BIBLIOGRAPHY

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ABSTRACT

The performance of four different bulb sizes of Benguet lily (*Lilium philippinensis)* were evaluated based on their growth, reproductive and cutflower quality; to determine the best bulb size as planting material suitable for Benguet lily production; and to evaluate the effect of different bulb size, as planting material on the growth characteristics of Benguet lily.

Results show that the number of leaves per plant at flowering and number of days from flower bud formation to tight bud stage were comparable in all different sizes of bulbs grown and evaluated. However, plants grown from 1 cm bud sizes were the tallest plants, having the longest flower buds, produced the longest cutflower stems and the biggest flowers at 50% anthesis. Plants grown from 2 cm bulb sizes produced the thickest stems at flowering. While lilies grown from 4 cm bulb sizes were the earliest to form flower buds and to flower. Bulbs with 1 cm size is therefore recommended for better cutflower quality and 4 cm bulb size for earlier flowering.

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INTRODUCTION

In the Cordillera, an indigenous lily known as Benguet lily (*Lilium philippinensis L.*) is an endemic lily that grows in the mountain slopes of the Cordillera. This was named by an American pioneer during the World War II who first cultivated it and saw it as a potential cutflower (Cimatu, 2000). The plant grows predominantly in Mountain Province, Benguet Province and other areas of the Cordillera.

Benguet lily belongs to the family Liliceae that are hardy perennials. These can be propagated through seeds, bulblets and can be transplanted in its young age. The bulb is dormant for several months naturally grows during rainy season from June to August and then becomes dormant of the following year.

Most plants will die, get lost or will revert to less desirable forms unless they are propagated under controlled conditions that will preserve the unique characteristics of the plant that makes them useful (Hartmann *et al*., 1986).

Benguet lily can be propagated through tissue culture but due to the lack of skilled personnel and the materials needed; seeds can be a substitute in its mass propagation which can be easily adopted by growers. However, the most popular propagating material for growing this crop is through the use of bulbs. Studies in the effect of different planting materials in growing this delicate flower are not yet available; hence this study was conceived to determine the most appropriate planting materials for Benguet lily production.

The objectives of the study were to establish the effect of different bulb size, as planting material on the growth characteristics of Benguet lily; and to determine the best bulb size as planting materials suitable for Benguet lily production.

The study was conducted at the Ornamental Horticultural Research Area, Benguet State University, La Trinidad, Benguet. from July 2009 to February 2010.

REVIEW OF LITERATURE

The Plant

Lilies are very delicate plants with lovely bell like flowers and grow in a wide range of soil types, varying climate, altitudes and shades. Some lilies grow only in the highlands like Benguet Lily (Asuncion *et al.*, 1976).

Lilies are one of the top ten popular flowers in the world. It ranks 5th in the Holland and 6th in Japan in 1988 and 1993, respectively. Japan is importing 25% of their 11 million flower requirements in 1993. Locally, the market demand is markedly increasing particularly with the newly introduced lilies (Hermano, 2000).

The species of the genus Lilium are classified botanically into seven sections (Comber, 1944 as cited by Collicut and Ronald, 1996), while the various types as cultivated lilies are divided into nine horticultural divisions (Anonymous, 1964) cultivars of the Aurelian and Oriental Horticultural Division constitute a large portion of the cultivated lilies. Aurelian hybrids are considered quite a reliable plant for Northern gardens, however, most oriental lilies are the late flowering types and fail to mature in the Northern zones (Collicut and Ronald, 1996).

There are numerous species of the genus Lilium that were mixed. Through hybridization and become highly hybrids. These hybrids are called Asiatic and Oriental hybrids. The other species that are popular are the longiforum and speciosum hybrids. The morphology of claimed indigenous lily and lost Easter lily of the Cordillera closely resemble longiforum sp. (Hermano, 2000). Lilium longiforum has large trumpet-shaped flowers, while the Asiatic hybrids are characterized as open often upward facing with

bright colors and jaunty profiles. The oriental hybrids are described as with much large blooms which are flamboyant than the Asiatic (Ampaguey *et al*., 2003).

The distinguishing characteristic of Benguet Lily is that it has only two waxy flowers, 12-18 cm (Asuncion *et. al.*, 1976). Olarte (2001) also identified the plants as branchless, bulbous herbs about 70 cm tall, having big showy flowers with lobes and very narrow leaves.

Benguet lily thrives well in well-drained, loam soil at altitudes of 300 to 1000 m above sea level and grows in isolated, even unreachable areas. This lily is mostly found in the pine regions of Benguet and spotted on the steep ridges of the Halsema highway, a major road linking Benguet to the other Cordillera municipalities (Cimatu, 2000).

Propagation of Lilies

Lilies are propagated through seeds, bulbs, bulbils, bulb scales and tissue culture. Seed propagation is used for the multiplication of species and new cultivars. The seeds of different lily species have different germination requirement (Hartmann *et al*., 1986). Many species are often increased by means of seeds which germinate in two types the epigeal and hypogeal germination (Petrova, 1975). For most commercially important species and hybrids like L. tigrinom, L. amabile, L. concolor, L. longiforum, Aurelian hybrids, mid century hybrids and others, the germination, shoots generally emerge three to six weeks after planting at moderately high temperature (Hartmann *et al.*, 2002).

Planting Materials

The most important method of propagating lilies is by seed. Since the earliest days of the RHS Lily Group some fifty years ago, seed has been advocated as a primary method of raising lilies. Seed is more readily available, easily transportable, the great added

advantage is that lily seed is not known to carry the virus disease of its parents. Seed produces a new and original being, so that where it is desired to maintain a particular quality (Fox, 1985).

Non-tunicate (scaly) bulbs are represented by the lily. These bulbs do not possess the enveloping dry covering. The scales are separate and attached to the basal plate. In general, non-tunicate bulbs are easily damaged and must be handled more carefully and must be kept continuously moist because they are injured by drying (Hartmann *et al.*, 2002). The size and quality of the flower are directly related to the size of the bulb. A bulb must reach a certain minimum size to be capable of initiating flower primordial. Commercial value is largely base on bulb size.

Underground stem bulblets are used to propagate the lily and other some lily species. Flowering of the lily occurs in early summer. Bulblets form and increase in size throughout summer (Hermano, 2000).

Planting

Bulbs for greenhouse culture or forcing are normally graded into size groups as larger bulbs produce more flowers and flowers slightly earlier than smaller bulbs, an important consideration if uniform is desired (Rimando, 2001).

The bulbs should be planted 18-15 cm deep in flats, pots, greenhouse beds or in the field. Shallow planting can reduce the time to grow faster in a vegetative stage and flowering by up to five days. Spacing depend on the method of culture and the cultivar but are usually 10-15 cm apart in rows 45-90 cm apart in the field, one bulb per 15 cm pot or 12x10 cm in greenhouse beds or flats (Bird, 1991).

Effect of Bulb Size

Bulbs are available in a range of sizes. Generally, the larger the bulb, the more leaves and flowers will be formed on the plant, and the taller it will be (Blaney et al. (1965; Langhans and Smith (1966) as cited by Miller, 1992). The author also added that larger bulbs tend to flower faster than smaller ones. Generally, growers use large bulbs 8 inches or larger to produce the highest quality crops. Since larger bulbs produce taller plants with more leaves, they should be given slightly more space than smaller bulbs for maximum cutflower quality.

Meristem Diameter

Larger bulbs have larger apical meristems, and this is probably the main reason for increased flower numbers (De Hertogh *et al*., 1976 as cited by Miller, 1992). Also, it has long been known that the rate of leaf initiation and unfolding is positively correlated to apex diameter. Using an 8-9 inch bulb will have about a 15% decrease or increase in leaf unfolding rate.

Vegetative Growth

Hartmann *et al.*, (2002) stated that an individual bulb goes through a characteristics cycle of development, beginning with its initiation as a meristem and terminating in flowering and seed production. This general developmental cycle is composed of two stages; vegetative and reproductive. In the vegetative stage, the bulblet grows to flowering size and attains its maximum weight.

He further stated that, vegetative stage begins with the initiation of the bulblet on the basal plate in the axil of a bulb scale.

MATERIALS AND METHODS

The materials used in the study were Benguet lily bulbs, mountain soil, polyethylene bags (10cm x 8cm), foot rule and labeling materials. The study was arranged in simple Randomized Complete Block Design (RCBD) with 3 replicates and 3 samples per treatment.

The treatments were as follows:

Treatment

P_1 – Bulb 1, with 1 cm, diameter (1-1.9 cm)

P_2 – Bulb 2, with 2 cm, diameter (2-2.9 cm)

P_3 – Bulb 3, with 3 cm, diameter (3-3.9 cm)

P_4 – Bulb 4, with 4 cm, diameter (4-4.9 cm)

Planting. Bulbs of Benguet lily with initial shoots are planted or grown in plastic pots measuring 15 cm in diameter.

Growing media. The soil that was used is obtained from the places where the Benguet lilies are collected (Mountain soil).

Analysis of data The significance of difference among treatment means was tested using Duncan's Multiple Range Test (DMRT).

Data Gathered

A. Vegetative Growth

1. Plant height at tight bud stage /whitish stage (cm). This was done by measuring the height of the plant from the base up to the flower at tight bud stage.

2. Final height at flowering (cm). This was obtained by measuring the final height of the plant from the base up to the flower at 25 % anthesis.

3. Stem diameter (cm) at flowering. This was measured 6 cm from the base of the plant.

4. Number of leaves per plant at flowering. This was gathered by counting the number of leaves at flowering.

B. Reproductive Growth

1. Number of days from planting to flower bud formation. This was taken by counting the number of days from planting to formation of 1 cm bud size.

2. Length of flower bud at bud stage (cm). This was taken by measuring the flower bud from the base to the tip at bud stage.

3. Number of days from planting to flowering. This was done by counting the number of days from planting to flowering.

C. Cutflower Quality

1. Number of days from flower-bud formation to tight bud stage. This was done by counting the number of days from flower-bud formation to tight level stage.

2. Stem length at harvest (cm). This was obtained by measuring the length of the cutflower stems at harvest.

3. Flower size at 50% anthesis (cm). This was measured by getting the diameter of the flower in centimeter by using a foot rule at 50% anthesis.

D. Documentation of the Study

This was taken through pictures during vegetative and reproductive stage of the plants.

RESULTS AND DISCUSSION

Final Height at Tight Bud Stage

Table 1 showed that there were significant differences on the sizes of bulbs planted with regards to the final height at tight bud stage of Benguet lily. Growing the plants from 1 cm in diameter bulbs produced the tallest plants with a mean of 88.00 cm at tight bud stage. Plants grown from 4 cm in diameter bulbs were the shortest with a mean of 58.67 cm.

Final Height at Flowering

Likewise, Table 2 showed that there were significant differences among the different bulb sizes as planting material with regards to the final height of Benguet lily plants at 25% anthesis. Means ranged from 59.67 to 87.17 cm from the base of the plant up to the top of the flower.

Table 1. Plant height at tight bud stage

TREATMENT	HEIGHT (cm)
Bulb 1, with 1 cm, diameter (1-1.9 cm)	88.00[a]
Bulb 2, with 2 cm, diameter (2-2.9 cm)	86.17[a]
Bulb 3, with 3 cm, diameter (3-3.9 cm)	70.33[ab]
Bulb 4, with 4 cm, diameter (4-4.9 cm)	58.67[b]
CV(%)	16.66

Means with a common letter are not significantly different at 5% level by DMRT

Table 2. Final height at flowering (25% anthesis)

TREATMENT	HEIGHT (cm)
Bulb 1, with 1 cm, diameter (1-1.9 cm)	86.67[a]
Bulb 2, with 2 cm, diameter (2-2.9 cm)	87.17[a]
Bulb 3, with 3 cm, diameter (3-3.9 cm)	67.00[ab]
Bulb 4, with 4 cm, diameter (4-4.9 cm)	59.67[b]
CV(%)	16.62

Means with a common letter are not significantly differebt at 5% level by DMRT.

Stem Diameter at Flowering

Significant differences were obtained on the stem diameter of Benguet lily plants measured at 25% anthesis as affected by the different bulb sizes of the planting material. Growing plants from 2 cm in diameter bulbs produced the thickest stems with a mean of 0.9 cm at flowering among the bulb size treatments. Plants grown from 1 cm and 4 cm in diameter bulbs were the thinnest with a mean of 0.6 cm.

Number of Leaves per Plant at Flowering

There were no significant differences noted on the number of leaves per plant at 25% anthesis from plants grown from the four bulb sizes. Nonetheless, 2 cm in diameter bulbs had higher number of leaves with a mean of 85.00, but was statistically comparable to the other bulb sizes with a mean of 51.67 to 83.00 leaves per plant.

Table 3. Stem diameter at flowering

TREATMENT	DIAMETER (cm)
Bulb 1, with 1 cm, diameter (1-1.9 cm)	0.6[b]
Bulb 2, with 2 cm, diameter (2-2.9 cm)	0.9[a]
Bulb 3, with 3 cm, diameter (3-3.9 cm)	0.7[b]
Bulb 4, with 4 cm, diameter (4-4.9 cm)	0.6[b]
CV(%)	12.37

Means with a common letter are not significantly different at 5% level by DMRT.

Table 4. Number of leaves per plant at flowering

TREATMENT	NUMBER
Bulb 1, with 1 cm, diameter (1-1.9 cm)	83.00[a]
Bulb 2, with 2 cm, diameter (2-2.9 cm)	85.00[a]
Bulb 3, with 3 cm, diameter (3-3.9 cm)	51.67[a]
Bulb 4, with 4 cm, diameter (4-4.9 cm)	51.67[a]
CV(%)	31.97

Means with a common letter are not significantly different at 5% level by DMRT

Number of Days from Planting to Flower Bud Formation

Statistical analysis showed that there were highly significant differences on the number of days from planting to 1 cm bud size as affected by the different bulb sizes. As shown in Table 5 and Figure 1. Growing Benguet lily from 4 cm in diameter bulbs promoted earlier forming of buds after a mean of 82.67 days from planting. This was followed by those grown from 3 cm in diameter bulbs with a mean of 104.00 days then

followed by 2 cm in diameter bulbs with a mean of 146.00 days. Significantly delayed bud formation was noted on plants grown from 1 cm in diameter bulbs with a mean of 161.33 days from planting.

Results showed that earlier flowering was obtained with increasing bulb size of the planting material such that earlier flowering was noted in larger bulb.

Length of Flower Bud at Bud stage (cm)

Significant differences were obtained on the length of flower buds mearured at bud stage of plants grown from different bulb sizes as shown in Table 6. Plants grown from 1 cm in diameter bulbs produced the longest buds with a mean of 19.50 cm but was statistically comparable to those grown from 2 cm in diameter bulbs which had a mean 17.00 cm. Slightly shorter buds were measured on plants grown from 4 cm in diameter bulbs which had a mean of 15.30 cm flower bud. Plants grown from 3 cm in diameter bulbs with a mean of 15.13 cm flower buds which the shortest buds measures among the four bulb sizes.

Table 5. Number of days from planting to flower bud formation (1 cm bud size)

TREATMENT	NUMBER
Bulb 1, with 1 cm, diameter (1-1.9 cm)	161.33[a]
Bulb 2, with 2 cm, diameter (2-2.9 cm)	146.00[b]
Bulb 3, with 3 cm, diameter (3-3.9 cm)	104.00[c]
Bulb 4, with 4 cm, diameter (4-4.9 cm)	82.67[d]
CV(%)	3.22

Means with a common letter are not significantly different at 5% level by DMRT.

Figure 1.Overview of the study at bud stage

Table 6. Length of flower bud at bud stage

TREATMENT	LENGTH (cm)
Bulb 1, with 1 cm, diameter (1-1.9 cm)	19.50[a]
Bulb 2, with 2 cm, diameter (2-2.9 cm)	17.00[ab]
Bulb 3, with 3 cm, diameter (3-3.9 cm)	15.30[b]
Bulb 4, with 4 cm, diameter (4-4.9 cm)	15.13[b]
CV(%)	10.05

Means with a common letter are not significantly different at 5% level by DMRT.

Number of Days From Planting to Flowering

Highly significant differences were observed on the number of days from planting to flowering as shown in Table 7 and Figure 2. Plants grown from 4 cm in diameter bulbs were the earliest to flower with a mean of 114.67 days from planting. However, it was comparable to those grown from 3 cm in diameter bulbs and 2 cm in diameter bulbs which flowered after 142.00 and 190.33 days, respectively. Plants grown from 1 cm in diameter bulbs were the latest to flower with a mean at 25% anthesis stage only after 195.33 days from planting

Number of Days from Flower Bud Formation to Tight Bud Stage

The number of days from flower bud formation to tight bud stage is presented in Table 8. Results showed that different bulb sizes on the duration of flower development. However, plants grown from 4 cm in diameter bulbs reached tight bud stage earlier compared to plants grown from the other sizes with a mean of 32.00 days. Plants grown

from 2 cm in diameter bulbs were the latest to reach tight bud stage with a mean of 44.00 days from flower bud formation.

Stem Length at Harvest

Table 9 presents the cutflower stem length of Benguet lily statistical analysis showed that there were no significant differences on the stem length of Bengue lily flowers at harvest. Although growing plants from 1 cm in diameter bulbs produced the longest cutflower stems measuring 80.67 cm. Plants grown from 2 cm in diameter bulbs and 3 cm in diameter bulbs produced comparable cutflowers with stem length of 80.17 cm; while those grown from 4 cm in diameter bulbs which had a mean of only 52.80 cm stem length at harvest.

Table 7. Number of days from planting to flowering

TREATMENT	NUMBER
Bulb 1, with 1 cm, diameter (1-1.9 cm)	195.33[a]
Bulb 2, with 2 cm, diameter (2-2.9 cm)	190.33[a]
Bulb 3, with 3 cm, diameter (3-3.9 cm)	142.00[b]
Bulb 4, with 4 cm, diameter (4-4.9 cm)	114.67[c]
CV(%)	6.82

Means with a common letter are not significantly different at 5% level by DMRT.

Figure 2. Overview of the study at flowering

Table 8. Number of days from flower bud formation to tight bud stage.

TREATMENT	NUMBER
Bulb 1, with 1 cm, diameter (1-1.9 cm)	36.67[a]
Bulb 2, with 2 cm, diameter (2-2.9 cm)	44.00[a]
Bulb 3, with 3 cm, diameter (3-3.9 cm)	38.67[a]
Bulb 4, with 4 cm, diameter (4-4.9 cm)	32.00[b]
CV(%)	15.64

Means with a common letter are not significantly different at 5% level by DMRT.

Table 9. Stem length at harvest

TREATMENT	LENGTH (cm)
Bulb 1, with 1 cm, diameter (1-1.9 cm)	80.67[a]
Bulb 2, with 2 cm, diameter (2-2.9 cm)	80.17[a]
Bulb 3, with 3 cm, diameter (3-3.9 cm)	57.37[ab]
Bulb 4, with 4 cm, diameter (4-4.9 cm)	52.80[b]
CV(%)	19.46

Means with a common letter are not significantly different at 5% level by DMRT

Flower Size at 50% Anthesis

Results showed that, there were no significant differences obtained on the flower size of plants grown from all bulb sizes evaluated (table 10). Plants grown with 1 cm in diameter bulbs produced the biggest flowers at 50% anthesis with a mean of 16.33 cm; while those grown from 3 cm in diameter bulbs produces the smallest flowers at 50% anthesis with a mean of 11.50 cm.

Table 10. Flower size at 50% anthesis (cm)

TREATMENT	SIZE (cm)
Bulb 1, with 1 cm, diameter (1-1.9 cm)	16.33[a]
Bulb 2, with 2 cm, diameter (2-2.9 cm)	14.67[ab]
Bulb 3, with 3 cm, diameter (3-3.9 cm)	11.50[b]
Bulb 4, with 4 cm, diameter (4-4.9 cm)	13.00[ab]
CV(%)	15.49

Means with a common letter are not significantly different at 5% level by DMRT.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

This study was conducted to evaluate the effect of different bulb size, as planting materials on the growth characteristics of Benguet lily; to determine the best bulb size as lplanting materials suitable for Benguet lily cutflower production. The study was conducted at Ornamental Horticulture Research Area, Benguet State University, La Trinidad, Benguet from July, 2009 to February, 2010.

Observations show that there were no significant differences among the different bulb sizes of Benguet lily in terms of number of leaves per plants at flowering and number of days from flower bud formation to tight bud stage.

However, Plants grown from 1 cm bud sizes were the tallest plants with a mean of 88.00 cm at tight bud stage, and the longest flower buds(19.50) at tight bud stage, also the longest cutflower stems at harvest having the mean of 80.67 cm and the biggest flowers(16.33cm) at 50% anthesis. Lilies grown from 2 cm bulb sizes had the thickest stem diameter of 0.9 cm at tight bud stage. On reproductive, lilies grown from 4 cm bulb sizes were the earliest to form flower buds (82.67 days) and to flower at only 114 days compared to the other bulb sizes evaluated.

Conclusion

Base on the results of the study conducted, bulbs with 1 cm sizes can be used as planting materials for better cutflower quality and 4 cm bulb sizes for earlier flowering and for earlier harvesting and marketing of produce.

Recommendation

It is recommended that bulbs with 1 cm in diameter should be used as planting materials for better cutflower quality and 4 cm in diameter for earlier flowering for Benguet lily production.

LITERATURE CITED

AMPAGUEY, D. W., I. D. CADELIÑA, M. D. DIMAS, A. B. MANG-OY, and J. A. PALAEZ. 2003. In-vitro propagation of Benguet Lily. BS Thesis. BSU, La Trinidad, Benguet. Pp. 1-3, 5-7.

ANONYMOUS. 1964. A Proposed Horticultural Classification of Lilies for Registration Show and Catalogue Purposes. Royal Horticultural Science Lily Yearbook 27: Pp. 152-164.

ASUNCION, R. G., K. R. FLORES and F. D. SAN MIGUEL, JR. 1976. Introduction to Floriculture and Landscape Gardening. Practical Arts in Agricultural Arts. Sta. Cruz, Manila: Saint Mary's Park Pub. Pp. 59-63.

BIRD, R. 1991. Lilies. London: The Apple Press. P. 59.

CIMATU, F. E. 2000. What's the Story, Benguet Lily. Philippine Daily Inquirer 15:75. 3.

COLLICUT, L. M. and W. G. RONALD. 1996. "Standard Sensation." Lily Cultivar Germplasm. Horticultural Science 31(2).

FOX, D. 1985. Growing Lilies. USA: Biddles Ltd. Pp. 45-48.

HARTMANN. 1990. Plant Propagation: Principles and Practices. New Jersey: Prentice Hall. 15 ed. 2:481-483

.

HARTMANN, H. T., D. E. KESTER and F. T. DAVIEW JR. 1986. Plant Propagation Principles and Practices. Engle Woods Cliffs, New Jersey: Prentice Hall. Pp. 479 481, 488-489.

HARTMANN, H. T., D. E. KESTER, F. T. DAVIES and R. L. GENEVE. 2002. Plant Propagation Principles and Practices, 7th Ed. U.S.A.: Pearson Ed., Inc. Pp. 564-566.

HERMANO, F. G. SR. 2000. Lily Production: A commercial Production Technoguide for Highland Philippines. A Consultant Manual. Pp. 1, 3-7, 15-17.

MILLER, W. B.1992. Easter and Hybrid Lily Production. Hongkong: Timber Press, Inc. Pp. 28-29.

OLARTE, A. 2001. Battle for Official Flower of Benguet Goes On. Philippine Daily Inquirer, February 28, 2001. Pp. 17-18.

PETROVA, E. I. 1975. A Concise Guide in Color Flowering Bulbs. London: The Hamlyn Pub. Group, Ltd. Pp. 9 ,14 ,25.

RIMANDO, R. J. 2001. Ornamental Horticulture. Philippines: SEAMEO SEARCA. Pp. 211-214.

APPENDICES

Appendix Table 1. Plant height at tight bud stage (cm)

REPLICATION	REPLICATION			TOTAL	MEAN
	I	II	III		
Bulb 1, with 1 cm, diameter (1 – 1.9 cm)	81.50	90.00	92.50	264.00	88.00
Bulb 2, with 2 cm, diameter (2 – 2.9 cm)	88.00	107.00	63.50	258.50	86.17
Bulb 3, with 3 cm, diameter (3 – 3.9 cm)	72.00	68.00	71.00	211.00	70.33
Bulb 4, with 4 cm, diameter (4 – 4.9 cm)	54.00	57.00	65.00	176.00	58.67

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F VALUE	TABULAR F	
					0.05	0.01
Replication	2	134.541667	67.270833			
Treatment	3	1739.229167	579.743056	3.64^{ns}	4.76	9.78
Error	6	956.458333	159.409722			
TOTAL	11					

ns – Not Significant Coefficient of Variation: 16.66%

Appendix Table 2. Final height at flowering (25% anthesis)

TREATMENT	Replication			TOTAL	MEAN
	I	II	III		
Bulb 1, with 1 cm, diameter (1 – 1.9 cm)	82.00	85.00	93.00	260.00	86.67
Bulb 2, with 2 cm, diameter (2 – 2.9 cm)	88.50	107.50	65.50	261.50	87.17
Bulb 3, with 3 cm, diameter (3 – 3.9 cm)	72.00	69.00	60.00	201.00	67.00
Bulb 4, with 4 cm, diameter (4 – 4.9 cm)	55.00	58.00	66.00	180.00	59.67

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F VALUE	TABULAR F	
					0.05	0.01
Replication	2	156.500000	78.250000			
Treatment	3	1749.562500	583.187500	3.74^{ns}	4.76	9.78
Error	6	935.500000	155.916667			
TOTAL	11	2841.562500				

ns – Not Significant Coefficient of Variation: 16.62%

Appendix Table 3. Stem diameter (cm) at flowering

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Bulb 1, with 1 cm, diameter (1 – 1.9 cm)	0.7	0.5	0.6	1.8	0.6
Bulb 2, with 2 cm, diameter (2 – 2.9 cm)	0.9	1.0	0.8	2.7	0.9
Bulb 3, with 3 cm, diameter (3 – 3.9 cm)	0.8	0.6	0.7	2.1	0.7
Bulb 4, with 4 cm, diameter (4 – 4.9 cm)	0.6	0.6	0.6	1.8	0.6

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F VALUE	TABULAR F	
					0.05	0.01
Replication	2	0.01500000	0.00750000			
Treatment	3	0.18000000	0.06000000	8.00*	4.76	9.78
Error	6	0.04500000	0.00750000			
TOTAL	11	0.24000000				

ns – Not Significant Coefficient of Variation: 12.37%

Appendix Table 4. Number of leaves per plant at flowering

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Bulb 1, with 1 cm, diameter (1 – 1.9 cm)	74.00	65.00	110.00	249.00	83.00
Bulb 2, with 2 cm, diameter (2 – 2.9 cm)	85.00	110.00	60.00	255.00	85.00
Bulb 3, with 3 cm, diameter (3 – 3.9 cm)	67.00	48.00	40.00	155.00	51.67
Bulb 4, with 4 cm, diameter (4 – 4.9 cm)	48.00	51.00	56.00	155.00	51.67

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F VALUE	TABULAR F	
					0.05	0.01
Replication	2	10.666667	5.333333			
Treatment	3	3142333333	1047.444444	2.25^{ns}	4.76	9.78
Error	6	3790.666667	465.111111			
TOTAL	11	5943.666667				

* – Significant Coefficient of Variation: 31.79%

Appendix Table 5. Number of days from planting to flower bud formation

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Bulb 1, with 1 cm, diameter (1 – 1.9 cm)	171.00	160.00	153.00	484.00	161.33
Bulb 2, with 2 cm, diameter (2 – 2.9 cm)	148.00	150.00	140.00	438.00	146.00
Bulb 3, with 3 cm, diameter (3 – 3.9 cm)	112.00	105.00	95.00	312.00	104.00
Bulb 4, with 4 cm, diameter (4 – 4.9 cm)	83.00	87.00	78.00	248.00	82.67

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F VALUE	TABULAR F	
					0.05	0.01
Replication	2	312.00000	156.00000			
Treatment	3	11955.66667	3985.22222	250.82**	4.76	9.78
Error	6	95.33333	15.88889			
TOTAL	11	12363.00000				

** – Highly Significant Coefficient of Variation: 3.22%

Appendix Table 6. Length of flower bud at bud stage (cm)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Bulb 1, with 1 cm, diameter (1 – 1.9 cm)	21.00	19.00	18.50	58.50	19.50
Bulb 2, with 2 cm, diameter (2 – 2.9 cm)	18.00	19.00	14.00	51.00	17.00
Bulb 3, with 3 cm, diameter (3 – 3.9 cm)	16.20	13.50	15.70	45.40	15.13
Bulb 4, with 4 cm, diameter (4 – 4.9 cm)	15.10	15.00	15.80	45.90	15.30

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F VALUE	TABULAR F	
					0.05	0.01
Replication	2	5.03166667	2.51583333			
Treatment	3	37.02000000	12.34000000	4.36*	4.76	9.78
Error	6	16.97500000	2.82916667			
TOTAL	11	59.02666667				

* – Significant Coefficient of Variation: 10.05%

Appendix Table 7. Number of days from planting to flowering

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Bulb 1, with 1 cm, diameter (1 – 1.9 cm)	212.00	182.00	192.00	586.00	195.33
Bulb 2, with 2 cm, diameter (2 – 2.9 cm)	187.00	204.00	180.00	571.00	190.33
Bulb 3, with 3 cm, diameter (3 – 3.9 cm)	155.00	142.00	129.00	426.00	142.00
Bulb 4, with 4 cm, diameter (4 – 4.9 cm)	115.00	119.00	110.00	344.00	114.67

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F VALUE	TABULAR F	
					0.05	0.01
Replication	2	428.66667	214.33333			
Treatment	3	13638.91667	4546.30556	37.82**	4.76	9.78
Error	6	721.33333	120.22222			
TOTAL	11	14788.91667				

** – Highly Significant Coefficient of Variation: 6.82%

Appendix Table 8. Number of days from flower bud formation to tight bud stage

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Bulb 1, with 1 cm, diameter (1 – 1.9 cm)	40.00	31.00	39.00	110.00	36.67
Bulb 2, with 2 cm, diameter (2 – 2.9 cm)	38.00	54.00	40.00	132.00	44.00
Bulb 3, with 3 cm, diameter (3 – 3.9 cm)	42.00	38.00	36.00	116.00	38.67
Bulb 4, with 4 cm, diameter (4 – 4.9 cm)	33.00	32.00	31.00	96.00	32.00

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F VALUE	TABULAR F	
					0.05	0.01
Replication	2	11.1666667	46.7000000			
Treatment	3	222.3333333	5.5833333	2.12^{ns}	4.76	9.78
Error	6	210.1666667	74.1111111			
TOTAL	11	443.6666667				

ns – Not Significant Coefficient of Variation: 19.46%

Appendix Table 9. Stem length at harvest (cm)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Bulb 1, with 1 cm, diameter (1 – 1.9 cm)	75.50	80.00	86.50	242.00	80.67
Bulb 2, with 2 cm, diameter (2 – 2.9 cm)	82.00	101.00	57.50	240.50	80.17
Bulb 3, with 3 cm, diameter (3 – 3.9 cm)	64.80	62.30	45.00	172.10	57.37
Bulb 4, with 4 cm, diameter (4 – 4.9 cm)	48.00	51.20	59.20	158.40	52.80

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F VALUE	TABULAR F	
					0.05	0.01
Replication	2	268.145000	134.072500			
Treatment	3	1956.990000	652.330000	3.75^{ns}	4.76	9.78
Error	6	1043.275000	173.879167			
TOTAL	11	3268.41000				

ns – Not Significant Coefficient of Variation: 19.46%

Appendix Table 10. Flower size at 50% anthesis (cm)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Bulb 1, with 1 cm, diameter (1 – 1.9 cm)	18.00	15.00	16.00	49.00	16.33
Bulb 2, with 2 cm, diameter (2 – 2.9 cm)	15.00	17.00	12.00	44.00	14.67
Bulb 3, with 3 cm, diameter (3 – 3.9 cm)	13.00	10.50	11.00	34.50	11.50
Bulb 4, with 4 cm, diameter (4 – 4.9 cm)	11.00	13.00	15.00	39.00	13.00

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	F VALUE	TABULAR F	
					0.05	0.01
Replication	2	1.12500000	0.56250000			
Treatment	3	39.22916667	13.07638889	2.83^{ns}	4.76	9.78
Error	6	27.70833333	4.61805556			
TOTAL	11	68.06250000				

ns – Not Significant Coefficient of Variation: 15.49%