



Varietal Evaluation of Asiatic Lily (*Lilium asiaticum*) Under Prayagraj Shade Net Condition

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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 present investigation entitled, "Varietal evaluation of Asiatic Lily (*Lilium asiaticum*) under Prayagraj shade net condition" was under taken in the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, (Allahabad). During Rabi season (2021-2022). The experiment was layout in Randomized block design (RBD) with 07 varieties, replicated thrice. The varieties V3 (Beau Soleil) was found the statistically significant compared to other varieties combination, which recorded highest plant height (64.15 cm), Number of leaves (63.33 cm), Length of leaf (11.53 cm), Width of Leaf (2.31 cm), Flower bud appearance (30.73 days), Number of flower buds per shoot (4.14), flower bud length (9.9 cm), Flower bud width (5.5 cm), Days taken for bud breaking (22.17 days), Days taken for first flower opening (49.63 days), Days taken for first flower opening (29.30 days), Width of Flower (16.87 cm), Length of Flower (12.80 cm), Flower stalk length (7.02 cm), Number of flowers per shoot (3.47), Weight of bulblets per plant (66.61 g), Number of bulblets per bulb (4.31), followed by V6 (Eremo).

Keywords: Asiatic lily; evaluation; shade net; varieties.

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1. INTRODUCTION

Lilium asiaticum is one of the horticulturally most important cut flower and pot plant production. Asiatic lilies are true lilies from the genus *Lilium* belongs to family *Liliaceae*. It is a species of great economic importance in production and commercialization of cut flower in the international market. *Lilium* as cut flowers occupy 4th position in the world cut flower trade. They are extensively grown in greenhouses as cut flower in global a flower trade due to wider choice of growing periods, array of colours and everlasting quality [1,2]. In Netherland, *Lilium* bulb production involves planting the bulb in the spring and lifting them again before winter. For the production of flower, the bulb can be planted throughout the year in many different climate zones, both in field and in greenhouse. These lovely perennials can grow up to 5 feet tall. Early autumn or late spring offer the best time for planting Asiatic lilies [3-5]. They thrive on full sun and well draining soil. While they look stunning grown together in small groups, you can also grow Asiatic lilies in containers and pots that can be scattered around in the lawn or used for home décor. Species of *Liliaceae* bloom at various times from spring to late summer. Lilies are usually planted as bulbs in the dormant season. These are best planted in south-facing (Northern hemisphere), slightly sloping aspect, in sun or part shade, at depth two and half times the height of the bulb. The maximum day and night temperature for obtaining good yield is 21°C to 25°C and 12°C and 15°C, respectively. Although the agro climatic condition of the state is quite favorable for this flower crop, its commercial cultivation has not yet been started by the flower growers due to lack of knowledge about its production technology and unavailability of quality planting materials. Among several factors influencing growth, yield and quality of flowers, including *lilium* improved varieties/ hybrids play significant roles which need proper evaluation for their performance under local agro climatic condition [6-8]. Hence, present investigation is to be conducted to assess the performance of 7 varieties of Asiatic lily for their growth, flowering and bulb production characters at Prayagraj condition.

Large and attractive flowers with the capacity to rehydrate after long distance transportation, have made Asiatic lily gain popularity fast in our country. The cultivars are highly appreciated for their outstanding range of colours, fragrance and adaptability to several environmental conditions.

Asiatic lily is commercially cultivated in different parts of India like, The Nilgiris (Cooner, Ooty, Kothagiri), Kalvarayan hills (Karumanthurai) Kodaikanal, Shevroy hills (Yercad), Himanchal Pradesh ie under Shimla and Kullu condition, North Eastern states like Arunanchal Pradesh, Manipur, and Jammu and Kashmir etc. The popularity of Asiatic lily is rising in our country due to their large and attractive flowers having capacity to rehydrate after a long transportation. These are fast emerging as the largest contributor when compared with any other cut flower or plantation crop being acquired from Bengaluru, Pune and hilly areas of the country like Himachal Pradesh, Uttarakhand and North Eastern regions. However, Asiatic lily varieties/ hybrids grown by amateurs in the state of Uttar Pradesh are coming up well and blooming in wide range of color, size and shape.

2. MATERIALS AND METHODS

A field experiment was carried out under the present investigation entitled "Varietal evaluation of Asiatic lily (*Lilium asiaticum*) under Prayagraj shade net conditions," under Department of Horticulture, SHUATS, Naini, Prayagraj during session of 2020-2021 during Rabi season in India.

The experimental material consists of Asiatic Lily the soil of the experiment field was alkaline, sandy loam and pH of 7.2. The experiment was laid out in randomized block design with three replications consisting of 7 varieties. Asiatic Lily was planted in the shade net at a spacing of 45x30 cm and the observation were recorded for Plant height (cm), Number of leaves per plant, Leaf length (cm), Leaf width (cm), Days taken for appearance of flower bud, Number of flower buds per shoot, Flower bud length (cm), Flower bud width (cm), Days taken for bud break from appearance of flower bud, Days taken for first flower opening from planting, Days taken for first flower opening from appearance of flower bud, Width of flower (cm), Length of flower (cm), Flower stalk length (cm), Number of flowers per shoot, Weight of bulblets per plant (g), Number of bulblets per plot, Number of bulb per hectare.

2.1 Source and Planting Material

Bulbs of Lily varieties for the experiment were procured from Bhola nursery, Lucknow, UP. The seven varieties of Asiatic Lily were Arcachon, Corleone, Albuferia Eremo, Indian summer set, Beau Soleil, Litouwen.

2.2 Statistical Analysis

The data were analysed in randomized block design as per procedure of Cochran and Cox (1959). Interpretation of results was made on the basis of "F" test and critical difference at 5% probability calculated to compare the varieties.

3. RESULTS AND DISCUSSION

3.1 Growth Parameters

3.1.1 Plant height

The statically analysed data on plant height of Asiatic Lily were represented in Table 1. The plant height with maximum length is recorded (36.00 cm, 47.25 cm, 64.15 cm) at 20,40,60 days in V3 (Beau Soleil), whereas the minimum Plant Height (10.91 cm, 19.41 cm, 31.27 cm) at 20,40,60 days was recorded in V4 (Albuferia). It is clear from the table that there is significant difference among various varieties of Asiatic Lily. The variation in plant height could be due to the variation in the genetic makeup of the different varieties. Environmental condition caused variation in the hormonal balance and the cell division rate that result in changes in the plant height of different varieties was, similar observations are also made by Vedavathi et al., [9].

3.1.2 Number of leaves per plant

The data mentioned in Table 1 showed that the maximum number of leaves per plant is recorded (51.67 cm, 61.67 cm, 63.33 cm) at 20,40,60 days was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (42.33 cm, 52.33 cm, 57.73 cm) at 20,40,60 days and the minimum number of leaves per plant (31.27 cm, 41.27 cm, 44.73 cm) in 20,40,60 days was recorded in V4 (Albuferia). It is clear from the table that there is significant difference among various varieties of Asiatic Lily. Similar observations were observed by Karthikeyan and Jawaharlal [10] in carnation and Vedavathi et al., [9] in Asiatic lily. The variation in number of leaves per plant under different varieties, might be due to difference in their genetic inherit capacity and suitability under this climate. Mohanty et al., (2002) also reported an increase in the number of leaves in tuberose.

3.1.3 Leaf length

The leaf length of Asiatic Lily varieties is mentioned in Table 1. It was clear from table that the maximum leaf length per plant at (9.76 cm, 11.53 cm, 11.76 cm) in 20,40,60 days was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (7.65 cm, 9.65 cm, 10.19 cm) at 20,40,60 days and the minimum Leaf length per plant (4.19 cm, 6.19 cm, 7.62 cm) at 20,40,60 days was recorded in V4 (Albuferia). Significantly the difference in leaf length may be due to the inherent character and genetic makeup of the varieties. Similar results were recorded in Carnation by Sympli et al., (2019).

3.1.4 Leaf width

The leaf width of Asiatic Lily varieties is mentioned in Table 1. It was clear from table that the maximum leaf width per plant at (1.97 cm, 2.31 cm, 2.38 cm) at 20,40,60 days was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (1.93 cm, 2.03 cm, 2.15 cm) at 20,40,60 days and the minimum Leaf width per plant (0.63cm, 1.03cm, 1.36cm) at 20,40,60 days was recorded in V4 (Albuferia). The variation in Leaf width could be due to the variation in the genetic makeup of the different varieties. Also shade net condition caused variation in the varieties, that result in changes in the leaf width of different varieties similar result were recorded in carnation by Sympli et al., (2019).

3.2 Flowering Parameters

3.2.1 Flower bud appearance

The flower bud appearance of Asiatic Lily varieties is mentioned in Table 2. It was clear from table that the maximum flower bud appearance (30.73) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (29.47) and the minimum flower bud appearance at (24.73) was recorded in V4 (Albuferia). Flower bud initiation had significantly differed and the difference may be due to the inherent character and genetic makeup of the variety. Similar results were recorded in chrysanthemum by Kumar et al., (2020).

3.2.2 Flower bud per shoot

The number of flower buds per shoot of Asiatic Lily varieties is mentioned in table 2. It was clear from table that the maximum flower bud per shoot (4.14) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (3.98) and the minimum number of flower buds per shoot at 20 days (2.01) was recorded in V4 (Albuferia). The difference in the flower bud shoot of Asiatic Lily may be due to varietal character, habitat and genetic makeup of the varieties. Similar results were recorded in Chrysanthemum by Singh et al., (2017).

3.2.3 Days taken for bud breaking from initiation of Asiatic Lily

The days taken for bud breaking Asiatic Lily varieties is mentioned in table 2. It was clear from table that the maximum days taken for bud breaking from initiation of lily (22.17) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (23.27) and the minimum days taken for bud breaking (25.74) was recorded in V4 (Albuferia). The difference in flower bud breaking may be due to the inherent character and genetic makeup of the varieties and environmental conditions similar results were recorded in Asiatic Lily by Kumar et al., (2011).

3.2.4 Days taken for first flower opening from planting bulbs of Asiatic Lily

The flower days taken for first flower opening Asiatic Lily varieties is mentioned in table 2. It was clear from table that the maximum (49.63 days) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (52.67 days) and the minimum days taken for first flower opening (63.46 days) was recorded in V4 (Albuferia). The difference in days taken for first flower opening from planting may be due to the inherent character and genetic makeup of the varieties and environmental conditions similar results were recorded in gladiolus by Shiva et al., (2002).

3.2.5 Days taken for first flower opening from initiation of flower bud of Asiatic Lily

The days taken for first flower opening from appearance of flower bud of Asiatic Lily varieties is mentioned in table 2. It was clear from table

that the maximum (29.30 days) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (30.55 days) and the minimum days taken for first flower opening from appearance of flower bud at (34.15 days) was recorded in V4 (Albuferia). The difference may be first flower opening from initiation of flower bud due to the inherent character and genetic makeup of the varieties and environmental conditions similar results were recorded in Asiatic Lily by Sindhu and Singh (2012).

3.2.6 Flower bud width

The flower bud width of Asiatic Lily varieties is mentioned in table 3. It was clear from table that the maximum flower bud width (5.5 cm) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (5.2 cm) and the minimum flower bud width (4.1 cm) was recorded in V4 (Albuferia). The difference in flower bud width may be due to the inherent character and genetic makeup of the varieties and environmental conditions similar results were recorded in Asiatic Lily by Kumar et al., (2011).

3.2.7 Flower bud length

The flower bud length of Asiatic Lily varieties is mentioned in Table 3. It was clear from table that the maximum flower bud length (9.9 cm) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (9.8 cm) and the minimum flower bud length (8.3 cm) was recorded in V4 (Albuferia). The difference in flower bud length may be due to the inherent character and genetic makeup of the varieties and environmental conditions similar results were recorded in Asiatic Lily by Barik et al., [11].

3.2.8 Flower width

The flower width of Asiatic lily varieties is mentioned in Table 3. It was clear from the table that the maximum width of flower (16.87 cm) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (16.61 cm) and the minimum width of flower at (14.27 cm) was recorded in V4 (Albuferia). The difference in flower width may be due to the inherent character and genetic makeup of the varieties and environmental conditions similar results were recorded in gladiolus by Srinivas et al., [12].

3.2.9 Flower length

The flower length of Asiatic lily varieties is mentioned in Table 3. It was clear from the table that the maximum length of flower (12.80 cm) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (12.18 cm) and the minimum length of flower at (9.46 cm) was recorded in V4 (Albuferia). The difference in flower length may be due to the inherent character and genetic makeup of the varieties and environmental conditions similar results were recorded in Asiatic Lily by Shiva et al., (2002).

3.2.10 Flower stalk length

The flower stalk length of Asiatic lily varieties is mentioned in Table 3. It was clear from the table that the maximum flower stalk length (7.02 cm) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (6.42 cm) and the minimum flower stalk length at (4.12 cm) was recorded in V4 (Albuferia). The higher flower stalk length of Asiatic Lily was due to inherit characteristics, better adaptability under the shade net conditions, at Allahabad. The result was given by Malik et al., (2019) in Asiatic Lily.

3.2.11 Number of flowers per shoot

The flower width of Asiatic lily varieties is mentioned in Table 3. It was clear from the table that The maximum number of flowers per shoot (3.47) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (3.27) and the minimum number of flowers per shoot (1.53) was recorded in V4 (Albuferia). The higher number of flower per shoot of Asiatic Lily was due to inherit characteristics, better adoptability for the shade net conditions. The result was given by Malik et al., (2019) in snapdragon.

3.3 Bulb Characters

3.3.1 Weight of bulblets per plant

The weight of bulblets per plant of Asiatic lily varieties is mentioned in Table 3. It was clear from the table that the maximum weight of bulblets per plant at (66.61 g) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (64.30 g) and the minimum number of weight of bulblets per plant (50.61 g) was

recorded in V4 (Albuferia). The difference in Weight of bulblets per plant may be due to the inherent character and genetic makeup of the varieties and environmental conditions similar results were recorded in Asiatic Lily by Desh raj [13].

3.3.2 Number of bulblets per bulb

The number of bulblets per bulb of Asiatic lily varieties is mentioned in Table 3. It was clear from the table that the maximum number of bulblets per bulb at (4.31) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (3.86) and the minimum number of bulblets per bulb (2.18) was recorded in V4 (Albuferia). The difference in number of bulblets per bulb may be due to the inherent character and genetic makeup of the varieties and environmental conditions similar results were recorded in Asiatic Lily by Desh raj [13].

3.4 Yield Parameters

3.4.1 Number of bulb per plot

The number of bulblets per plot of Asiatic lily varieties is mentioned in Table 3. It was clear from the table that the maximum number of bulb per plot at (2.05) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (2.04) and the minimum number of bulb per plant at (1.12) was recorded in V4 (Albuferia). The difference in the yield per plot may be due to varietal character, habitat type and genetic makeup of varieties and suitability under shade net condition. Similar results were recorded in chrysanthemum by Srilatha et al. (2015).

3.4.2 Number of bulb per hectare

The number of bulb per hectare of Asiatic lily varieties is mentioned in Table 3. It was clear from the table that the maximum number of bulb per hectare at (76764.74) was recorded in the variety V3 (Beau Soleil), followed by V6 (Eremo) with (76176.34) and the minimum number of bulb per hectare at (73883.93) was recorded in V4 (Albuferia). The difference in the yield per hectare may be due to varietal character, habitat type and genetic makeup of varieties. Similar results were recorded in chrysanthemum by Singh et al. (2017).

Table 1. Evaluation of asiatic lily varieties in terms of plant height (cm), no of leaves, leaf length (cm), leaf width (cm)

Notations	Varieties	Plant height (cm)			No. of leaves per plant			Leaf length (cm)			Leaf width (cm)		
		20 DAP	40 DAP	60 DAP	20 DAP	40 DAP	60 DAP	20 DAP	40 DAP	60 DAP	20 DAP	40 DAP	60 DAP
V1	Arcachon	32.83	41.33	50.07	42.47	52.47	56.27	6.91	8.91	10.11	1.37	1.77	1.94
V2	Indian Summer Set	27.73	36.23	46.37	39.77	49.77	52.42	5.97	7.94	7.97	1.18	1.58	1.67
V3	Beau Soleil	38.75	47.25	64.15	51.67	61.67	63.33	9.76	11.53	11.76	1.97	2.31	2.38
V4	Albuferia	10.91	19.41	31.27	31.27	41.27	44.73	4.19	6.19	7.62	0.63	1.03	1.36
V5	Corleone	14.13	22.63	45.62	33.67	43.67	48.20	5.73	7.73	7.89	0.81	1.21	1.44
V6	Eremo	36.00	44.50	58.60	42.33	52.33	57.73	7.65	9.65	10.19	1.93	2.03	2.15
V7	Litouwen	29.79	38.29	46.37	40.47	50.47	54.39	6.08	8.08	9.24	1.30	1.70	1.72
	F-TEST	S	S	S	S	S	S	S	S	S	S	S	S
	SEd(±)	1.06	1.06	0.68	0.87	0.87	0.43	0.27	0.27	0.16	0.27	0.27	0.10
	CD (5%)	3.27	3.27	2.08	2.69	2.69	1.33	0.82	0.82	0.49	0.82	0.82	0.32
	CV%	6.76	5.15	2.39	3.75	3.01	1.39	6.95	5.33	2.96	6.95	5.33	9.96

Table 2. Evaluation of asiatic lily varieties in terms of flower bud appearance, flower bud per shoot, days taken to bud breaking from initiation of flower bud, days taken for first flower opening from planting of bulbs, days taken to first flower opening from initiation of flower bud

Notations	Varieties	Flower bud appearance	Flower bud per shoot	Days taken to bud breaking from initiation of flower bud	Days taken for first flower opening from planting of bulbs	Days taken to first flower opening from initiation of flower bud
V1	Arcachon	28.67	3.61	24.16	54.44	31.83
V2	Indian Summer Set	25.87	2.86	24.74	56	32.97
V3	Beau Soleil	30.73	4.14	22.17	49.63	29.30
V4	Albuferia	24.73	2.01	25.74	63.46	34.15
V5	Corleone	27.43	2.29	25.24	57	33.40
V6	Eremo	29.47	3.98	23.27	52.67	30.55
V7	Litouwen	27.80	3.03	24.51	55.29	32.22
	F-TEST	S	S	S	S	S
	SEd(±)	0.63	0.11	0.23	0.74	0.71
	CD (5%)	1.95	0.33	0.69	2.28	2.19
	CV%	3.92	5.92	1.61	2.31	3.84

Table 3. Evaluation of asiatic lily varieties in terms of flower bud width (cm),flower bud length (cm), width of flower (cm), length of flower (cm), flower stalk length (cm), number of flowers per shoot. Weight of bulblets per plant (g), number of bulblets per bulb, yield per plot, yield per hectare (lakh), benefit cost ratio

Notations	Varieties	Flower bud width (cm)	Flower bud length (cm)	Width of flower (cm)	Length of flower (cm)	Flower stalk length (cm)	Number of flowers per shoot	Weight of bulblets per plant (g)	Number of bulblets per bulb	Yield per plot	Yield per hectare (lakh)	Benefit Cost ratio
V1	Arcachon	5.1	9.7	16.28	11.46	6.03	2.47	61.38	3.42	1.96	75255.23	3.30
V2	Indian Summer Set	4.6	9.1	15.21	10.65	5.22	1.82	56.78	2.94	1.71	73735.77	2.82
V3	Beau Soleil	5.5	9.9	16.87	12.80	7.02	3.47	66.61	4.31	2.05	76764.74	4.24
V4	Albuferia	4.1	8.3	14.27	9.46	4.12	1.53	50.61	2.18	1.12	73883.93	1.88
V5	Corleone	4.5	8.5	14.80	9.93	4.84	1.80	54.67	2.60	1.73	75513.3	2.35
V6	Eremo	5.2	9.8	16.61	12.18	6.42	3.27	64.30	3.86	2.04	76176.34	3.77
V7	Litouwen	4.8	9.6	15.61	10.79	5.50	1.88	59.20	3.37	1.36	75634.23	3.30
	F-TEST	S	S	S	S	S	S	S	S	S	S	S
	SEd(±)	0.19	0.18	0.12	0.18	0.17	0.10	0.83	0.09	0.09	473.47	
	CD (5%)	0.58	0.54	0.37	0.54	0.53	0.32	2.57	0.28	0.28	1354.38	
	CV%	6.77	3.30	1.33	2.74	5.33	7.75	2.44	4.94	4.94	1.08	

4. CONCLUSION

In the present investigation it was concluded that variety (V3) (Beau Soleil) was found to be the best plant growth, flower quality and flower yield as compared to other varieties. The higher in terms of benefit cost ratio was recorded in (Beau Soleil).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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