), while the maximum number of bulblets/plant (3.90) were produced by Tresor followed by Red Stone (3.44). Henceforth, Tresor and Red Stone when grown under polyhouse performed better in vegetative parameters and when grown under shade-net performed better in bulb parameters than the other combinations of growing conditions and varieties.

Key words: Asiatic lily, Bulblets, Bulbs, Open field, Polyhouse, Shade-net, Varieties, µ (micron).

INTRODUCTION

Flowers are associated with mankind and used for religious offerings and social ceremonies since ancient times. These are not only important for their aesthetic value but also have great significance from commercial point of view. Lilies (*Lilium* species) are very important ornamental bulbous plants belonging to the family Liliaceae. The genus *Lilium* comprises of nearly 100 species and more than 9,400 cultivars (Fatmi *et al*., 2018). All *Lilium* species are diploid except some triploid forms of *Lilium tigrinum* and *Lilium bulbiferum* which are present in nature. Lilies are considered as high value flower with attractive colours like red, pink, yellow, orange, white *etc*., excellent vase life and in some cases with exhilarating fragrance. Among the lily groups, Asiatic lily is much preferred and covers maximum area under lily cultivation in India due to hardiness and easy cultivation. The maximum day and night temperature for obtaining good yield is 21 to 25°C and 12 to 15°C, respectively. Lilies grow well with low light intensity of 2000 to 3000 foot candle. Therefore, during summer and winter seasons, shade net can be used to cut off 75 per cent and 50 per cent light, respectively. The optimum humidity inside the green house must be 80-85 per cent. Sandy loam soil with pH 6-7 is suitable for lily cultivation. Bulbs are planted at a spacing of 20 × 30 cm in the month of October-November in plains.

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Lily ranks fourth among top ten cut flowers of the world next to rose, chrysanthemum and tulip (Chaudhary *et al.,* 2018). The global production of lily bulbs occurs in ten countries (Buschman, 2005) with the Netherlands with maximum cultivation area (4280 hectares, 77%), followed by France (401 hectares, 0.8%), Chile (205 hectares, 0.4%), Japan (189 hectares, 0.3%) and New Zealand (110 hectares, 0.2%). In India, lilies are famous among the growers of Haryana, Himachal Pradesh, Jammu Kashmir, Uttarakhand and Tamil Nadu because of its high profitability within a short growing period of four months.

Asiatic hybrid lily can be multiplied through seeds, bulb scales, bulb division and stem bulblets, however, the stem bulblets and bulb division are two of the most suitable

methods to propagate it. Growth and development of lilies are influenced and controlled by many interacting genetic and environmental factors. Throughout lily forcing, temperature has the greatest influence on the rate of growth and development (Riviere, 1978), whereas long day treatments promote vegetative growth (Langhans and Miller, 1960).

Among the several factors influencing the growth and production of bulbs/bulblets, the selection of suitable variety/ hybrid also plays a significant role in the performance of this bulbous crop under the local agro climatic conditions. Further, growing environment is also an important factor which influences the various growth and bulb parameters of this crop to a greater extent. In this context, protected which ensures the quality production of planting materials to reduce cost of cultivation of this crop so that the local flower growers can be promoted to cultivate this crop commercially. Presently, it has been observed that different varieties of Asiatic lily are grown as garden plants by some amateurs in Hisar and other urban areas of the state by purchasing planting materials from the local nurserymen or procuring from the Chandigarh or Delhi based private supplier. So, the agro-climatic condition of the state is quite favourable for the cultivation of this flower crop, but the production of quality planting material has not been taken seriously yet by the flower growers due to the lack of proper knowledge about the production technology of planting material and its post harvest handling and storage. With this background, the present investigation has been carried out to find out suitable growing conditions and the varieties of Asiatic lily for commercial adoption as well as production of bulbs/bulblets under Hisar condition.

MATERIALS AND METHODS

The experiment was conducted at research farm of Agri-tourism Centre, CCS HAU, Hisar (Haryana) during the cropping year 2019-2020. The experimental site has a semi-arid subtropical climate with hot, dry and desiccating winds during summer season and severe cold during winter season. During the cropping period (Nov. to June 1st week) of this year, the mean weekly maximum temperature (43.2°C) was recorded in last week of May, while the minimum (2.6°C) was recorded in last week of December. The area of Hisar also got unpredictable rains in the month of March from thunderstorms in association with the passing western disturbances. The soil of district Hisar has been derived from Indo-Gangetic alluvial plain, which is sandy loam in texture and has some amount of calcium carbonate in the profile. Physico-chemical analysis of the soil of experiment field was done and it was found to be sandy loam in texture, alkaline in nature, medium in organic carbon, low in available nitrogen, high in available phosphorus and high with respect to available potassium. The experiment was laid out in RBD (factorial) with three replications and twelve treatment combinations, comprising of three growing conditions (polyhouse of 200 µ, green shade-net of 50% shade and open field) and four varieties (Courier White, Tresor, Red Stone and Nova Lux). As per requirement, uniformed sized programmed bulbs of four varieties of Asiatic lily were procured from the Progreen Biotech. Private Limited, New Delhi, treated with carbendazim (Bavistin) 0.2% plus mancozeb (Indofil M-45) 0.35% and planted as per layout plan on dated 7th November 2019 with spacing of 30 × 20 cm and at 6-8 cm depth on raised bed of 15 cm height, 1.25 m width and 1.50 m length in each plot. Various agronomical practices like drip irrigation, fertilization, intercultural operations like- weeding, hoeing, earthing up, staking *etc*. and plant protection measures were adopted according to the "package of practices for horticultural crops" as recommended by SAU,s and ICAR Institutes for this crop. After cessation of flowering, the irrigation was gradually withheld and the bulbs were allowed to mature. The following observations on vegetative (except sprouting) and bulb parameters were recorded on five healthy plants as selected randomly in each plot.

The number of days taken to bulb sprouting were recorded from the date on which bulbs planted to the average date on which first sign of bulb sprout was visible with naked eye on soil surface and such varied dates were recorded for all the bulbs planted in each plot and then the average number of days taken to bulb sprout were worked out for each treatment. The percentage of sprouted bulbs was calculated by counting the number of sprouted bulbs in each plot after the twelve days of planting and the emergence of healthy sprout from the bulb was considered as a successful sprouting. Percentage of sprouted bulbs in individual treatment was calculated by using the mathematical formula. Plant height (cm) of five selected plants in each plot was measured from the surface of soil to the top of inflorescence of each plant with the help of meter rod at peak flowering stage and then averaged. The total numbers of leaves on these five plants in each plot were also counted at full bloom stage and mean number of leaves per plant were calculated. The length of three leaves (*i.e*. 4th leaf from base, middle leaf and upper leaf) from the stem base to the tip of leaf in each selected plant was measured with the help of meter rod at full bloom stage and then the average length of leaf per plant was calculated for each treatment and expressed in cm. Similarly, the width of three leaves (*i.e*. 4th leaf from base, middle leaf and upper leaf) from margin to margin at the middle of leaf in each selected plant was measured with the help of foot scale at full bloom stage and then averaged for each treatment and expressed in cm.

For taking observations on bulb parameters, five healthy plants were selected randomly after the harvesting of spikes in each plot and their bulbs were dug out separately during the last week of May and first week of June when all the plants had dried up. All these bulbs and bulblets were cleaned, shade-dried and kept in cloth bags. The number of days taken upto the harvesting of bulbs for each treatment were calculated by counting days from the planting date of bulbs upto the harvesting date of daughter bulbs in each plot. The weight of bulbs (g) was recorded by weighing all

the daughter bulbs produced by five selected plants with the help of an Electronic Weighing Balance and then the average weight of bulbs per plant was calculated. The diameter of bulb (cm) was recorded by measuring the minimum and maximum equatorial diameter of bulbs, as produced by the five selected plants in each plot, with the help of a digital Vernier Caliper and the average diameter of the bulb per plant was calculated. The total number of bulblets produced by five selected plants in each plot were also counted and the mean number of bulblets per plant were calculated. The recorded data on different parameters were statistically analysed by applying the analysis of variance technique and the treatment differences were tested by 'F' test of significance on the basis of null hypothesis (Cochran and Cox, 1963). Statistical analysis was done by using OPSTAT statistical software design developed by CCS HAU, Hisar to find out the significance of variation resulting from the experimental treatments. All tests of significance were made at 5% level of the significance.

RESULTS AND DISCUSSION

Effect of growing conditions and varieties on vegetative parameters

The data presented in Table 1 reveals that the number of days taken to bulb sprouting, plant height at flower harvesting stage and number of leaves per plant were significantly influenced by different growing conditions. Varieties of asiatic lily when grown under polyhouse recorded the minimum days (4.59) for bulb sprouting, the maximum plant height (107.10 cm) and number of leaves/plant (66.57), which was followed by varieties when grown under shade-net, while the maximum days (5.50) for bulb sprouting, the minimum plant height (58.10 cm) and number of leaves (54.80) were recorded when these varieties grown under open field condition. Bhat *et al.* (2016) also reported the better plant height and more number of leaves in varieties of Asiatic hybrid lily when grown under polyhouse due to better light and favourable temperature inside the polyhouse in comparison to open field condition. Similar results were also reported by Palai (2009) in chrysanthemum and Mohanty *et al.* (2011) in rose. Similarly, the length and width of leaf was also significantly influenced by different growing conditions (Table 1). The maximum leaf length (9.74 cm) and leaf width (2.32 cm) were observed in varieties when grown under shade-net and the varieties grown under polyhouse were observed at par with shade-net in these parameters, whereas the minimum leaf length (6.70 cm) and leaf width (2.08 cm) were observed in varieties when grown under open field condition. This might be due to change in leaf morphology, where in plants grown in shade- net developed large thin leaves with lesser stomata to compensate for the loss in light intensity by increasing the surface area for the process of photosynthesis (Fatmi *et al.*, 2018). This finding also got support from another finding of Kumari *et al.* (2019) in lily and Parekh *et al.* (2002) in rose.

The data presented in Table 1 reveals that the number of days taken to bulb sprouting, plant height at harvest and number of leaves/plant were also significantly influenced by the varieties of asiatic lily. The variety Tresor took minimum days for bulb sprouting (5.11 days) and Red Stone (5.33 days) was observed at par with Tresor, whereas the maximum days taken to bulb sprouting (6.00 days) were recorded in Nova Lux. The maximum plant height (89.01 cm) and number of leaves/plant (64.08) were recorded in Variety Tresor and it was followed by Red Stone, whereas the minimum plant height (73.28 cm) and number of leaves/plant (57.01) were recorded in Nova Lux. Length and width of leaf was also found to be significantly influenced by different varieties (Table 1). The longest leaf (9.50 cm) was observed in variety Tresor and Red Stone (9.36 cm) was found at par with Tresor, whereas the shortest leaf length (8.10 cm) was recorded in Courier White. However, the maximum leaf width (2.33 cm) was recorded in variety Nova Lux and Red Stone (2.22 cm) was observed at par with Nova Lux, while the minimum leaf width (2.09 cm) was registered in Tresor. Such variation in these vegetative parameters might be due to the different genetic constitution of these varieties as well as prevailing environmental conditions during the vegetative phase of this crop. Sankari *et al.* (2017) also reported that among the Asiatic varieties, Tresor and Brunello were superior by producing longer stem and more number of leaves/plant as compared to other varieties. Regarding vegetative parameters, almost similar variations were also observed by Mohanty *et al.* (2011) in rose.

Among the vegetative parameters, only two parameters *viz*. plant height and number of leaves/plant were significantly influenced by the interaction of growing conditions and varieties (Table 1). The variety Tresor when grown under polyhouse (C_1V_2) produced the maximum plant height (115.13 cm) and numbers of leaves/plant (69.67) and it was followed by Red Stone when grown under the same condition (C_1V_4), whereas the minimum plant height (51.20 cm) and number of leaves/plant (51.17) were recorded in Nova Lux and Courier White, respectively, when grown under open field condition. The maximum plant height and number of leaves/plant in variety Tresor under polyhouse condition might be due to varietal character and the favourable growing conditions in polyhouse mainly higher concentration of carbon dioxide gas. Bhat *et al.* (2016) also reported that the interaction of variety with growing could influence only few characters in varieties of Asiatic hybrid lily.

Effect of growing conditions and varieties on bulb parameters

It is clear from the data presented in Table 1 that the days taken upto harvesting of bulbs, weight of bulbs/plant, diameter (size) of bulb and the number of bulblets/ plant were found to be significantly influenced by different growing conditions. The varieties of asiatic lily when grown under

Table 1: Effect of different growing conditions and genotypes on growth and bulb parameters of Asiatic lily.

Treatments	Days taken to bulb sprouting	Percentage of sprouted bulbs	Plant height (cm) at harvest	No. of leaves/plant at harvest	Leaf length (cm) at harvest	Leaf width (cm) at harvest	Days taken upto the harvesting of bulbs	Weight of bulbs/ plant (g)	Diameter (size) of bulb (cm)	Number of bulblets/ plant
A: Growing conditions (C)										
C_1: Polyhouse	4.59	100.00	107.10	66.57	9.71	2.19	232.25	49.97	3.16	2.05
C_2: Shade-net	5.50	100.00	80.70	59.80	9.74	2.32	243.92	62.66	4.13	3.40
C_3: Open field	6.50	100.00	58.10	54.80	6.70	2.08	237.17	55.66	3.60	2.45
CD at 5%	0.35	NS	0.90	0.75	0.23	0.13	0.64	0.46	0.08	0.14
B: Genotypes (V)										
V_1: CourierWhite	5.67	100.00	78.21	58.02	8.10	2.14	238.11	54.85	3.37	2.31
V_2: Tresor	5.11	100.00	89.01	64.08	9.50	2.09	236.56	57.42	3.91	2.99
V_3: Nova Lux	6.00	100.00	73.28	57.01	7.94	2.33	239.22	53.06	3.52	2.51
V_4: Red Stone	5.33	100.00	87.33	62.23	9.36	2.22	237.22	59.03	3.72	2.72
CD at 5%	0.41	NS	1.09	0.87	0.54	0.15	0.70	0.54	0.09	0.12
Growing conditions × Genotypes (CV)										
C_1V_1	4.67	100.00	104.17	65.00	9.02	2.23	232.66	48.27	2.85	1.81
C_1V_2	4.33	100.00	115.13	69.67	10.73	2.20	231.00	51.97	3.38	2.20
C_1V_3	5.00	100.00	97.50	64.67	8.85	2.29	233.67	46.13	3.08	2.02
C_1V_4	4.34	100.00	111.50	66.93	10.25	2.26	231.67	53.50	3.32	2.16
C_2V_1	5.67	100.00	75.17	57.17	9.18	2.15	244.00	61.20	3.86	3.10
C_2V_2	5.00	100.00	86.10	64.30	10.23	2.25	242.67	63.93	4.45	3.90
C_2V_3	6.00	100.00	71.13	55.13	9.07	2.50	245.33	60.20	4.03	3.18
C_2V_4	5.33	100.00	90.33	62.30	10.47	2.37	243.67	65.30	4.20	3.44
C_3V_1	6.67	100.00	55.30	51.17	5.94	2.05	237.67	55.10	3.40	2.01
C_3V_2	6.00	100.00	65.73	58.27	7.42	2.02	236.00	56.36	3.90	2.88
C_3V_3	7.00	100.00	51.20	51.23	5.92	2.22	238.67	52.86	3.47	2.34
C_3V_4	6.33	100.00	60.17	57.47	7.37	2.03	236.33	58.30	3.65	2.55
CD at 5%	NS	NS	1.90	1.50	NS	NS	1.35	0.92	NS	0.24

polyhouse took the minimum days (232.25) upto the harvesting of bulbs, while the maximum days (243.92) were taken by the varieties when grown under shade-net condition. The maximum weight of bulbs/plant (62.66 g), diameter of bulb (4.13 cm) and number of bulblets/plant (3.40) were produced by the varieties when grown under shade-net, whereas the minimum weight of bulbs/plant (49.97 g), diameter (size) of bulb (3.16 cm) and number of bulblets/plant (2.05) were obtained when the varieties were grown under polyhouse. The reduction in weight and size of bulbs and bulblet yield under polyhouse might be attributed to the decreased assimilation of photosynthates due to early senescence of crop plants under polyhouse condition owing to high temperature as compared to shade-net condition, where aerial parts remained green for longer time which resulted in better performance of crop plants in the bulb parameters under shade-net as compared to polyhouse as well as open field conditions. Jhon and Khan (2003) and Jhon *et al.* (2005) also observed the similar results in tulip and concluded that the number of bulbs, bulblets and their weight per plant, and vase life of tulip flowers were comparatively less when grown under polyhouse condition.

The data (Table 1) revealed that the days taken upto harvesting of bulbs, weight of bulbs/plant, diameter (size) of bulb and number of bulblets/plant were also found to be significantly influenced by the varieties. The minimum days (236.56) upto the harvesting of bulbs were taken by variety Tresor which was followed by Red Stone (237.22 days), whereas the maximum days (239.22) were taken by Nova Lux. The maximum weight of bulbs/plant (59.03 g) was recorded in variety Red Stone and the minimum weight of bulbs/plant (53.06 g) was noticed in Nova Lux. The maximum diameter (size) of bulbs (3.91 cm) and number of bulblets/plant (2.99) were produced by Tresor, while the minimum diameter of bulb (3.72 cm) and number of bulblets/plant (2.31) were recorded in Courier White. Such variations in bulb parameters of asiatic lily might be due to the varietal character of these varieties controlled by genetically as reported by Kumar *et al*. (2011).

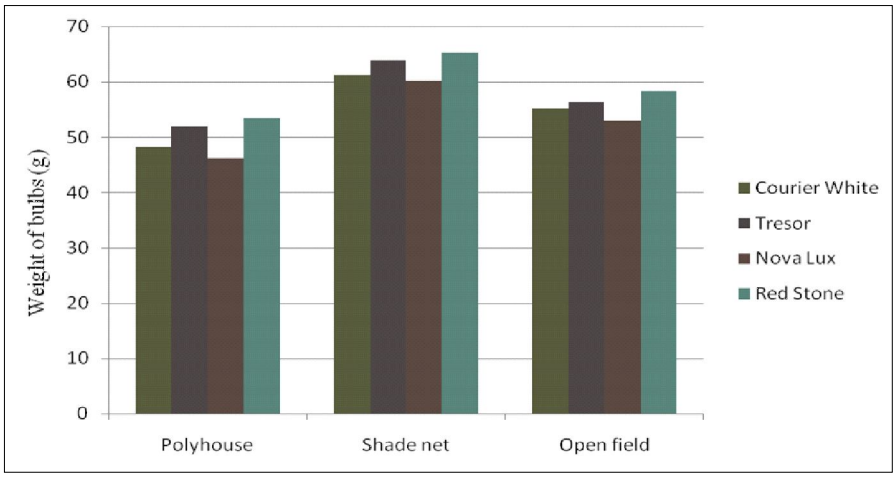

Fig 1: Comparative performance of varieties of Asiatic lily under different growing conditions with respect to weight of bulbs/plant.

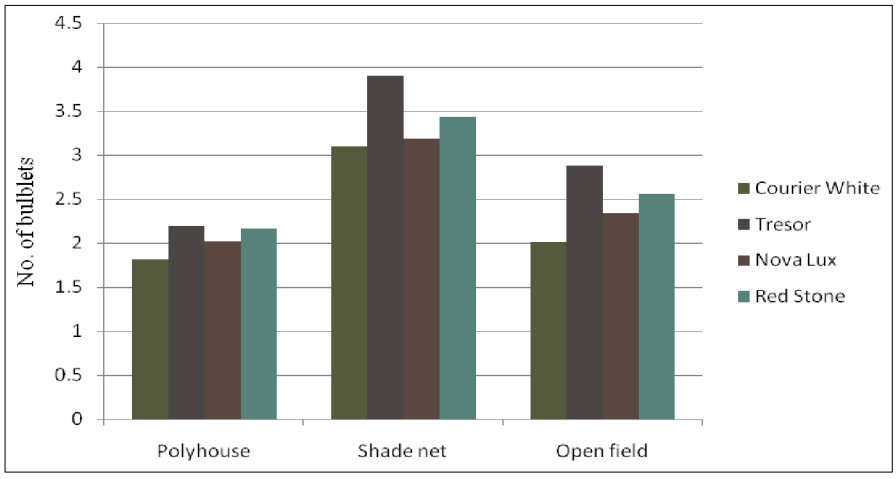

Fig 2: Comparative performance of varieties of Asiatic lily under different growing conditions with respect to number of bulblets/plant.

The data presented in Table 1 indicates that the bulb parameters *viz*. days taken upto the harvesting of bulbs, weight of bulbs/plant (Fig 1) and number of bulblets/plant (Fig 2) were also significantly influenced by the interaction of growing conditions and the varieties. Minimum days (231.00) upto the harvesting of bulbs were recorded in variety Tresor when grown under polyhouse (C_1V_2) and it was closely followed by Red Stone when grown under the same condition (C_1V4), whereas the maximum days (245.33) were taken by variety Nova Lux when grown under the shade-net condition (C_2V_3). Variety Red Stone when grown under shade-net (C_2V_4) produced the maximum weight (65.30 g) of bulbs/plant, and it was followed by Tresor (63.93 g) when grown under the same condition (C_2V_2), while the variety Nova Lux when grown under polyhouse (C_1V_3) produced the minimum weight (46.13 g) of bulbs/plant. Variety Tresor when grown under shade-net (C_2V_2) produced the maximum number of bulblets/plant (3.90), which was followed by Red Stone (3.44) when grown under the same condition (C_2V_4), whereas variety Courier White when grown under polyhouse (C_1V_1) produced the minimum number of bulblets/plant (1.81). Similar findings were also reported by Deeptimayee and Mohanty (2015) in lily. Overall, the growing conditions *viz*. polyhouse as well as shade-net and the varieties were found to be influencing the vegetative and bulb parameters of Asiatic lily under Hisar condition.

CONCLUSION

From the present investigation, it has been concluded that the varieties of Asiatic lily when grown under polyhouse, however, performed better in various vegetative and bulb parameters than the shade-net as well as open field conditions, resulting in early bulb sprouting (4.59 days), maximum plant height (107.10 cm), maximum number of leaves/plant (66.57) and the minimum days (232.25) upto the harvesting of bulbs, but in other vegetative as well as bulb parameters *viz*. leaf length (9.74 cm), leaf width (2.32 cm), weight of bulbs/plant (62.66 g), diameter of bulb (4.13 cm) and number of bulblets/plant (3.40), the shade-net condition was observed to be better than polyhouse. Out of four varieties, Tresor comparatively performed better in vegetative and bulb parameters than the other varieties, resulting in early bulb sprouting (5.11 days), minimum days (236.56) upto the harvesting of bulbs and the maximum plant height (89.01 cm), number of leaves/plant (64.08), leaf length (9.50 cm), diameter of bulb (3.91 cm) and number of bulblets/plant (2.99). Variety Red Stone also performed better as compared to other two varieties resulting in maximum weight of bulbs/plant (59.03 g) and also observed next to Tresor in various parameters *viz*. days taken to bulb sprouting, days upto the harvesting of bulbs, plant height, number of leaves/plant, leaf length, diameter of bulb and number of bulblets/plant. However, the maximum leaf width (2.33 cm) was recorded in variety Nova Lux and the percentage of sprouted bulbs was observed non-significantly influenced by the growing conditions as well as varieties. The interaction of growing conditions and varieties also influenced the various vegetative and bulb parameters significantly in asiatic lily. Variety Tresor when grown under polyhouse condition took minimum days (231.00) upto the harvesting of bulbs and produced maximum plant height (115.13 cm) as well as numbers of leaves/plant (69.67) and it was closely followed by Red Stone when grown under the same condition. Variety Red Stone when grown under shade-net produced the maximum weight (65.30 g) of bulbs/plant and it was followed by Tresor (63.93 g) when grown under the same condition, while variety Tresor when grown under shade-net produced the maximum number of bulblets/plant (3.90) and it was followed by Red Stone (3.44) when grown under the same condition. Henceforth, the varieties Tresor and Red Stone when grown under polyhouse (thickness: 200 µ) performed better in vegetative parameters and when grown under the green shade-net (providing: 50% shade) performed better in bulb parameters than the other combinations of growing conditions and varieties.

REFERENCES

Bhat, S.K., Patra, S.K. and Mohanty, C.R. (2016). Varietal evaluation of Asiatic hybrid lilies under open and polyhouse condition. Int. J. Agri. Sci. and Res. 6(3): 569-576.

Buschman, J.C.M.(2005). Globalisation-flowers-flower bulbs-bulb flowers. Acta Horticulture. 673: 27-33.

Chaudhary, N., Sindhu, S.S., Kumar, R., Saha, T.N., Raju, D.V.S., Arora, A. and Sharma, R.R. (2018). Effect of growing media composition on growth, flowering and bulb production of LA hybrid (Red Alert) and Oriental (Avocado) group of Lilium under protected condition at Hisar (Haryana). Int. J. Curr. Microbiol. App. Sci. 7(6): 3389-3394.

Cochran, W.G. and Cox, G.M. (1963). Experimental Designs. Asia Publishing House, New Delhi.

Deeptimayee, B. and Mohanty, C.R. (2015). Evaluation of asiatic hybrid lily varieties under Bhubaneswar condition. Asian Journal of Horticulture. 10(2): 194-200.

Fatmi, U., Singh, D. and Bharti, S. (2018). Growth and flowering of Asiatic lily cv. Pollyanna as influenced by different growing environments. Plant Archives. 18(1): 760-762.

Jhon, A.Q. and Khan, F.U. (2003). Evaluation tulips under polyhouse and open conditions. Journal of Ornamental Horticulture. 6(1): 42-45.

Jhon, A.Q., Khan, F.D., Rouf, A., Bhat, R.A. and Nazki, I.T. (2005). Effect of growing environment on flowering and bulb production of tulip. Journal of Ornamental Horticulture. 8(2): 112-114.

Kumar, R., Patel, V., Verma, D., Bidyut, C. Singh. and Sindhu, S. (2011). Evaluation of Asiatic lilium under subtropical mid hills of Meghalaya. Advance Research Journal of Crop Improvement. 2(2): 257-259.

Kumari, S., Kumar, S. and Singh, C.P. (2019). Comparative performance of Oriental Hybrid Lily cv. White Cup under protected conditions. International Journal of Current Microbiology and Applied Sciences. 8(1): 2451-2455.

Langhans, R.W. and Miller, R.O. (1960). Influence of the Day Length, Temperature and Number of Short Days on the Flowering of Poinsettia (*Euphorbia pulcherrima*). Proceedings of the American Society for Horticultural Science. 75: 753-760.

Mohanty, C.R., Mohanty, A., Das, A.B. and Kar, D.S. (2011). Comparative performance of some rose varieties under open and protected environment. Asian Journal of Horticulture. 6(2): 288-293.

Palai, S.K. (2009). Comparative studies on performance of spray chrysanthemums under open and naturally ventilated polyhouse. Journal of Ornamental Horticulture. 12(2): 138- 141.

Parekh, N.B., Kikani, K.P., Joshi, K.I. and Jadav, R.G. (2002). Comparative Studies of Gladiator Rose under Net House and Open Conditions. Abstract, National Symposium on Indian Floriculture in the New Millennium, Feb. 25-27, 12p.

Riviere, S. (1978). Influence of the temperature on the flowering of the white lily (*Lilium candidum*). Canadian Journal of Botany. 56: 110-120.

Sankari, A., Anand, M. and Anita, B. (2017). Evaluation of *Lilium Nilgiris*. Advances in Floriculture And urban Horticulture. p. 176.