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# Evaluation of performance of varieties and effect of different levels of harvesting of flower shoot on bulb production of LA hybrids in northern plain conditions

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ABSTRACT

A study was conducted to evaluate the performance and impact of different levels of harvesting of flower shoot on bulbs and bulblets production of LA hybrid lily cultivars Pavia, Ercolana and Brindisi in northern plain conditions. Field experiment was conducted at the Research Farm of the Division of Floriculture and Landscaping, Indian Agricultural Research Institute, New Delhi during 2014-15 and 2015-16. Uniform and healthy bulbs were planted in the month of November at a spacing of 15 × 15 cm between rows and bulbs under 50 % green shade net conditions in both the years. There is significant difference among the cultivars for days taken for flowering. The cv. Brindisi (70.10 days) has taken minimum days to flowering followed by Ercolana and Pavia. The maximum length and diameter of flower shoot 121.06 cm and 0.85 cm, respectively, was observed in cv. Pavia. Higher number of flower buds/shoot 6.13 was also recorded in cv. Pavia. The cv. Brindisi produced longer and bigger size flowers as compared to other cultivars. The maximum yield of bulbs and bulblets were recorded in disbudding plants followed by harvesting of flower shoot at 40 cm above the ground surface in cv. Pavia. The effect of harvesting flower shoots at 40 cm above the ground surface, resulted in better performance in the remaining parameters such as weight of bulbs per plant, diameter of bulb, and weight of bulblets per plant in all three cultivars. Harvesting of flower shoots at 40 cm is the best for bulb production in LA hybrid lily cultivation under northern plains conditions.

**Key words**: Cultivars, Different level of harvesting of flowers, Lily

*Lilium* is one of the very valuable ornamental bulbous plant. It has beautiful, attractive and bright flowers with long life and widely used in the floral industry as cut flowers and potted plants. Lilies differ from each other with regard to their flower shapes, sizes, colours, flowering time, arrangement of leaves and inflorescence and the direction to which the flower faces. The cultivars of genus *Lilium* are highly appreciated by the horticulturists for their outstanding adaptability to several environmental conditions (Bahr and Compton 2004). The LA hybrid lily flowers are usually sky facing, non- fragrant, colourful and early blooming. LA hybrid lilies enjoy excellent consumer preference for their relatively higher returns per unit area, wide spectrum of varieties of different hues to satisfy the choice of different people and comparatively less susceptibility to insects, pests and diseases. Due to all these reasons, millions of cut flower of lilies are transacted every year in the flower markets all over the world. Lilies are native to northern hemisphere in Asia, Europe and North America. Most of the species are endemic to temperate zone reported by Mc Rac (1998). The genus *Lilium* of the family Liliaceae comprises more than 80 species and these are divided into 7 sections (Comber 1949). Among the different types of lilies, LA hybrid lily is very popular in recent times. Due to its flower size, beauty and longevity *Lilium* is one of the 10 most superior cut flowers in the world (Thakur *et al.* 2005). LA hybrid lily can be multiplied through seeds, bulb, bulb division, stem bulblets and stem bulbils. The concept of propagation of lilies through use of scales is known to new plant propagule by Rees (1992). Stem bulblets and bulb division are suitable propagation methods. The number and size of bulb and bulblets depends upon the growth of lily plants. The optimum growing conditions and canopy is required for proper development and growth of bulbs and bulblets. Though LA hybrid lily is being commercially cultivated in India since more than one decade and every year traders are importing the bulbs in bulk quantity and supplying to the flower growers on high cost, significant research finding on production technology was not reported under northern plains . Keeping these facts in view, the present study was first time conducted to investigate the performance and impact of different levels of harvesting of flower shoot on bulbs and bulblets production of LA hybrid lily cultivars Pavia, Ercolana and Brindisi under northern plain conditions.

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## MATERIALS AND METHODS

The experiment was laid out in randomized block design consisting three cultivars, viz. Pavia ($V_1$), Ercolana ($V_2$) and Brindisi ($V_3$) of LA hybrid lily and four different level of harvesting of flower shoot above the ground surface, viz. 10 cm ($L_1$), 20 cm ($L_2$), 30 cm ($L_3$), 40 cm ($L_4$) and disbudding of flower buds as control ($L_5$) with three replications and 10 bulbs in each replication at the Research Farm of the Division of Floriculture and Landscaping, ICAR-Indian Agricultural Research Institute, New Delhi during 2014-15 and 2015-16. Disbudding produced the greatest bulblet weight in Asiatic hybrid lily (Dantuluri and Misra 1992). Soil of the experimental plot is well drained clay loam in texture having pH 6.2. Uniform and healthy 12-14 cm circumference bulbs were planted in the month of November at a spacing of 15 cm × 15 cm between rows and bulbs in 50 % green shade net conditions in both the years. The depth of planting of bulb adopted was 8 cm reported by Kim *et al.* (1994). Mixture of sand @ 1 cft/$m^2$ and decomposed farmyard manure (FYM) @ 5 kg/ $m^2$ as well as NPK @ 25:5:30 g/$m^2$ were applied reported by Singh (2010). Total quantity of sand, FYM, phosphorus and potassium in the form of Single Super Phosphate (SSP) and Muriate of Potash (MoP), respectively, were incorporated into the soil before planting of bulbs. The improved plant height might be result of increased synthesis of proteins and protoplasm, reported by Wand Leigh (1957). Nitrogen was applied in the form of Calcium Ammonium Nitrate (CAN) in three equal split doses at the time of planting, at 40 and 80 days after planting and irrigated the crop by drip irrigation method. The flowering was observed in the last week of January to first week of February and bulbs and bulblets were harvested in first week of May in both the years. Various parameters on vegetative growth, flower and bulb production were recorded. The pooled data of two years were analysed using the analysis of variance (ANOVA) technique, outline by Gomez and Gomez (1994) and treatments were compared by using tabulated 'F' value at 5% level of significance.

## RESULTS AND DISCUSSION

The results were explained on the basis of pooled of two years. Data related to the performance of individual cultivars and data related to interaction (cultivars with different level of harvesting of flower shoot above the ground surface). Effect of cultivars Pavia ($V_1$), Ercolana ($V_2$) and Brindisi ($V_3$) on vegetative and flower traits are given in Table 1. It is evident from the data that there is a significant difference among the cultivars for days taken to sprouting. Minimum days were taken for sprouting in cultivar Brindisi (8.16 days) followed by Pavia and Ercolana, whereas maximum days were taken for sprouting in cultivar Ercolana (10.44 days). Such varietal difference for sprouting was also reported by Sindhu (2012). The days taken for bud formation differed significantly between the cultivars. Minimum number of days for bud formation was observed in cultivar Brindisi (41.44 days) which remained at par with Pavia (43.22 days). However, maximum days taken for bud initiation was observed in cultivar Ercolana (44.27 days). Variations in floral parameter of lilium was reported by Kumar *et al.* (2011).

The data presented in Table 1 revealed that the maximum length of flower shoot and diameter of shoot (121.06 cm and 0.851 cm, respectively) were recorded in $V_1$ (Pavia) which differed from other cultivars. Significant difference was observed in the number of leaves per flowering shoot. The cultivar Pavia produced maximum number of leaves per flowering shoot (52.16) followed by cultivar Ercolana (45.27). Significant difference among all the cultivars under study might be due to genetic base as well as having good plant height, stem diameter and number of leaves. Similar variation due to cultivars was also observed by Wilfret and Raulston (1971), Patil *et al.* (1994), Dhiman (2003), Sindhu (2006) and Ranpise *et al*. (2007). Data pertaining to the number of flowers revealed that significantly more number of flower buds per flowering shoot was observed in cultivar Pavia (6.31) over Ercolana and Brindisi. The significantly maximum flower bud length and size of flower (8.65 cm and 14.69 cm, respectively) was recorded in cultivar Brindisi followed by Pavia (8.53 and 13.91cm, respectively) whereas minimum in cultivar Ercolana (8.33 cm and 13.68 cm, respectively). The floral characters of the cultivar are invariable with respect the varietal characters. Similar findings were reported by Janakiram and Srinivas (2006) and Thakur *et al.* (2010). The post-harvest studies of flowers with regards to keeping quality are very important. The cultivar Pavia had maximum vase life (9.55 days) followed by Ercolana (8.21 days), whereas shortest vase life was observed in cultivar Brindisi (8.05 days). The vase life of flower is total effect of floral as well as physiological characters of cultivar.

Table 1 Evaluation of LA hybrid lily under northern plain conditions

| Varieties | Days required for sprouting | Days taken for bud formation | Days required for flowering since sprout | Length of flower shoot (cm) | Diameter of flower shoot (cm) | No. of leaves bud/shoot | No. of flower bud/shoot | Length of flower bud (cm) | Flower size (cm) | Shelf of life flower (days) |
|---|---|---|---|---|---|---|---|---|---|---|
| Pavia | 10.10 | 43.22 | 76.82 | 121.06 | .851 | 52.16 | 6.13 | 8.53 | 13.91 | 9.55 |
| Ercolana | 10.44 | 44.27 | 73.10 | 86.13 | .821 | 45.27 | 3.88 | 8.33 | 13.68 | 8.21 |
| Brindisi | 8.16 | 41.44 | 70.10 | 85.50 | .786 | 41.27 | 3.95 | 8.65 | 14.69 | 8.05 |
| CD (p=0.05) | 0.369 | 1.29 | 2.30 | 2.22 | 0.033 | 4.98 | 0.183 | 0.132 | 0.145 | 0.222 |

Table 2 Impact of different levels of harvesting of flower shoot on bulb production of different cultivars of LA hybrid in northern plain conditions

| Varieties | No. of bulbs/plant | | | | | | No. of bulblets/plant | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 cm | 20 cm | 30 cm | 40 cm | Disbudding | Mean | 10 cm | 20 cm | 30 cm | 40 cm | Disbudding | Mean |
| Pavia | 1.02 | 1.02 | 1.00 | 1.08 | 1.08 | 1.04 | 1.99 | 2.21 | 2.32 | 2.54 | 2.88 | 2.39 |
| Ercolana | 1.00 | 1.00 | 1.00 | 1.02 | 1.00 | 1.00 | 1.66 | 1.94 | 2.04 | 2.34 | 2.54 | 2.10 |
| Brindisi | 1.00 | 1.00 | 1.02 | 1.05 | 1.10 | 1.03 | 2.09 | 2.38 | 2.60 | 2.70 | 2.82 | 2.53 |
| Mean | 1.00 | 1.00 | 1.00 | 1.05 | 1.08 | | 1.91 | 2.17 | 2.32 | 2.53 | 2.75 | |
| CD (P=0.05) | V= NS | | | | | | V= 0.181 | | | | | |
| | L= 0.046 | | | | | | L = 0.233 | | | | | |
| | V × L = NS | | | | | | V × L = NS | | | | | |
| | *Diameter of bulb (cm)* | | | | | | *Weight of bulb (g)* | | | | | |
| Pavia | 3.30 | 3.76 | 3.88 | 4.10 | 4.23 | 3.85 | 20.56 | 25.66 | 28.43 | 34.70 | 39.53 | 29.78 |
| Ercolana | 2.73 | 2.96 | 3.40 | 3.80 | 4.06 | 3.39 | 24.66 | 29.13 | 32.26 | 36.40 | 39.06 | 32.30 |
| Brindisi | 2.23 | 2.53 | 3.60 | 3.83 | 4.10 | 3.26 | 16.10 | 19.96 | 26.33 | 29.96 | 36.16 | 25.70 |
| Mean | 2.75 | 3.08 | 3.62 | 3.91 | 4.13 | | 20.44 | 24.95 | 29.01 | 33.68 | 38.25 | |
| | V= 0.069 | | | | | | V = 0.796 | | | | | |
| | L= 0.089 | | | | | | L= 1.02 | | | | | |
| | V × L = 0.154 | | | | | | V × L = 1.77 | | | | | |
| | *Weight of bulblets/plant* | | | | | | *Weight of bulbs and bulblets (g)* | | | | | |
| Pavia | 5.16 | 6.46 | 6.93 | 8.86 | 9.73 | 7.43 | 25.73 | 32.15 | 35.36 | 43.53 | 49.26 | 37.21 |
| Ercolana | 4.76 | 4.70 | 5.73 | 6.06 | 8.36 | 5.92 | 29.43 | 33.83 | 38.00 | 42.48 | 47.43 | 38.23 |
| Brindisi | 6.03 | 6.50 | 7.96 | 8.20 | 9.16 | 7.56 | 22.13 | 26.46 | 34.30 | 38.16 | 45.26 | 33.26 |
| Mean | 5.32 | 5.88 | 6.87 | 7.71 | 9.06 | | 25.76 | 30.81 | 35.86 | 41.39 | 47.32 | |
| | V=0.255 | | | | | | V=0.849 | | | | | |
| | L=0.330 | | | | | | L=1.09 | | | | | |
| | V × L=0.571 | | | | | | V × L= 1.89 | | | | | |

Significant variation among the cultivars and different level of harvesting of flower shoot for yield and quality parameters of bulbs were recorded. The data regarding the same is presented in Table 2. Maximum number of bulbs/plant was recorded by not harvesting of flower shoot (control) (1.10) in cultivar Brindisi. The cultivar Pavia produced highest number of bulbs (1.08) by harvesting of flower shoot at 40 cm above the ground surface, while the minimum number of bulbs/plant was observed in cultivars Ercolana (1.00) and Brindisi (1.00) by harvesting of flower shoot at 10 cm height above the ground surface. The total number of bulblets, 2.88/plant was highest in cultivar Pavia by not harvesting of flower shoot (control). In different levels of harvesting of flower shoot maximum number of bulblets (2.70) was produced with harvesting at 40 cm height in cultivar Brindisi.

Highest diameter of bulb (4.33 cm) was observed in cultivar Pavia with disbudding of flower bud (control) followed by Brindisi (4.13 cm) by the same treatment (Table 2). It is evident from present studies that the maximum level of height of harvesting of flower shoot (40 cm) produced maximum weight of bulb (36.40) g in cultivar Ercolana, whereas minimum weight of bulb 16.10 g in cultivar Brindisi with flower harvesting at 10 cm height from ground surface. The role of canopy is very important for maximum multiplication and weight of bulb. The present study revealed that weight of bulblet significantly increased with increase the canopy area (control) of plant (Table 2). The weight of bulbs and bulblets with harvesting of flower shoot increased with 40 cm height of harvesting of flower shoot in all cultivars (Table 2).

From this experiment, it was evident that all three cultivars of LA hybrid lily are suitable for northern plain conditions and harvesting of flower shoot at 40 cm height was observed as most suitable for bulbs and bulblets production along with flower production under northern plain conditions.

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