



# Evaluation of Liliium Cultivars for Vegetative and Propagation Traits under Temperate Conditions of Kashmir

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## **Author's contribution**

*The sole author designed, analyzed, interpreted and prepared the manuscript.*

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## **ABSTRACT**

Morphological characterization of 15 genotypes viz. Navona, Malesco, Litouwen, Black Out, Revenna, Pink Palace, Tiber, Conca-D, Nello, Yellow Diamond, Tresor, Rialto, Courier, Cobra, Pavia genotypes was carried out during year 2018 at Division Of Floriculture and Landscape Architecture SKUAST- K Shalimar with an objective to assess the response to traits of growth and propagation ratio. On the basis of data maximum plant height of 90.70 cm resulted with cultivar black out and minimum 50.60cm with cultivar Navona. Number of leaves per plant followed the same trend with maximum 99.87 noticed in cultivar Black out and minimum 62.20 in cultivar Navano. Leaf area per plant ranged from 166.30 cm<sup>2</sup> in cultivar Tiber to 443.50 cm<sup>2</sup> in Pink Palace. The leaf area index varied between 1.20 and 1.96 in Tiber and Pink Palace cultivars, respectively. Weight of bulb cluster plant<sup>-1</sup> (gm) ranged from 30.81 (gm) in Navona to 72.97 (gm) in Black Out.

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Variability for weight of subsidiary bulbs per plant varied from 32.65 g in Navona to 80.45 g in Black Out respectively. Highest values for weight of main bulb plant<sup>-1</sup> (73.65 gm) resulted with cultivar Black out and minimum 31.52(gm) in Navona. Weight of subsidiary bulbs plant<sup>-1</sup> (gm) followed the same trend recording maximum 7.30 (gm) with cultivar Black out and minimum 2.70 (gm) for cultivar Navano. Size of main bulb (cm) ranged between 4.63(cm) in cultivar Navano to 6.33(cm) in cultivar blackout.

*Keywords: Lilium cultivars; characterisation; vegetative traits; propagation.*

## 1. INTRODUCTION

"Lilium is one of the most important flowering geophytes of the world. The genus Lilium comprises of many species and these are divided into seven sections. Northern hemisphere mainly Asia, North America and Europe, especially China, Nepal, Korea and Japan are the gene centres of this genus around the world. Lilium is a perennial ornamental crop belonging to Liliaceae and has great ornamental, medicinal and edible value. It is being cultivated for centuries as an ornamental plant due to its importance in production and commercialization of cut flower in the international market. Due to its size, beauty and longevity, Lilium is one of the most superior cut flowers in the world. Due to their large and attractive flowers having capacity to rehydrate after a long transportation, popularity of lilium is gaining momentum in our country. Lilium is incredibly attractive wonderful ornamental plant with varied uses and grown in border or planted in lines along formal paths, beds, and pots and are excellent cut flowers of magnificent appearance and outstanding range of colour, fragrance and adaptability to several environmental conditions" [1]. Lilium deserves to be called the "Aristocrat" of the plant world. Lilies can be used for informal planting in grassland or among orchard trees, along crocuses, bluebells and tulip to create flower meadow. The pointed leaves are stark green in colour and provide exciting contrast to the bright, flamboyant blooms. Lilium is native to Northern Hemisphere including 100 species [2]. Earlier, its cultivation was restricted to temperate zone but now with the efforts of researchers, it is being grown successfully in plains too. There is marked difference in desired plant heights at the time of flowering, total number of marketable flowers, spike length and several other qualitative and quantitative parameters in various cultivars of Lilium. Commercial floriculture as an economic venture has been noticed from last few decades. The annual growth rate is around 10% and global trade is estimated around \$ 60 billion. Aesthetic

taste has increased among the masses and use of flowers in social functions has an important place. Total global area under bulbous crops has covered around 50000 ha and more area is put under the cultivation keeping in view demand of bulbs in global market. India has around 3 lakh ha under cultivation of commercially viable flower crops [3]. Lilium is one of the important crops in world and comprises of around 100 species, 7 sections. During the last decade Asiatic, Oriental, OT and LA has gained popularity worldwide among the cut flowers and potted flowering plants and more than 10,000 Lilly cultivars have been bred [4]. Crores of bulbs are imported annually in India which costs huge foreign exchange. Kashmir is endowed with highly suitable agro-climate and offers immense scope for bulb production. So in absence of any interstate competition, Kashmir can supply bulbs of tulip to national markets. But which variety can perform best from vegetative to reproductive point of view is always questionable. Thus current study of evaluation engages a scope for delimiting varieties of lilium which can be explored from commercial point of view.

## 2. MATERIALS AND METHODS

### 2.1 Geographical Features

Srinagar, the summer capital of Jammu and Kashmir, India is situated between 34°05' to 34°07' north latitude and 74°08' to 74°09' east longitude at an altitude of about 1587 m above mean sea level. It is flanked on the southeast and northeast by the lofty Himalayan ranges.

### 2.2 Morphological Parameters of Different Lilium Cultivars

Studied parameters include plant height (cm), number of leaves plant<sup>-1</sup>, leaf area plant<sup>-1</sup> (cm<sup>2</sup>) and leaf area index (LAI); weight of bulb cluster

plant<sup>-1</sup> (g), weight of main bulb plant<sup>-1</sup> (g), weight of small/subsidiary bulbs plant<sup>-1</sup> (g) and size of main bulb (cm).

### 2.3 Statistical Analysis

Statistical analysis of the data collected for different parameters during the present investigation was subjected to analysis of variance for complete randomized block design with three replications [5].

## 3. RESULTS AND DISCUSSION

Perusal of data (Table 1) (Fig. 1) performance of 15 genotypes showed significant variation for all the vegetative parameters. However maximum plant height of 90.70 cm resulted with cultivar Black out and minimum 50.60cm with cultivar Navona. Number of leaves per plant followed the same trend with maximum 99.87 noticed in cultivar Black out and minimum 62.20 in cultivar Navano. Leaf area per plant ranged from 166.30 cm<sup>2</sup> in cultivar Tiber to 443.50 cm<sup>2</sup> in Pink Palace. The leaf area index varied between 1.20 and 1.96 in Tiber and Pink Palace cultivars, respectively. Weight of bulb cluster plant<sup>-1</sup> ranged from 30.81(gm) in Navona to 72.97 (gm) in Black Out. Range for weight of subsidiary bulbs per plant varied from 32.65 (gm) in Navona to 80.45 (gm) in Black Out respectively. Highest values for weight of main bulb plant<sup>-1</sup> (73.65 gm) resulted with cultivar Black out and minimum 31.52(gm) in Navona (Table 2) (Fig. 2). Weight of subsidiary bulbs plant<sup>-1</sup> (g) followed the same trend recording maximum 7.30 g with cultivar Black out and minimum 2.70 g for cultivar Navano. Size of main bulb (cm) ranged between 4.63cm in cultivar Navano to 6.33 cm in cultivar Blackout. Vegetative growth is important for propagation ratio. Genetic makeup of a particular cultivar indicates its level of performance in a particular agro climatic. Vegetative growth is important for propagation ratio as nutrient accumulation indicates the quality of subsidiary propagules. Grassotti et al. [6], Balode [7] and Masoodi et al. [4] reported higher phenotypic variability for plant height in *Lilium*. Singh and Sen [8] suggested that if the phenotypic coefficient of variation is greater than the genotypic co-efficient of variation, the apparent variation is not only due to genotypes, but also

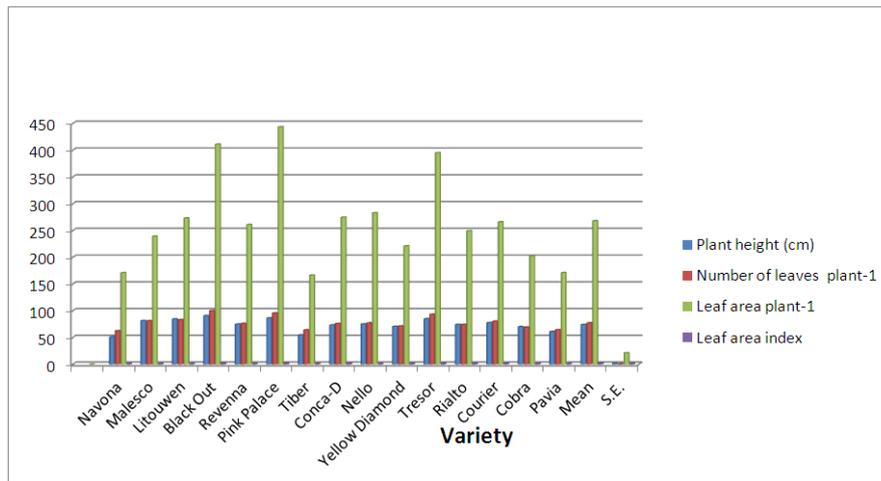
due to influence of environment. The estimates of phenotypic and genotypic co-efficient of variance showed a low disparity for plant height (cm) and number of leaves per indicating effect of environment on different traits and phenotypic variability could be a reliable measure of genotypic variability. Bhatia et al. [9] reported variability of plant height in tulip genotypes and distinct response for performance under particular agro climatic conditions. The results are also in line with the findings of Singh and Kumar [10] in marigold for plant height, Dhiman et al. [11] in Asiatic hybrid lily, Masoodi et al. [4] in Asiatic, Oriental and LA hybrids. Variability in genotypes is attributed to genetic make-up of the different cultivars and genotypic expression is superimposed by the environmental influence. Co related findings on response of cultivars are in complete agreement with the work of Monika et al. [12] and Masoodi *et al* 2018. High genotypic and phenotypic co-efficient of variation for weight of subsidiary bulb, number of florets per spike, weight of bulb cluster per plant and weight of main bulb per plant were observed for number of flowers per stem in China Aster by Ravikumar and Patil [13] and in French marigold and number of florets per spike in gladiolus [14]. Grassotti et al. [6] and Balode [7] also reported higher phenotypic variability for plant height in *Lilium*. Singh and Sen [8] suggested that if the phenotypic coefficient of variation is greater than the genotypic co-efficient of variation, the apparent variation is not only due to genotypes, but also due to influence of environment. The estimates of phenotypic and genotypic co-efficient of variance showed a low disparity for plant height (cm), number of leaves per plant and inflorescence diameter (cm) indicating the least effect of environment on different traits and phenotypic variability could be a reliable measure of genotypic variability. Similar results were also reported by Misra and Saini [15] in gladiolus. Bhatia et al. [9] have also reported low PCV and GCV for days to flowering in tulip. Genotypic co-efficient of variation helps in the measurement of genetic diversity in the qualitative and quantitative characters. "The estimation of heritability has a greater role to play in determining the effectiveness of selection provided it is considered in conjunction with the predicated genetic advance" [16], (Johnson et al. 1955).

**Table 1. Response of liliium genotypes to vegetative parameters**

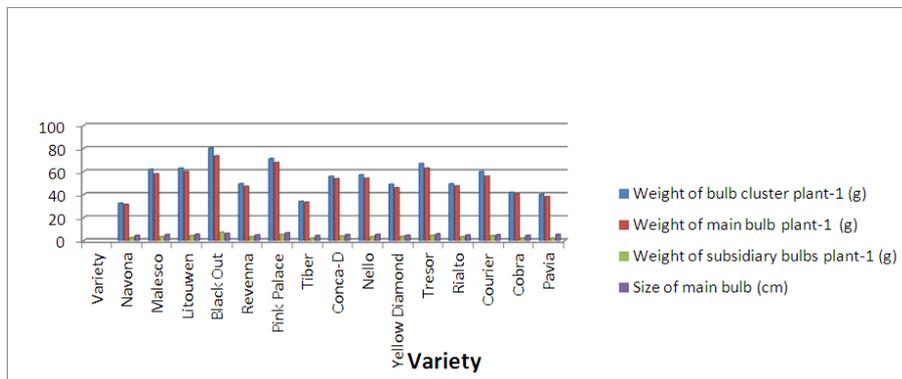
<b>Variety</b>	<b>Plant height (cm)</b>	<b>Number of leaves plant<sup>-1</sup></b>	<b>Leaf area plant<sup>-1</sup> (cm<sup>2</sup>)</b>	<b>Leaf area index</b>
Navona	50.60	62.20	170.88	1.00
Malesco	81.30	80.96	239.09	1.01
Litouwen	84.50	83.10	273.00	0.98
Black Out	90.70	99.87	411.00	1.96
Revenna	74.70	76.01	260.88	1.10
Pink Palace	86.34	95.45	443.50	1.96
Tiber	54.50	63.96	166.30	1.20
Conca-D	73.20	75.76	274.60	1.50
Nello	75.01	76.96	282.74	0.96
Yellow Diamond	70.35	71.10	220.96	0.99
Tresor	84.96	93.09	394.96	1.50
Rialto	74.10	73.96	249.10	1.46
Courier	77.48	80.06	265.93	1.50
Cobra	70.10	69.13	201.96	1.30
Pavia	60.96	64.26	170.96	0.96
Mean	74.01	77.11	268.00	1.96
S.E.	1.50	0.73	21.10	1.10
<b>C.D (p≤0.05)</b>	<b>2.45</b>	<b>2.12</b>	<b>59.20</b>	<b>0.20</b>

**Table 2. Mean per se performance of 15 liliium genotypes for bulb characters**

Variety	Weight of bulb cluster plant <sup>-1</sup> (g)	Weight of main bulb plant <sup>-1</sup> (g)	Weight of subsidiary bulbs plant <sup>-1</sup> (g)	Size of main bulb (cm)
Navona	32.65	31.52	2.70	4.63
Malesco	61.99	58.00	3.45	5.36
Litouwen	62.96	59.96	4.47	5.64
Black Out	80.45	73.65	7.30	6.33
Revenna	49.55	47.22	3.45	5.10
Pink Palace	71.33	67.88	5.55	6.87
Tiber	34.22	33.44	2.09	4.53
Conca-D	56.01	53.80	3.99	5.33
Nello	57.25	54.20	3.45	5.45
Yellow Diamond	48.99	45.87	3.67	4.74
Tresor	66.94	62.96	4.70	6.00
Rialto	49.33	47.55	3.45	4.96
Courier	59.89	56.01	4.45	5.25
Cobra	41.99	40.55	2.45	4.63
Pavia	40.33	38.24	2.33	5.55
<b>C.D (p≤0.05)</b>	<b>2.55</b>	<b>2.52</b>	<b>0.96</b>	<b>0.33</b>



**Fig. 1. Response of liliun genotypes to vegetative parameters**



**Fig. 2. Mean per se performance of 15 liliun genotypes for bulb characters**

**4. CONCLUSION**

Variation in cultivars may be due to genetic makeup of cultivars as influenced to some extent by environmental conditions. The data depicts that maximum plant height resulted with cultivar black out and minimum with cultivar Navona. Number of leaves per plant followed the same trend with maximum noticed in cultivar Black out and minimum in cultivar Navano. Leaf area per plant ranged from Lower to higher in cultivar Tiber to Pink Palace. The leaf area index varied between low to high in Tiber and Pink Palace cultivars, respectively. Weight of bulb cluster plant<sup>-1</sup> (gm) ranged from lower to higher in Navona and Black Out. Variability for weight of subsidiary bulbs per plant varied from low to higher in Navona and Black Out respectively. Highest values for weight of main bulb plant<sup>-1</sup> ranges from higher to lower resulted with cultivar Black out and Navona. Weight of subsidiary bulbs plant<sup>-1</sup> (gm) followed the same trend recoding maximum with cultivar Black out and

minimum for cultivar Navano. Size of main bulb (cm) ranges from lower to higher in cultivar Navano and cultivar blackout.

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**COMPETING INTERESTS**

Author has declared that no competing interests exist.

**REFERENCES**

1. Bahr LR, Compton ME. Competence for in vitro bulb regeneration among eight liliun genotypes. Hort. Science. 2004;39(1): 127-129.
2. MC Rae EA. Lilies. Timber Press, Poland; 1998.

3. Kashmir's Floriculture Sector: Suitability and Opportunities, Rising Kashmir. 2021;13.
4. Masoodi NH, Nayeem SM. Evaluation of Different Liliium Hybrids Under Climatic Conditions of Kashmir Valley. Agri Res & Tech: Open Access J. 2018;17 (1): 556008.
5. Gómez K, Gómez A. Statistical Procedures for Agricultural Research. 2nd Edition, John Wiley & Sons, Hoboken. 1983:630.
6. Grassotti A, Torrini F, Mercuri A, Schiva T. Genetic improvement of liliium in Italy. Acta Horticulture. 1990;266:339-347.
7. Balode A. Phenotypic analysis of hybrids and their parents in liliium species. Breeding, Annual 16th International Scientific Conference Proceedings. Research for Rural Development. 2010;1: 65-70.
8. Singh D, Sen NL. Genetic variability, heritability and genetic advance in marigold. Journal of Ornamental Horticulture. 2000;3(2):75-78.
9. Bhatia R, Dhiman MR, Chander P, Dey SS. Genetic variability and character association in tulip (*Tulipa gesneriana*) for various quantitative traits. Indian Journal of Agricultural Sciences. 2013; 83(7):773-780.
10. Singh, Deepthi, Kumar S. Studies on genetic variability, heritability, genetic advance and correlation in marigold. Journal of Ornamental Horticulture. 2008; 11 (1):27-31.
11. Dhiman MR, Parkash C, Kumar R, Guleria MS, Dhiman M. Studies on genetic variability and heritability in Asiatic hybrid lily (*Lilium x elegans* L). Molecular Plant Breeding. 2015;6:1-8.
12. Monika, Singla, Sehrawat SK, Gupta AK, Suresh K, Dahiya DS. Studies on phenotypic correlation coefficient in gladiolus cultivars. Haryana Journal of Horticultural Sciences. 2008;3(1-2): 82-84.
13. Ravikumar H, Patil VS. Evaluation of China aster [*Callistephus chinensis* (L.) Ness] genotypes under transitional zone of north Karnataka. Indian Society of Ornamental Horticulture. 2003;12-14.
14. Kispotta LM, Jha KK, Horo P, Tirkey SK, Misra S, Sengupta S. Genetic variability and heritability in *Gladiolus hybridus*. International Journal of Science, Environment and Technology. 2017;6(1): 519-528.
15. Misra RL, Saini HC. Correlation and path-coefficient studies in gladiolus. Indian Journal of Horticulture. 1990;47(1):127-132.
16. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. Indian Council of Agricultural Research, New Delhi. 1985;152-156.

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