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# Evaluation of Asiatic hybrid lily varieties under Bhubaneswar condition

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**ABSTRACT :** An experiment was carried out for evaluation of five Asiatic hybrid lily varieties *viz*., New Wave ($V_1$), Orange Matrix ($V_2$), Alaska ($V_3$), Nov Cento ($V_4$) and Mount Negro ($V_5$) to assess their performance with respect to growth, flowering and bulb production during 2012-13 at the Department of Floriculture and Landscaping, OUAT, Bhubaneswar. The genotype under study showed significant variation for different characters. The analysed data indicated that the variety Nov Cento recorded significantly maximum plant height (26.16 cm) as compared to others, whereas the minimum was recorded in Orange Matrix (13.16 cm). Similarly maximum number of leaves per plant (108.04) was recorded in Mount Negro ($V_5$), maximum leaf length (5.18 cm) and width (1.72 cm) in Alaska ($V_3$), numbers of flower bud per shoot (4.17) in Mount Negro, flower width and length (17.83 cm and 11.60 cm, respectively) in Orange Matrix ($V_2$), on the other hand the minimum number of leaves per plant (36.71) was recorded in Orange Matrix ($V_2$), leaf length (2.84 cm) and width (0.76cm) in New Wave and Mount Negro, respectively, numbers of flower bud per shoot (1.52) in Orange Matrix ($V_2$), flower width and length (14.27cm and 8.61 cm, respectively) in Mount Negro ($V_5$). Variety Mount Negro ($V_5$) was the earliest (20.00 days) to produce flower bud whereas Orange Matrix was latest (30.0days). Variety Mount Negro ($V_5$) was found earliest to bud break from planting (44.48 days) and from appearance of flower bud (24.62 days). Whereas the maximum days ware recorded in Orange Matrix (57.87 days) to bud break from planting and in New wave (30.17 days) to bud break from appearance of flower bud.

**KEY WORDS :** Asiatic hybrid lily, Evaluation, Significant, Genotype, Flower bud, Bud break, Variety

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Flowers are symbol of beauty, love and tranquillity; they form the soul of garden and convey the message of nature to mankind. *Lilium* is one of the horticulturally most important genera for cut flower and pot plant production. The genus *Lilium* of the family Liliaceae comprises more than 80 species and these are divided into seven sections (Comber, 1949). Northern hemisphere, mainly Asia, North America and Europe, especially China, Nepal, Korea and Japan are the gene centres of this genus around the world. It is one of the six major genera of flower bulbs produced worldwide (Hertogh and Le Nard, 1993). It is a species of great economic importance in production and commercialization of cut flower in the international market (Jimenez *et al.*, 2012). Due to its size, beauty and longevity *Lilium* is one of the ten most superior cut flowers in the world (Thakur *et al.*, 2005). Due to their large and attractive flowers having capacity to rehydrate after a long transportation, popularity of *Lilium* is gaining fast in our country. The cultivars of genus *Lilium* are highly appreciated by the horticulturists for their outstanding range of colour, fragrance and adaptability

to several environmental conditions (Bahr and Compton, 2004). *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 meadows (Beck, 2010). They can be planted in lines along formal paths (Dilon, 2010). Lilium hybrids have a wide range of colours and shape which are produced from interspecific hybridization. The popularity of these hybrids, especially Asiatic and oriental types is increasing both as cut flower and pot plant (Lian *et al.,* 2003). In Odisha, *Lilium* is gaining popularity both as cut flower as well as garden plants. However, almost all the cut flowers of *Lilium* available in the florists' shop are being procured from Bangalore, Pune and other places of the country. It has been observed that Asiatic lily varieties/hybrids grown as garden plants by some amateurs in Bhubaneswar and other urban areas of the state are coming up well with a wide range of size, shape and colour. Although the agro climatic condition of the state is quite favourable 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. Hence, present investigation was conducted to assess the performance of five genotypes of Asiatic hybrid lily for their growth, flowering and bulb production characters at Bhubaneswar condition.

## RESEARCH METHODS

The present investigation was carried out during 2012-13 at the Department of Floriculture and Landscaping, OUAT, Bhubaneswar. Five varieties of Asiatic hybrid lilies *viz*., New Wave ($V_1$), Orange Matrix ($V_2$), Alaska ($V_3$), Nov Cento ($V_4$) and Mount Negro ($V_5$) were screened for various vegetative, floral and bulb characters under the local agro climatic condition. Healthy and uniform size bulbs weighing about 38 to 47 g and diameter 13.5 to 15.5 cm were planted in earthen pots of 30 cm diameter filled with a mixture containing soil: coco peat: sand in 2: 1: 1 ratio (v/v). The trial was conducted in form of Completely Randomised Design with three replications using four pots of each genotype in each replications. Water was given as per needed. Observation on different parameters of vegetative growth, flowering and bulb production characters were recorded. The mean values of the recorded data on various parameters were subjected to statistically analysis and presented in Tables.

### Observational techniques and collection of experimental data :

*Growth parameters:*

Observations on various growth parameters were recorded after one month of planting of bulbs.

Plant height :

The height of the plant was recorded by measuring the length from the base to the highest point of growth (*i.e.,* tip of the top most leaf) of the plant and average was worked out and expressed in centimetres.

Number of leaves per plant :

Number of leaves present in each plant was counted and recorded.

Leaf length :

The length of longest leaf in the plant was measured and expressed in centimetres.

Leaf width :

The leaf used for measuring the length was also used for recording width. The widest part of the leaf was measured to determine the leaf width and expressed in centimetres.

Basal stem diameter :

By the help of slide callipers basal stem diameter of each plant was measured and was expressed in mm.

Leaf area :

Leaf area was recorded with the help of leaf area meter by selecting five leaves randomly and equally from 10 cm middle length of selected plant. The readings were taken and expressed in square centimetres (Paramagoudar, 2010).

*Flowering characters:*

Days taken for appearance flower bud :

The date on which the first flower bud was visible in each plant was recorded and number of days taken for appearance of visible flower bud was found out by

counting the days from the date of planting to bud initiation stage and recorded.

Number of flower buds per shoot :

After completion of the bud emergence in each plant, total number of flower buds were counted and recorded.

Flower bud length :

Flower bud length was found out by measuring the length of the longest matured unopened flower bud in a flowering shoot from the base of bud to its tip with the help of a scale and recorded in centimetres.

Flower bud width :

The flower bud which was taken for measuring the length was also taken for measuring width. By the help of a scale the maximum width was measured and recorded in centimetres.

Days taken for bud break from planting :

Days taken for bud break was found out by counting the number of days from the date of planting to the date on which the first appeared bud of plant showed colour and recorded.

Days taken for bud break from appearance of flower bud :

The date on which the bud showed colour was recorded and the days taken for bud break from appearance of flower bud was found out by counting the days from appearance of flower bud to bud shown colour and recorded.

Days taken for first flower opening from planting :

The exact date of the flowering of first bloomed flower in each plant was noted and days taken for first flower opening was found out by counting the days from the date of planting to flowering of first bloomed flower and recorded.

Days taken for first flower opening from appearance of flower bud :

The exact date of the flowering of first bloomed flower in each plant was noted and days taken for first flower opening from appearance of flower bud was found out by counting the days from appearance of flower bud to flowering of first bloomed flower and recorded

Width of flower :

The width of the flower was measured by the help of a scale and recorded in centimetres.

Length of flower :

The flower taken for measuring the width was also taken for measuring the length of flower and recorded in centimetres.

Length of flowering shoot:

The length of flowering shoot of each plant (from ground level to the point of emergence of flower stalk) was measured and was expressed in centimetres.

Diameter of flowering shoot:

The diameter of the flowering shoots at the ground level was measured by a slide calliper and was recorded in mm.

Flower stalk length :

The flowers which were used to measure the width and length were also selected for measuring flower stalk length and recorded in centimetres.

Number of flowers per shoot :

Total number of full bloomed flowers in each plant were counted and recorded.

*Bulb characters:*

Circumference of bulb :

After digging of bulbs circumference was measured by a thread and the same was again measured by a scale and recorded in centimetres.

Weight of bulbs per plant :

The weight of the bulb formed in the individual plant under various treatments was taken by a top pan balance and recorded in gram.

Number of bulblets per bulb :

Number of bulblets formed in each bulb was also counted and recorded.

## RESEARCH FINDINGS AND DISCUSSION

The data presented in Table 1 revealed that the maximum plant height (26.16 cm) was recorded in $V_4$ (Nov Cento) which differed significantly from other varieties. It was followed by $V_1$ *i.e.* New Wave (24.10

cm) which was at par with $V_5$ *i.e.* Mount Negro (22.85 cm). On the other hand the minimum was recorded with $V_2$ *i.e.* Orange Matrix (13.16 cm). Similar variation in plant height of different varieties of *Lilium* was also reported by Sindhu and Singh (2012) under northern plains. Similarly number of leaves per plant was maximum (108.04) in var. Mount Negro ($V_5$) followed by var. Nov Cento ($V_4$) and var. New Wave ($V_1$) which recorded 74.12 and 69.75 leaves per plant, respectively. On the other hand the minimum (36.71) was recorded in var. Orange Matrix ($V_2$).

Variety Alaska ($V_3$) recorded maximum (5.18 cm) leaf length which differed significantly from others except $V_4$ *i.e.* var. Nov Cento (4.98 cm) which was at par with var. Alaska ($V_3$). Similarly variety Orange Matrix ($V_2$) was at par with var. Mount Negro ($V_5$) which recorded average leaf length of 4.17 cm and 4.28 cm, respectively. On the other hand the minimum (2.84 cm) was recorded in var. New Wave ($V_1$).

Width of leaf was maximum (1.72 cm) in Alaska which differed significantly from others. It was followed by var. Orange Matrix ($V_2$) and var. New Wave ($V_1$) with leaf width of 1.36 cm and 1.00 cm, respectively. The minimum width (0.76 cm) was recorded in var. Mount Negro ($V_5$) which was at par (0.88 cm) with var. Nov Cento ($V_4$). Variety Alaska ($V_3$) recorded the maximum (15.92 mm) basal stem diameter which was closely followed by var. Nov Cento ($V_4$) with basal stem diameter of 15.33 mm without showing any significant variation from each other. The minimum (11.75 mm) was recorded in var. Orange Matrix ($V_2$) among all the varieties under trial. Thicker stems are preferred to have sturdiness of plant otherwise the weak and thin stems may lead to lodging of plants. Variety Alaska ($V_3$) recorded the maximum leaf area (11.15 cm²) which differed significantly from other varieties. It was followed by var. Orange Matrix ($V_2$) and var. Nov Cento ($V_4$) which recorded average leaf area of 9.11 cm² and 8.02 cm², respectively. On the other hand the minimum (4.82 cm²) was recorded in var. Mount Negro ($V_5$). Similar variation in the vegetative parameters of Asiatic *Lilium* was also reported by Dwibedi *et al.* (2002); Pandey *et al.* (2008) and Deka *et al.* (2010). Difference in vegetative growth characters of different cultivars may be due to varied growth rate and their genetic make ups as a result, variation in phenotypic expression are expected to occur. Similar results with respect to vegetative characters were also observed by Mishra (1997).

The perusal of data on flowering characters (Table 2) indicates that var. Mount Negro ($V_5$) was the earliest to produce flower bud which took 20.00 days and was at par with var. New wave *i.e.* $V_1$ where the same was observed in 20.6 days. On the other hand significantly maximum number of days (30.0 days) were taken by var. Orange Matrix ($V_2$) followed by var. Nov Cento (27.7 days). Findings of the present study are in close agreement with Dhiman (2003) who observed significant variation among *Lilium* hybrids with respect to days to visible bud formation under Kullu condition. The variation in number of days required for first bud initiation was primarily due to the different genetic constitution of various cultivars and prevailing environmental conditions during the period of crop growth.

Number of flower buds per shoot is an important character which decides the cost of the flowering shoot. Generally more flower buds per shoot are preferred. In the present study performance of var. Mount Negro was better which produced maximum number flower buds per shoot (4.17). It was followed by var. Alaska (3.5) and var. New Wave (3.21). On the other hand the minimum (1.52) was recorded in var. Orange Matrix ($V_2$).

Flower bud length and width in different Asiatic lily varieties differed significantly. Maximum length and width were recorded in var. Orange Matrix (10.73 cm and 3.46

**Table 1 : Vegetative characters**

| | 30 days after planting | | | | | Leaf area ($cm^2$) |
|---|---|---|---|---|---|---|
| Treatments | Plant height (cm) | Number of leaves per plant | Leaf length (cm) | Leaf width | Basal stem diameter (cm) | |
| $V_1$ | 24.10 | 69.75 | 2.84 | 1.00 | 14.00 | 6.09 |
| $V_2$ | 13.16 | 36.71 | 4.17 | 1.36 | 11.75 | 9.11 |
| $V_3$ | 17.39 | 51.08 | 5.18 | 1.72 | 15.92 | 11.15 |
| $V_4$ | 26.16 | 74.12 | 4.98 | 0.88 | 15.33 | 8.02 |
| $V_5$ | 22.85 | 108.04 | 4.26 | 0.76 | 14.37 | 4.82 |
| S.E. ± | 0.48 | 0.56 | 0.19 | 0.07 | 0.20 | 0.23 |
| C.D. (P=0.05) | 1.43 | 1.65 | 0.58 | 0.22 | 0.60 | 0.68 |

**Table 2 : Flowering characters**

| Treatments | Days taken for appearance of flower bud | No. of flower buds per shoot | Flower bud length (cm) | Flower bud width (cm) | Days taken for bud break from planting | Days taken for bud break from appearance of flower bud | Days taken for first flower opening from planting | Days taken for 1st flower opening from appearance of flower bud | Width of flower (cm) | Length of flower (cm) | Length of flowering shoot (cm) | Diameter of flowering shoot (mm) | Length of flower stalk (cm) | Numbers of flower per shoot (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_1$ | 20.60 | 3.21 | 8.72 | 3.31 | 50.83 | 30.17 | 55.29 | 34.12 | 15.63 | 9.73 | 35.77 | 16.54 | 6.43 | 3.00 |
| $V_2$ | 30.00 | 1.52 | 10.73 | 3.46 | 57.87 | 27.87 | 63.46 | 33.37 | 17.83 | 11.60 | 30.23 | 13.56 | 6.04 | 1.71 |
| $V_3$ | 23.80 | 3.50 | 9.39 | 3.36 | 52.37 | 28.58 | 56.00 | 32.25 | 14.98 | 10.08 | 31.99 | 18.12 | 5.23 | 3.58 |
| $V_4$ | 27.70 | 2.04 | 8.99 | 3.18 | 54.46 | 26.79 | 57.00 | 29.33 | 15.79 | 10.26 | 44.31 | 17.62 | 5.51 | 2.00 |
| $V_5$ | 20.00 | 4.17 | 7.78 | 2.55 | 44.58 | 24.62 | 49.63 | 30.58 | 14.27 | 8.61 | 32.39 | 16.43 | 4.13 | 3.95 |
| S.E.± | 0.44 | 0.16 | 0.11 | 0.07 | 0.37 | 0.38 | 0.44 | 0.37 | 0.19 | 0.09 | 0.53 | 0.29 | 0.24 | 0.20 |
| C.D. (P=0.05) | 1.29 | 0.47 | 0.32 | 0.23 | 1.09 | 1.13 | 1.30 | 1.09 | 0.58 | 0.26 | 1.56 | 0.84 | 0.72 | 0.59 |

cm, respectively). While the minimum values (7.78 cm length and 2.55 cm width) were recorded in var. Mount Negro ($V_5$) and other varieties were in between these two. Size of flowers also contributes to the quality of the flowering shoot and bigger buds in a flowering shoots are always preferred.

All the cultivars under study differed significantly with respect to days taken for bud break from both planting and appearance of flower bud. The result of the study revealed that var. Mount Negro ($V_5$) was found earliest to bud break from planting and from appearance of flower bud taking 44.48 days and 24.62 days, respectively. Whereas the maximum days to bud break from planting and from appearance of flower bud was recorded by var. Orange Matrix ($V_2$) and var. New wave ($V_1$) with 57.87 days and 30.17 days, respectively. Pandey *et al.* (2012) reported the same variation in gladiolus.

Data recorded on days taken for first flower opening from planting and from appearance of flower bud revealed that var. Mount Negro ($V_5$) was the earliest to flower from planting whereas var. Nov Cento ($V_4$) was earliest to flower from flower bud appearance which recorded 49.63 days and 29.33 days, respectively. However, performance of var. Nov Cento and Mount Negro with respect to days to first flowering from appearance of flower bud was more or less comparable where the later took 30.58 days for the same. The maximum time (63.46 days) was taken by var. Orange Matrix ($V_2$) among all the varieties under study to commence flower from planting whereas var. New wave ($V_1$) and var. Orange Matrix ($V_2$) took more time (34.12 days and 33.37 days, respectively) from appearance of flower bud to flowering. Similar variation among the cultivars for days to first flowering was also reported by Sindhu and Singh (2012) in *Lilium*.

So far as the width and length of flower was concerned, var. Orange Matrix ($V_2$) recorded the maximum flower width and length (17.83 cm and 11.60 cm, respectively) which differed significantly from the others. It was followed by var. Nov Cento ($V_4$) with 15.79 cm and 10.26 cm width and length, respectively. The minimum was observed in var. Mount Negro ($V_5$) which recorded a value of 14.27cm and 8.61 cm (width and length, respectively). It may be concluded that variation in diameter of flower mainly due to the genetic makeup which might have been further modified by the environmental condition prevailing during the time of

experiment.

Length of flowering shoot is an important parameter of cut flowers and longer shoots are always preferred which fetch better price. In the present study significant variation in length of flowering shoot was observed due to different varieties tried. The var. Nov Cento ($V_4$) recorded the maximum length of flowering shoot (44.31 cm) which differed significantly from other varieties under study and was followed by var. New wave ($V_1$), Mount Negro ($V_5$) and Alaska ($V_3$) which recorded shoot length of 35.77 cm, 32.59 cm and 31.99 cm, respectively. Significantly shorter shoot length (30.23 cm) was recorded in var. Orange Matrix ($V_2$).

Significant variation among different Asiatic lily varieties was noticed with respect to diameter of flowering shoot in the present study. The data indicated that the var. Alaska ($V_3$) recorded the maximum diameter of flowering shoot (18.12 mm). However, it was statistically comparable with var. Nov Cento ($V_4$) which recorded flower shoot diameter of 17.62 mm. It was followed by var. New wave ($V_1$) and var. Mount Negro ($V_5$) which recorded flower shoot diameter of 16.54 mm and 16.43 mm, respectively and these two were at par with each other. On the other hand the minimum flower shoot diameter (13.56 mm) was recorded in var. Orange Matrix ($V_2$).

Stalk length which is another important quality parameter significantly varied among Asiatic lily cultivars. The variety New wave ($V_1$) recorded the maximum length of flower stalk (6.43 cm) and it was statistically at par with var. Orange Matrix ($V_2$) which recorded flower stalk length of 6.04 cm. It was followed by var. Nov Cento ($V_4$) and var. Alaska ($V_3$) which recorded stalk length of 5.51 cm and 5.23 cm, respectively without showing significant variation from each other. On the other hand the minimum flower stalk length (4.13 cm) was recorded in var. Mount Negro ($V_5$). This variation in flower stalk length might be due to difference in the genetic makeup of varieties of *Lilium.*

Number of flowers per flowering shoot is also an important character for cut flower production. Results of the study indicated that the maximum number (3.95) of flowers per shoot was observed in var. Mount Negro ($V_5$) and it was followed by and at par with var. Alaska ($V_3$) which recorded 3.58 flowers per shoot. Variety Alaska was also found at par with var. New wave ($V_1$) which recorded 3 flowers per shoot. On the other hand the minimum was produced in var. Orange Matrix ($V_2$) which recorded on an average 1.71 flowers per shoot only. Result of the present study is in conformity with the findings of Deka *et al.* (2010), Srinivas (2002) and Srinivas (2003) who reported similar variation among *Lilium* cultivars with respect to this parameter. Wide variation in floral parameters due to varieties has also been reported by Dhiman (2003).

Data from Table 3 revealed that significant difference was observed among different cultivar with respect to bulb characters. Variety Nov Cento ($V_4$) recorded the maximum circumference (16.04 cm) and was followed by and at par with var. New wave ($V_1$), Orange Matrix ($V_2$) and Alaska ($V_3$) which recorded 15.75 cm, 15.46 cm and 15.29 cm, respectively. On the other hand the lowest was recorded in var. Mount Negro ($V_5$) which had a value of 14.84 cm only. Similarly, the maximum weight of bulb (64.58 g) was recorded in Nov Cento, maximum number (3.79) of bulblets per bulb in Orange Matrix which was at par with Nov Cento (3.33) and Monte Negro (3.29). The minimum weight (49.58 g) was recorded in var. Monte Negro, number of bulblets per bulb (2.33) in var. Alaska which was at par (2.5) with New wave. Significant differences for various bulb and bulblet characters of Asiatic *Lilium* cultivars were also reported by Sindhu (2006) and Deka *et al.* (2010). Significant differences among the cultivars of Asiatic lily and the cultivars of Oriental lily for all the characters studied were also reported by Gupta (2002) and Gupta

**Table 3 : Bulb characters**

| Treatments | Circumference of bulbs (cm) | Weight of bulbs per plant (g) | No. of bulblets per bulb |
|---|---|---|---|
| $V_1$ | 15.75 | 56.75 | 2.50 |
| $V_2$ | 15.46 | 59.17 | 3.79 |
| $V_3$ | 15.29 | 54.58 | 2.33 |
| $V_4$ | 16.04 | 64.58 | 3.33 |
| $V_5$ | 14.84 | 49.58 | 3.29 |
| S.E. ± | 0.26 | 0.51 | 0.28 |
| C.D. (P=0.05) | 0.78 | 1.49 | 0.81 |

(2003).

It is concluded that the variation in cultivars may be due to genetic and environmental interaction. The selected cultivars can be used both for cut flower and pot plant production under Bhubaneswar condition, also with proper management practices good quality bulbs can be produced from these varieties.

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