A Study on the Effect of Scale Position on Vegetative Growth and Bulblet Formation in LiLium through Scale Propagation

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Abstract

The impact of scale location on bulblet development and vegetative growth during lilium scale propagation was examined in an experiment. The study's findings showed that, out of all the scale positions, the middle scale had the highest values for scale sprouting (61.10%) and plantlet survival (64.44%). On the other hand, the middle scale also showed the highest values for vegetative characteristics such as the number of leaves per clump (4.17), the number of roots per scale (7.53), and the length of the longest root (9.50 cm).

Additionally, it generated a greater number of bulblets per scale in terms of circumference (6.07 cm), individual weight (23.49g), and overall weight (131.94g). However, when it came to the quantity of bulblets per scale (6.80), the outer scale fared better.

In this regard, the mother bulb's middle scale performed very well across all criteria, regardless of variety, with the exception of the number of bulblets per scale, which peaked beneath the outer scale. To get the maximum bulblet number per scale for manufacturing, middle and outer scales should be used.

Keywords: Scale, Bulblets, LIlium

Introduction

In addition to being a significant garden plant, Lilium has a significant position in the cut flower trade among the many commercially farmed flowers. When compared to other cut flowers, they are becoming the biggest source of revenue. However, a large portion of bulbs used in commercial production are imported, and there has been a lot of interest in producing Lilium bulbs in vivo as a result of the growing expense of commercial bulbs.

According to Hartmann et al. (1997), liliums are often spread either sexually via seeds or asexually by the natural development of daughter bulbs, axillary bulblets formed in the leaf axils, stem bulblets from aboveground or underground, and scales.

Scale propagation is one of the most used traditional propagation techniques for lilium

multiplication. But it takes three to four years to get commercial-sized bulbs (Park et al., 1996). Scale-based propagation is a quick way to multiply, especially for cultivars that don't develop stem bulblis (Bose and Yadav, 1998). Our goal was to investigate how scale location affected bulblet development and vegetative growth during lilium scale proliferation.

MATERIALS AND METHODS

The current experiment was conducted in 2016–2017 as a pot culture trial. Harvested in the second week of February 2013, Asiatic Liliium hybrid bulbs of the cv. New Wave, Orange Matrix, Alaska, Nov Cento, and Monte Negro were stored in moist medium in perforated poly bags in a refrigerator at 40 °C for vernalization. The bulbs' diameter and weight varied from 14.84 to 16.04 cm and 49.0 to 64.5 g, respectively.

The outermost scale layers that were damaged or wilted were eliminated. Based on their physical location on the basal plate, the scales of Asiatic hybrid lilies were manually separated from each bulb and divided into three groups: outer scale (S1), middle scale (S2), and inner scale (S3). Care was taken to ensure that a little piece of the basal plate remained connected to each scale when it was detached from the mother bulb. Each pot with a media composition of soil included six healthy, uniformly sized scales of five Asiatic hybrid lily kinds, divided into three groups (inner, middle, and outer): FYM: on November 19, 2013, in the afternoon, sand was placed at a depth of 5 cm in a 2:1:1 ratio (V/V). After seven months, the bulblets were harvested, and data collected on various attributes were statistically analyzed using a factorial complete randomized design with three replications, fifteen treatment combinations, and scale positions (inner, middle, and outer).

RESULTS AND DISCUSSION

An analysis of the data in Table 1 showed that the number of leaves per scale, the survival rate of the plantlets that sprouted, and the proportion of scales that sprouted were all significantly impacted by the scale location. It was discovered that S2 (Middle scale) had the highest sprouting (61.10%), which was much different from other scale locations. S1, or outside scale, came next (54.44%). Conversely, S3, or the inner scale, reported the lowest (50.00%). Similarly, S2 (Middle scale) had the highest survival rate (64.44%) of plantlets derived from sprouted scales, which was substantially different from other places. However, the survival rates of S1, or the outer scale, (52.22%), and S3, or the inner scale, (52.21%), were essentially the same and did not vary significantly from one another. Therefore, a higher proportion of scale sprouting and a better survival rate for newly created plantlets may have been caused by the existence of a larger food resource, namely carbohydrates with increased middle scale meristematic activity. Conversely, the inner scale had the lowest proportion of scale sprouting due to the existence of less reserve food resources.

Table-1: Effect of scale position on sprouting percentage of scales, survival rate of sprouted plantlets and number of leaves per scale in Asiatic Lilium hybrids.

SCALE POSITION	Sprouting percentage of scales	Survival rate of sprouted plantlets (%)	Number of leaves per scale
OUTER SCALE (S1)	54.44 (47.63)	52 .22 (46.28)	8.03
MIDDLE SCALE (S2)	61.10 (51.65)	64.44 (53.72)	6.72
INNER SCALE (S3)	50.00 (45.00)	52.21 (46.30)	5.20
SE (M)±	0.30 (0.18)	0.15 (0.09)	0.07
CD AT 5%	0.88 (0.52)	0.44 (0.26)	0.22

(The values in the bracket are angular transformed values)

Table 1 made it clear that S1 (Outer scale) had the highest number of leaves per scale (8.03), which was substantially different from other scale locations. S2, or the intermediate scale, came next (6.72). However, S3, or the inner scale, was also used to record the minimum (5.20). Regarding the scales' positions, the production of more leaves may have been determined by the outside and middle scales' greater reserves of carbohydrates relative to the inner scale. This study's findings are consistent with those of Matsuo (1972), who also noted that the Easter lily's (Lilium longiflorum) inner and outer scales had more scale leaves. Uesato (1973) also discovered that the outer scales produced twice as many leaves as the innermost scales.

A review of the data in Table 2 revealed that S2 (Middle scale) had the highest number of roots per bulb (7.53), which was very different from the others. S1, or the outer scale, came next (6.86). On the other hand, S3, or inner scale, was used to record the minimum (6.60). Compared to S3 (inner scale), a substantially greater number of roots were formed in S2 (middle scale) and S1 (outer scale) among the scale locations. This might be because these scales have larger food reserves. The current study's results go counter to those of Dhiman (2007), who found that the inner scale had the most roots, followed by the middle and outside scales. However, Uesato (1973) discovered that the outer scales produced four times as many roots as the innermost scales.

Table-2: Effect of scale position on Number of roots per bulblet, Length of the longest root and Number of bulblets per scale in Asiatic Lilium hybrids.

SCALE POSITION	Number of roots per bulblet	Length of the longest root (cm)	Number of bulblets per scale
OUTER SCALE (S1)	6.86	7.94	6.80
MIDDLE SCALE (S2)	7.53	9.50	6.07
INNER SCALE (S3)	6.60	7.83	5.31
SE (M)±	0.14	0.42	0.03
CD AT 5%	0.40	1.23	0.08

Table 2 made it clear that the greatest root length (9.50 cm) was noted in S2 (Middle Scale), which was much different from the others. S1, or the outer scale, came next (7.94 cm), and it was comparable to S3, or the inner scale (7.83 cm). Among various scale placements S1 (outer scale) and S3 (inner scale) were statistically equivalent with one another, however the intermediate scale (S2) yielded a much longer root. Similar findings were also reported by Dhiman (2007), who found that on a sand + vermiculite medium, the center scale had the longest roots, followed by the outer and inner scales. Table 2 showed that S1 (Outer Scale) had the highest number of bulblets per scale (6.80), which was substantially different from the others. S2, or the intermediate scale (6.00), came next. S3, or the inner scale, was used to record the lowest (3.33). The study's findings are consistent with those of Iapichino et al. (1994), who said that scale location on the mother bulb has to be carefully considered. Because the inner scale was smaller and lighter than the middle and outer scales, it had fewer wound surfaces available for adventitious bulblet development and provided less food to support generative processes and bulblet growth. Park (1996) similarly reported similar findings and came to the conclusion that a higher carbohydrate content was most likely the cause of the increase in bulblet production in the outer scale.

Table-3: Effect of scale position on Circumference of the bulblets, Weight of individual bulblet per scale, Weight of total number of bulblets per scale in Asiatic Lilium hybrids.

SCALE POSITION	Circumference of the bulblets (cm.)	Weight of individual bulblet per scale (g.)	Weight of total number ofbulblets per scale (g.)
OUTER SCALE (S1)	5.42	18.42	108.93
MIDDLE SCALE (S2)	6.07	23.49	131.94
INNER SCALE (S3)	5.31	17.12	67.26
SE (M)±	0.03	0.41	0.12
CD AT 5%	0.08	1.18	0.34

The maximum circumference (6.07 cm) was discovered in S2 (Middle scale), which varied substantially from other scales, according to an analysis of the data in Table 3. S1, or the outer scale, came next (5.42 cm). However, S3, or the inner scale, was used to record the lowest (5.31 cm). The study's findings concur with those of Marinangeli et al. (2003), who noted that bulblets from inner scales had a noticeably smaller diameter than those from intermediate and outer scales. Table 3 shows that the greatest weight of a single bulblet per scale (23.49g) was recorded in S2 (Middle Scale), which was substantially different from other scales. S1, or the outside scale, came next (18.42g), and S3, or the inner scale, came in last (17.12). Nonetheless, bulblet weights under S3 and S1 were statistically similar. These findings contradict those of Sawwan et al. (2000), who similarly found that the bulblets in the outer scales of Lilium longiflorum Cv. White American weighed the most.According to the data in Table 3, the bulblet's highest weight (131.94g) was recorded in S2 (Middle Scale), which was substantially different from the others. S1, or the outside scale, came next

with 108.93g, and S3, or the inner scale, came last with 67.26g.Although there were significantly more bulblets (6.80) with S1 (outer scale) than with S2 (middle scale, 6.00), it was found that the weight of each bulblet was significantly higher (23.49g) with middle scale (S2) than with outer scale (S1, 18.42g), meaning that the total weight of bulblets per scale was significantly higher under S2 (middle scale) than under outer scale (S1). The number of bulblets under S3, or the inner scale, was significantly lower (3.33), than under S1 (outer scale) or S2 (middle scale), despite the fact that the individual weight of the bulblets (17.12g) under S3 (inner scale) was statistically comparable with that order S1 (outer scale). This could be the reason why S3 (inner scale) recorded the lowest weight of all the bulblets per scale. These findings run counter to those of Dhiman (2007), who determined the bulblet's maximum weight on the inner scale.

CONCLUSION

According to the study's findings, the mother bulb's middle scale performed very well across the board, with the exception of the number of bulbs per scale, which peaked at the outer scale. However, for every metric under study, the inner scale showed the most subpar performance. However, for horticultural output, middle and outside scales should be used.

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REFERENCE

1. Bose TK, Yadav LP. (1989). Commercial flowers, NayaProkash, India, 868 pp.
2. Dhiman MR. 2007. Effect of scale position and growing medium on bulblet formation and growth during scale propagation of Lilium, Journal of Ornamental Horticulture, 10 (2): 119-121.
3. Hartmann HT, Kester DE, Davies FT and Geneva RL. 1997. Plant Propagation: principle and practices, 6th ed. Prentice- Hall, U.S.A.pp.70-72.
4. Iapichino G, Amico RU. and Sciortino A. 1994. Effeect of scale position on the mother bulb on invivo multiplication of bulblets from bulb scale of different Lilium sps. And hybrids,Advances in Horticultural Science,8(4): 195-199.
5. Marinangeli PA, Hernandez LF, Pellegrini CP and Curvetto NR. 2003. Bulblet differentiation after scale propagation of Lilium longiflorum,Journal of the American Society for Horticultural Science,128(3): 324-329.
6. Matsuo E. 1972. Studies on the Easter lily (Lillium longiflorium) of Serkaku Retto (Pinnacle Islands). 1. Comparative study on growth, Journal of Japanese society for horticultural Science, 41 : 383-392

7. Park N. 1996. Effect of temperature, scale position, and growth regulators on the bulblet formation and growth during scale propagation of Lilium, Acta Horticulture,414:257-262.
8. Sawwan J, Qrunfelh TM. and Basher FA 2000. Effect of growth regulators on bulblet formation of Lilium Longiflorum 'White American', Dirasat Agricultural Science, 27(1): 20-25.
9. Uesato k. 1973. Studies on the propagation of Lilium longiflorum by bulb scale, Science bulletin of the college of Agriculture, university of Ryu Kyus, 20: 13-19.