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GASILANG, RONA C. MAY 2010. Growth and Flowering of Benguet Lily (*Lilium philippinensis*) as Affected by Light Intensity and Different Potting Media. Benguet State University, La Trinidad, Benguet

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ABSTRACT

The study was conducted at the Ornamental Horticulral Research Area of Benguet State University, La Trinidad, Benguet from September 2009 to April 2010, to determine the effect of different light intensity and potting media on the growth and flowering of Benguet Lily and identify the best potting media mixes which will improve cutflower yield, quality and vaselife and best light intensity that will promote good growth and flowering of Benguet Lily (*Lilium philippinensis*).

Results show that plants grown in potting media combination of 1:1:1:1 mountain soil+BSU compost+ horse manure+ alnus leaves compost grow under Full Sun were the earliest to form flower buds (1cm bud size), had the highest leaf count and had the longest length of flower buds at tight bud stage. Final height, number of days from flower bud formation to tight bud stage 25% and 50% anthesis were not significantly affected by different potting media used and were similar in growth and flowering characteristics when grown under full sun (>1000fc), partial shade (500-1000 fc), deep shade (100-150fc).

Based on the results of the study 1:1:1:1 mountain soil+ BSU compost+ horse manure+ alnus compost as growing media for Benguet Lily and grown under Full sun (>1000fc) is therefore recommended for the improvement of growth and flowering of Benguet Lily (*Lilium philippinensis*).

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INTRODUCTION

Liliums are familiar cut flower and potted plants for it have the power to catch the eye whether they are wild or in a border or in a bunch of cut flowers and they have a presence that is impossible to ignore. The Lily family is compost of 240 genera and 4,000 species and many of which are economically important. Aside from its important, it is gaining popularity because of its superior quality as a cutflower.

Benguet Lily (*Lilium philippinensis*) belongs to the herbaceous plant family Liliaceae. It is seldom used since they produced one or two flowers per plant and is described to have round bulbs, erect stem, linear shaped leaves, and profusely flowering during the month of May to August. The flowers measures 5-7 cm long with either one or two blossom on the stalk. It is also used as symbol of beauty, purity and peace.The Benguet Lily, (putputak/dupdupak/canyon to locals) is a rare species of white lilium found only in the colder areas of Benguet and Mountain Province in the Philippine Is. It is threatened due to the destruction of its natural habitat and the failure of horticulturists to domesticate it.

The study was conducted at the Ornamental Horticultural Research Area from September 2009 to April 2010 to determine the effect of light intensity and different potting media in the growth and flowering of Benguet Lily (*Lilium philippinensis*).

REVIEW OF LITERATURE

Potting Media

Compost and leaf mold was once a major compound of potting mixes. Mature compost contributes nutrients and increases the readily available water content of otherwise very open mixes. In increasing the volume of compost made from general organic waste mainly of garden origin, from sewage sludge's and from municipal solid waste. Furthermore, Poincelot (1980) reported that the actual nutrient requirement of horticultural crop is based on several parameters. They include soil diagnosis to determine the total nutrients, the available nutrients and the factors contributing ton a nutrient unavailability, and plant diagnosis to determine the actual amount of nutrient absorbed by the plant. Together; these are correlated to establish a relationship concentration of the plant tissue to influence by the leaves of various nutrients in the soil.

Brady (1984) as cited by Allan (1999) mentioned that organic matter is compost of living or dead plants and animal residues which are very active and important portion of soilage. They protect soil against erosion, supplies cementing substances for desirable aggregation formation and it loosens the soil to provide better aeration and water movement.

He further considered that the farm manures are degraded plant materials and they tend to increase the yield crops. The nutrient element taken by the animal manures are valuable sources of both microelement and macro element.

As stated by Einert (1972), rice hull provide a light to medium texture with good drainage and aeration and does not affect soil ph. Rice hull are good as soil amendments

especially in heavy clay soils. He further stated that maximum effectiveness obtained when rice hull is not more than 20% by volume of potting media.

Adamson and Maas (1971) revealed that sawdust is good potting media in foliage plant. However, it should not be more than 25% by volume of potting mixture.

In 1994, Oryan found that 1:1:1: 1 part by weight of garden soil, horse manure, sand and compost greatly improved the vegetative growth and flowering of African violet grown in pots under partial shade. The media mixture of 1: 1: 1 part by weight of garden soil, horse manure, sand and compost produced the tallest plants and had the higher leaf count ant anthesis and initiated flower bud earlier in chrysanthemum (Acop, 1987).

Gabawan (1999) found that 1: 1: 1: 1 pats by weight of garden soil, horse manure and compost had greatly improved the vegetative growth and reproductive ability of geranium plants.

Light Intensity

Light intensity influences the manufacture of plant food, stem length, leaf color and flowering. Generally speaking, plant grows in low light tends to be spindly with light green leaves. A similar plant grown in very bright area tends to be shorter, with better branches and have larger, dark green leaves. It is also sufficient for photosynthesis to produce carbohydrates for the plant to grow. Light intensity which is important to photosynthesis can be measured in units of foot- candles and is concerned only with visible light. Full sunlight on a clear summer day has an intensity of 10, 000 foot-candles. A classroom will have an intensity of about 100 foot- candles. Photosynthesis and hence rate of plant growth will increase linearly with increase in light intensity from about 100 foot- candles to about 2500 foot- candles. A large number of plants are more

efficient in use of sunlight and will increase in their rates of photosynthesis up to 10,000 foot- candles. Most plants which are adaptable to growing indoors become saturated with light about 2,500 foot- candles.

Effect Light Intensity on Plants

Sunlight is the main source of energy for all plants growth. Light is essential in stimulating such events as the differentiation of plant tissues and organs. Through the utilization of sunlight, plant synthesized carbohydrates and other sugars which are used to keep the plant alive. Other organic compound synthesized by green plants through photosynthesis is used either directly or indirectly by every living organism on earth. . All of the valuables that come and out of the photosynthetic process are limited by light quantity and quality (Boardman, 1977).

Martin (1988) stated that, plant leaves that develop in full sunlight often are quite different from those that grow in the shade. Sun leaves exhibit greater rates of transpiration, respiration and photosynthesis than shade leaves and they dissipate heat more efficiently. Sun leaves are also thicker in cross section than shade leaves, and they contain more water area of leaf. These features were adaptation that improves efficiency of sun leaves hot, bright environment.

MATERIALS AND METHODS

The materials used were Benguet Lily (*Lilium philippinensis*) seedlings, labeling materials, polyethylene black plastic bags (5X10), greenhouse tools, watering can, and with potting mixture consisting of mountain soil, 1:1: mountain soil + alnus compost, 1:1:1:1 mountain soil+ BSU compost+ horse manure+ sawdust, 1:1:1:1: mountain soil+ BSU compost + horse manure+ alnus compost, garden soil,1:1 garden soil+ alnus compost, 1:1:1:1 garden soil+BSU compost+ horse manure+ saw dust, garden soil+ BSU compost+ horse manure+ alnus compost.

The study was laid-out following the Randomized Complete Block Design (RCBD) arrangement wherein Factor A was the different light levels; and the different potting media as Factor B. There were three replications per treatment combination with three sample plants per replication.

The treatments were as follows;

Factor A =Light Level

Code	Description	Light Intensities (Foot candles)
L_1	Full sun	>1,000
L_2	Partial shade	500-1,000
L_3	Deep shade	100-150

Factor B= Potting media

Code	Description
P_1	Mountain Soil (Control 1)
P_2	Garden Soil (Control 2)
P_3	1:1 Mountain Soil+ Alnus Compost
P_4	1:1:1:1 Mountain Soil+ BSU Compost+ Horse Manure +Saw Dust
P_5	1:1:1:1 Mountain Soil+ BSU Compost + Horse Manure+ Alnus Compost
P_6	1:1 Garden soil+ Alnus Compost
P_7	1:1:1:1 Garden Soil+ BSU Compost+ Horse Manure +Saw Dust
P_8	1:1:1:1 Garden Soil+ BSU Compost + Horse Manure+ Alnus Compost

Seedlings of Benguet Lily were planted in polyethylene plastic bags measuring 15 cm in diameter. The soil used for planting was taken from the mountain slopes where Benguet Lily was observed abundantly growing. Potting media to be used were mountain soil, garden soil, alnus compost, BSU compost, horse manure and saw dust. All recommended cultural practices required for growing Benguet Lily was employed uniformly on all treatments to produce quality cutflowers.

Data gathered was tabulated, computed and the means compared using the Duncan's Multiple Range Test (DMRT) were the following,

A. Vegetative Growth

1. Initial height (cm).This was obtained by measuring the height of the plant two weeks after transplanting.

2. Final height of plant at flowering (cm). This was obtained by measuring the final height of the plant from the base up to the flower tip at tight bud stage.

3. Initial and final number of leaves at flowering. This was done by counting the number of leaves per plant two weeks after transplanting.

B. Reproductive Growth

1. Number of days from transplanting to flower bud formation. This was obtained by counting the days from having 1 cm bud size to tight bud stage.

2. Number of days from flower bud formation to tight bud stage 25% and50% anthesis. This was counted from the time the plants started to form flower bud up to tight bud stage.

C. Cutflower Quality

1. Length of flower at tight bud stage (cm). This was obtained by measuring the length of the f lower buds at tight bud stage.

D. Meteorological data. This was taken from BSU. PAG- ASA station. The data will include Daylength (minutes), Rainfall (mm), (C^0) Temperature, Relative Humidity (%).

E. Documentation through pictures. This was taken after planting the seedlings and after gathering all the needed data for the study Figures 1- 3.

Figure 1. Benguet Lily plants grown in full sun at seedling stage and at flowering

Figure 2. Benguet Lily plants grown in partial shade at seedling stage and at flowering

Figure 3. Benguet Lily plants grown in deep shade at seedling stage and at flowering

RESULTS AND DISCUSSION

Vegetative Growth

Initial Height at Transplanting and Final Height at Flowering

Effect of light levels. The effect of different light levels on the initial height and final height of Benguet Lily is shown in Table 1. Results show that there were no significant differences on the initial height of Benguet Lily grown under full sun, partial shade and deep shade. However, final height of Benguet Lily grown under different light levels showed significant differences. Plants grown under deep shade was the tallest with a mean of 47.61cm and was followed Partial Shade with a mean of 38.15 cm and Full Sun with a mean of 33.53 cm.

Oryan in 1994 found that 1:1:1 part by weight of garden soil, horse manure and compost greatly improved the vegetative growth and flowering of African violets grown in pots under partial shade.

Effect of different potting media. Result showed significant differences on the final height of Benguet Lily at flowering stage as affected by different potting media. However, plants grown in potting media consisting of mountain soil+ BSU compost+ horse manure+ alnus compost was the tallest with a mean of 53.58 cm and was followed by plants grown in potting media consisting mountain soil+ alnus compost with a mean of 46.26 cm. Result further showed that the shortest plant at flowering were observed in plants planted in garden soil only with a mean of 33.53 cm.

Table1. Initial height one week after transplanting and final height at flowering

TREATMENT	PLANT HEIGHT (cm) INITIAL HEIGHT	FINAL HEIGHT
Light Levels		
Full Sun	10.10[a]	33.53[b]
Partial Shade	9.94[a]	38.15[b]
Deep Shade	9.79[a]	47.61[a]
Growing Media		
Mountain Soil	9.82[a]	36.82[bc]
Mountain Soil+ Alnus Compost	9.95[a]	46.26[ab]
Mountain Soil+BSU Compost+ Horse Manure+Saw Dust	9.56[a]	39.92[bc]
Mountain Soil+BSU Compost+ Horse Manure+Alnus Compost	9.83[a]	53.58[a]
Garden Soil	10.27[a]	33.43[c]
Garden Soil+Alnus Compost	9.33[a]	38.36[bc]
Garden Soil+BSU Compost+ Horse Manure+Saw Dust	9.96[a]	36.44[bc]
Garden Soil+BSU Compost+ Horse Manure+Alnus Compost	10.30[a]	36.29[bc]
CV (%)	14.20	26.27

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

Interaction effect. Figure 4 shows that plants grown in a potting media consisting of 1:1:1:1 mountain soil+ BSU compost+ horse manure+ alnus compost were the tallest at flowering when grown under deep shade.

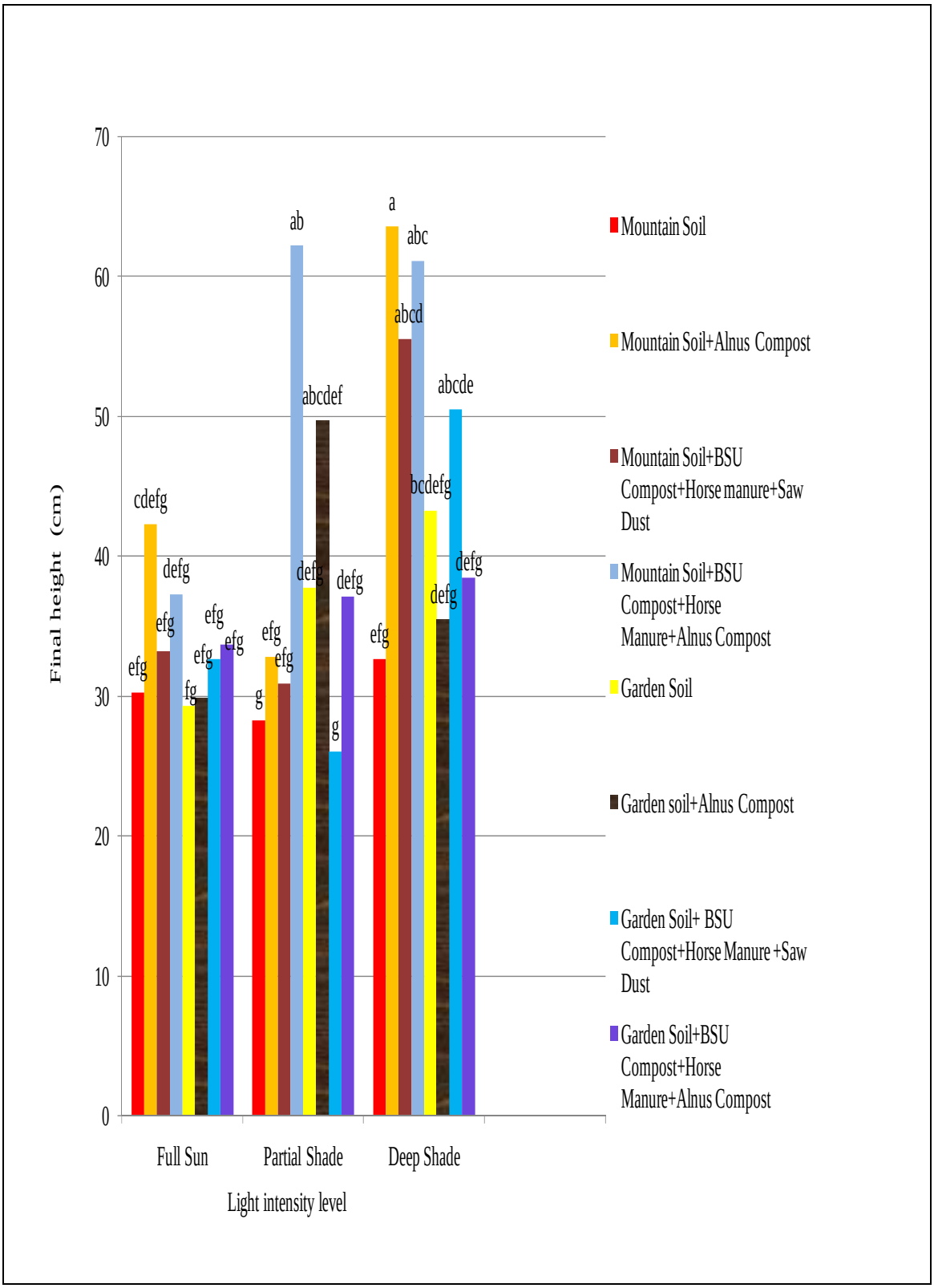

Figure 4. Final height at flowering

Initial Number of Leaves One week after Transplanting
and Final Number of Leaves at Flowering

Effect of light levels. There were no significant differences on plants grown under full sun, partial shade, and deep shade. However, final height of plants grown under full sun has higher leaf count with a mean of 90.67 followed by plants grown under deep shade with a mean of 49.21and partial shade with a mean of 39.63.

Effect of different potting media. In Table 2, it was showed that there were no significant differences on the initial number of leaves. However, table 2 also shows significant differences on its final height. Plants grown in potting media consisting mountain soil, BSU compost, horse manure and alnus compost had more number of leaves with a mean of 83.44 as compared to garden soil with a mean of 34.22.

Caballo (2001) found that Milflores grown in media composition of 1:1:1 hortiperl, alnus compost, cow manure had the highest leaf count produced. Aladog (2005) also found that potting media mixture of 1:1:1 alnus compost, chicken manure, and garden soil significantly produce the highest number of leaves in Zinnia Plants.

Interaction effect. Statistical analysis shows that plants grown in potting media consisting of mountain soil, BSU compost, horse manure and alnus compost obtained significant differences on number of leaf counted grown under full sun.

Table 2. Initial number of leaves one week after transplanting and final number of leaves at flowering

TREATMENT	INITIAL NUMBER OF LEAVES	FINAL NUMBER OF LEAVES
Light Levels		
Full Sun	6.21[a]	90.67[a]
Partial Shade	6.71[a]	39.63[b]
Deep Shade	7.25[a]	49.21[b]
Growing Media		
Mountain Soil	6.00[a]	38.88[dc]
Mountain Soil+ Alnus Compost	7.56[a]	66.33[ab]
Mountain Soil+BSU Compost+ Horse Manure+Saw Dust	7.22[a]	72.11[ab]
Mountain Soil+BSU Compost+ Horse Manure+Alnus Compost	7.78[a]	83.44[a]
Garden Soil	7.11[a]	34.22[d]
Garden Soil+Alnus Compost	6.33[a]	55.00[bc]
Garden Soil+BSU Compost+ Horse Manure+Saw Dust	5.78[a]	56.67[bc]
Garden Soil+BSU Compost+ Horse Manure+Alnus Compost	6.00[a]	72.00[ab]
CV (%)	27.64	33.57

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

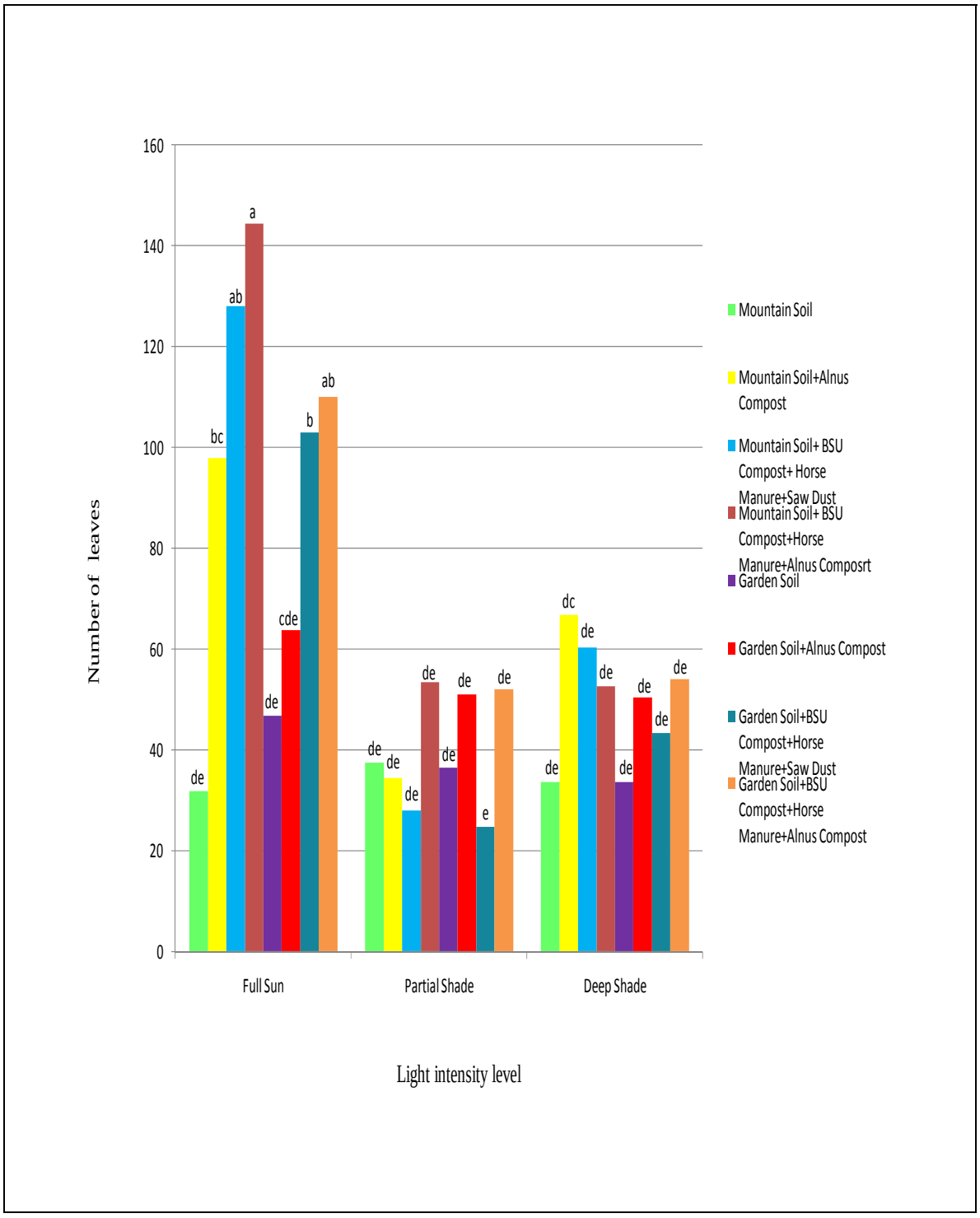

Figure 5. Final number of leaves at flowering

Reproductive Growth

Number of Days from Transplanting to Flower Bud Formation (1cm bud size)

Effect of light levels. Result showed no significant differences on plants as affected by light levels. However, plants grown under full sun were the earliest to form buds with a mean of 115.50 days followed by deep shade with a mean of 118.33 days and partial shade with a mean of 119.08 days.

Effect of potting media. Result showed that there were significant differences on the number of days from transplanting to flower bud formation as affected by different potting media as showed in Table 3. Plant grown in 1:1:1:1 garden soil were the latest to form flower buds with a mean of 125.78 days while plants grown in 1:1:1:1 garden soil, BSU compost, horse manure and alnus compost were the earliest to form flower bud with a mean of 104.88 days.

Cais (1996) found that potting media consisting 1:1:1:1 of wood shaving, saw dust, cow manure, sunflower leaves, showed the earliest buds in anthurium.

Interaction effect. Plant grown in potting media combination of garden soil, BSU compost, and horse manure and alnus compost showed significant differences on the number of days from transplanting to flower bud formation (1cm bud size).

Number of Days from Flower Bud Formation to Tight Bud Stage (25% Anthesis)

Effect of light levels. Table 4 shows no significant differences on the plant grown under full sun, partial shade, and deep shade. Plants grown in full sun had slight difference on the days from flower bud formation with a mean of 22.63 followed by partial shade with a mean of 22.83 and deep shade with a mean of 23.04.

Table 3. Number of days from transplanting to flower bud formation (1cm bud size)

TREATMENT	MEAN (Days)
Light Levels	
Full Sun	115.50[a]
Partial Shade	119.08[a]
Deep Shade	118.33[a]
Growing Media	
Mountain Soil	125.78[a]
Mountain Soil+ Alnus Compost	113.44[ab]
Mountain Soil+BSU Compost+ Horse Manure+Saw Dust	119.11[ab]
Mountain Soil+BSU Compost+ Horse Manure+Alnus Compost	112.68[ab]
Garden Soil	125.78[a]
Garden Soil+Alnus Compost	112.00[ab]
Garden Soil+BSU Compost+ Horse Manure+Saw Dust	116.78[ab]
Garden Soil+BSU Compost+ Horse Manure+Alnus Compost	104.88[b]
CV (%)	14.49%

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

Effect of potting media. Result showed that there were no significant differences on the duration of flower bud formation to tight bud stage (25% anthesis) as affected by different potting media used as shown in Table 4. However, plant grown in garden soil

Table 4. Number of days from flower bud formation to tight bud stage (25% Anthesis)

TREATMENT	MEANS (Days)
Light Levels	
Full Sun	22.63[a]
Partial Shade	22.83[a]
Deep Shade	23.04[a]
Growing Media	
Mountain Soil	22.67[a]
Mountain Soil+ Alnus Compost	22.33[a]
Mountain Soil+BSU Compost+ Horse Manure+Saw Dust	22.89[a]
Mountain Soil+BSU Compost+ Horse Manure+Alnus Compost	22.22[a]
Garden Soil	24.00[a]
Garden Soil+Alnus Compost	23.11[a]
Garden Soil+BSU Compost+ Horse Manure+Saw Dust	22.67[a]
Garden Soil+BSU Compost+ Horse Manure+Alnus Compost	22.78[a]
CV (%)	7.86

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

only was the late to form flower bud at tight bud stage with a mean of 24.00 days while plants grown in 1:1:1:1 mountain soil, BSU compost, horse manure and alnus compost were the earliest to form flower bud formation at tight bud stage with a mean of 22.22 days.

Interaction effect. There were no interaction effects noted between the light levels and different potting media used with regards to the number of days from flower bud formation to tight bud stage (25% anthesis).

Number of Days from Flower Bud Formation
to Tight Bud Stage to 50% Anthesis

Effect of light levels. Result shows that significant differences on plants planted under light levels as showed in Table 5. Plant grown under deep shade was the earliest in number of days from flower bud formation to tight bud stage to 50% anthesis with a mean of 27.38 days while plants grown under full sun and partial shade with slight difference with a mean of 29.58 days and 28.38 days.

Effect of potting media. Table 5 shows the number of days from flower bud formation to tight bud stage to 50 % anthesis as affected by different potting media. Plant grown in garden soil only were late to form flower bud to tight bud stage to 50% anthesis with a mean of 29.44 days while plants grown in 1:1:1:1 mountain soil, BSU compost, horse manure, alnus compost were the earliest to form flower bud formation to tight bud stage to 50 % anthesis with a mean of 26.33 days.

Interaction effect. There were no interaction effects observed between the light levels and different potting media used with regards to the number of days from flower bud formation to tight bud stage to 50% anthesis.

Cutflower Quality

Length of Flower Buds at Tight Bud Stage

Effect of light levels. Result showed no significant differences on plants grown under full sun (>1000fc), partial shade (500-1000fc) and deep shade (100-150 fc).

Effect of potting media. In Table 6, it was showed significant differences on potting media used. Plants grown in potting media consisting of mountain soil, BSU compost, horse manure and alnus compost had the longest length of flower bud at tight

Table 5. Number of days from flower bud formation to tight bud stage (50% Anthesis)

TREATMENT	MEAN (Days)
Light Levels	
Full Sun	29.58[a]
Partial Shade	28.38[ab]
Deep Shade	27.38[b]
Growing Media	
Mountain Soil	28.89[a]
Mountain Soil+ Alnus Compost	29.11[a]
Mountain Soil+BSU Compost+ Horse Manure+Saw Dust	27.56[ab]
Mountain Soil+BSU Compost+ Horse Manure+Alnus Compost	26.33[b]
Garden Soil	29.44[a]
Garden Soil+Alnus Compost	28.88[a]
Garden Soil+BSU Compost+ Horse Manure+Saw Dust	28.56[ab]
Garden Soil+BSU Compost+ Horse Manure+Alnus Compost	28.78[a]
CV (%)	7.87

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

bud stage with a mean of 7.40 cm while potting media consisting of mountain soil, BSU compost, horse manure and saw dust were the shortest with a mean of 5.92.

Table 6. Length of flower buds at tight bud stage

TREATMENT	LENGTH OF FLOWER AT TIGHT BUD STAGE (cm)
Light Levels	
Full Sun	6.44[a]
Partial Shade	6.68[a]
Deep Shade	6.50[a]
Growing Media	
Mountain Soil	6.60[ab]
Mountain Soil+ Alnus Compost	6.44[ab]
Mountain Soil+BSU Compost+ Horse Manure+Saw Dust	5.92[b]
Mountain Soil+BSU Compost+ Horse Manure+Alnus Compost	7.40[a]
Garden Soil	6.29[ab]
Garden Soil+Alnus Compost	6.43[ab]
Garden Soil+BSU Compost+ Horse Manure+Saw Dust	6.41[ab]
Garden Soil+BSU Compost+ Horse Manure+Alnus Compost	6.83[ab]
CV (%)	18.03

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

Interaction effect. There were no interaction effects noted between the light levels and different potting media used with regards to the length of flower bud formation to tight bud stage.

Meteorological Data

Meteorological data obtained in BSU PAG-ASA, Balili, La Trinidad, Benguet on September 2009- April 2010 is shown in Table 7. Relative humidity increased during the month of November to April during the study period and had decreased during the month of September to October. The maximum and minimum temperatures were the highest temperature during the months April while the rest of the growing season had low temperatures during the month of September to March. Rainfall had the highest during the month of April while the month of January had the longest Daylength.

Table 7. Meteorological data

MONTH	RELATIVE HUMIDITY	TEMPERATURE (Min)	TEMPERATURE (Max)	RAINFALL	DAYLENGTH (Min)
Sept-09	90	24.7	17.6	18.2	735.0
Oct-09	96	23.0	15.3	2.8	708.3
Nov-09	84	24.7	13.8	00.0	605.0
Dec-09	81	23.7	10.9	1.0	673.4
Jan-10	81	23.0	12.5	00.0	780.0
Feb-10	83	23.5	12.0	00.0	700.3
March-10	83	25.0	16.0	1.2	728.2
April-10	80	26.1	18.1	21.7	731.0

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted at Ornamental Horticultural Research Area of Benguet State University, La Trinidad, Benguet from September 2009- May 2010 to determine the effect light intensity and different potting media on the growth and flowering of Benguet Lily (*Lilium philippinensis*) and identify which potting media mixes that is suitable for Benguet Lily production.

Results showed that there were significant differences in some of the data gathered. Taller plants were noted from those plant grown under deep shade with potting media consisting of 1:1:1:1 mountain soil+ BSU compost+ horse manure+ alnus compost, higher number of leaves were counted from those plants grown under full sun (>1000fc) with potting media consisting of mountain soil+ BSU compost+ horse manure+ alnus compost followed by garden soil+ BSU compost+ horse manure+ alnus compost, earliest to form flower bud (1cm bud size) were those plants grown under full sun (>1000fc) with potting media consisting of garden soil+ BSU compost+ horse manure+ alnus compost, fastest to form flower bud to tight bud stage 25% and 50% anthesis are plants grown under deep shade (100-150 fc) with potting media consisting of mountain soil+ BSU compost+ horse manure+ alnus compost. Lastly length of flower bud size at tight bud stage was observed on plants grown under full sun (>1000 fc) with potting media consisting mountain soil+ BSU compost+ horse manure+ alnus compost.

Conclusion

Based on the results of the study, it is concluded that a potting medium of 1:1:1:1 mountain soil+ BSU compost+ horse manure+ alnus compost should be used as potting media in *Lilium philippinesis* and grown under full sun (>1000fc) to improve the growth and flowering of Benguet Lily.

Recommendation

From the preceding results, the use of 1:1:1:1 mountain soil+ BSU compost+ horse manure+ alnus compost as growing media for Benguet Lily and grown under full sun is therefore recommended for the improvement of the growth and flowering of Benguet Lily (*Lilium philippinensis*). Other studies on Benguet Lily is recommended to be conducted with the use of potting media consisting of garden soil+ BSU compost+ horse manure+ alnus compost to validate results.

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APPENDICES

Appendix Table 1. Initial Height

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_1P_1	9.6	8.5	9.0	27.1	9
L_1P_2	10.0	10.8	12.7	33.5	11
L_1P_3	9.0	9.0	9.0	27.0	9
L_1P_4	9.5	12.0	11.0	32.5	11
L_1P_5	10.7	11.0	8.0	29.9	10
L_1P_6	12.0	9.0	9.0	30.0	10
L_1P_7	11.8	8.8	10.0	30.6	10
L_1P_8	13.0	10.0	9.0	32.0	11
L_2P_1	10.0	9.0	9.0	28.0	9
L_2P_2	9.0	9.0	11.0	29.0	10
L_2P_3	12.0	10.6	9.0	31.6	10
L_2P_4	10.0	10.0	8.0	28.0	9
L_2P_5	10.0	11.0	12.0	33.0	11
L_2P_6	9.0	10.0	9.0	28.0	9
L_2P_7	9.0	12.0	8.0	29.0	10
L_2P_8	11.0	9.0	12.0	32.0	11
L_3P_1	9.0	11.6	12.7	33.3	11
L_3P_2	8.0	12.0	10.0	30.0	10
L_3P_3	10.0	9.4	9.8	29.2	10
L_3P_4	12.0	8.0	8.0	28.0	9
L_3P_5	8.8	9.7	11.3	29.8	10
L_3P_6	9.0	9.0	8.0	26.0	9
L_3P_7	11.0	10.0	9.0	30.0	10
L_3P_8	9.0	10.7	9.0	28.7	9

ANALYSIS OF VARIANCE

SOURCES OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Factor A	2	1.14	0.57	0.29	0.7524	
Factor B	7	7.07	1.00	0.51	0.8248	
AXB	14	25.96	1.85	0.93	0.5346	
ERROR	46	91.67	1.00			
TOTAL	71	126.786				

ns = Not significant
*= Significant
**= Highly significant

Coefficient of Variation= 14.95 %

Appendix Table 2. Final height (cm)

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_1P_1	32.0	28.0	31.0	91.0	30
L_1P_2	33.2	32.0	61.7	126.9	42
L_1P_3	33.0	29.9	36.8	99.7	33
L_1P_4	34.0	38.0	40.0	112.0	37
L_1P_5	21.5	35.0	31.4	87.9	29
L_1P_6	35.6	30.0	24.0	89.6	30
L_1P_7	28.6	34.0	35.5	98.1	33
L_1P_8	36.0	30.6	32.9	99.5	33
L_2P_1	25.9	29.0	30.0	84.9	28
L_2P_2	35.0	32.0	31.6	98.6	33
L_2P_3	30.0	29.4	33.5	96.9	32
L_2P_4	54.5	72.2	60.0	186.7	62
L_2P_5	38.5	36.0	39.0	113.5	38
L_2P_6	57.1	42.0	50.0	149.1	50
L_2P_7	24.3	26.0	28.0	78.3	26
L_2P_8	39.0	35.0	37.5	111.5	37
L_3P_1	33.0	34.0	31.0	98.0	33
L_3P_2	81.0	53.3	56.5	190.8	64
L_3P_3	30.8	92.0	43.9	166.7	56
L_3P_4	82.5	41.0	60.0	183.5	61
L_3P_5	45.0	30.0	55.0	130.0	43
L_3P_6	32.0	38.0	36.5	106.5	36
L_3P_7	50.0	41.0	60.6	151.6	51
L_3P_8	40.0	38.6	37.0	115.6	39

ANALYSIS OF VARIANCE

SOURCES OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Factor A	2	2474.17	1237.09	11.34**	<0.0001	
Factor B	7	3184.03	454.86	4.17*	0.0013	
AXB	14	3271.92	233.71	2.14*	0.0266	
ERROR	46	5017.55	109.08			
TOTAL	71	1414.15				

ns = Not significant
*= Significant
**= Highly significant

Coefficient of variation= 26.27%

Appendix Table 3. Initial number of leaves

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_1P_1	5	5	7	17	6
L_1P_2	5	6	5	16	5
L_1P_3	6	5	5	16	5
L_1P_4	6	8	5	19	6
L_1P_5	9	5	10	24	8
L_1P_6	5	7	5	17	6
L_1P_7	5	10	5	20	7
L_1P_8	6	8	6	20	7
L_2P_1	8	6	5	19	6
L_2P_2	7	5	11	23	8
L_2P_3	5	10	8	23	8
L_2P_4	11	5	8	24	8
L_2P_5	5	5	6	16	5
L_2P_6	9	9	5	23	8
L_2P_7	5	5	5	15	5
L_2P_8	5	7	6	18	6
L_3P_1	5	8	5	18	6
L_3P_2	10	9	10	29	10
L_3P_3	5	11	10	26	9
L_3P_4	11	9	7	27	9
L_3P_5	6	8	10	24	8
L_3P_6	5	5	7	17	6
L_3P_7	7	5	5	17	6
L_3P_8	5	6	5	16	5

ANALYSIS OF VARIANCE

SOURCES OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Factor A	2	13.02	6.51	1.89^{*}	0.1631	
Factor B	7	38.67	5.52	1.60^{ns}	0.1595	
AXB	14	73.42	5.24	1.52^{ns}	0.1422	
ERROR	46	158.80	3.45			
TOTAL	71	286.44				

ns = Not significant
*= Significant
**= Highly significant

Coefficient of variation= 27.64 %

Appendix Table 4. Final number of leaves at flowering

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_1P_1	28	36	31	95	32
L_1P_2	128	109	57	294	98
L_1P_3	143	128	113	384	128
L_1P_4	129	153	151	433	144
L_1P_5	29	41	70	140	47
L_1P_6	85	68	38	19	164
L_1P_7	57	129	123	309	103
L_1P_8	123	68	139	330	110
L_2P_1	27	50	35	112	37
L_2P_2	36	28	39	103	34
L_2P_3	26	21	37	84	28
L_2P_4	40	66	54	160	53
L_2P_5	32	36	41	109	36
L_2P_6	60	43	50	153	51
L_2P_7	24	27	23	74	25
L_2P_8	40	31	55	126	42
L_3P_1	31	33	37	101	34
L_3P_2	88	52	54	194	65
L_3P_3	31	98	52	181	60
L_3P_4	79	35	44	158	53
L_3P_5	30	25	46	101	34
L_3P_6	38	68	45	151	50
L_3P_7	33	40	54	127	42
L_3P_8	46	65	51	162	54

ANALYSIS OF VARIANCE

SOURCES OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Factor A	2	35327.08	17663.54	43.77**	<0.0001	
Factor B	7	18238.44	2605.49	6.46*	<0.0001	
AXB	14	20365.80	1454.70	3.61*	0.0005	
ERROR	46	18561.58	403.51			
TOTAL	71	92532.00				

ns = Not significant
*= Significant
**= Highly significant

Coefficient of variation= 33.57 %

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

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_1P_1	118	103	105	326	109
L_1P_2	131	155	99	385	128
L_1P_3	120	38	114	332	111
L_1P_4	128	115	117	360	120
L_1P_5	102	116	136	354	118
L_1P_6	97	90	110	297	99
L_1P_7	94	111	103	308	103
L_1P_8	100	118	96	314	105
L_2P_1	98	114	141	353	118
L_2P_2	111	150	139	400	133
L_2P_3	132	116	112	359	120
L_2P_4	138	127	116	381	127
L_2P_5	107	111	96	314	105
L_2P_6	156	99	108	363	121
L_2P_7	131	116	122	369	123
L_2P_8	96	121	100	317	106
L_3P_1	97	110	128	335	112
L_3P_2	137	113	97	347	116
L_3P_3	150	126	104	380	127
L_3P_4	122	153	115	390	130
L_3P_5	114	100	139	353	118
L_3P_6	143	98	107	348	116
L_3P_7	117	124	133	374	125
L_3P_8	103	113	97	313	104

ANALYSIS OF VARIANCE

SOURCES OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Factor A	2	838.11	419.05	1.47^{ns}	0.2394	
Factor B	7	3220.61	460.08	1.62^{ns}	0.1540	
AXB	14	2381.89	170.13	0.60^{*}	0.8519	
ERROR	46	13070.89	284.15			
TOTAL	71	19757.27				

ns = Not significant
*= Significant
**= Highly significant

Coefficient of variation= 14.49 %

Appendix Table 6. Number of days from flower bud formation to tight bud stage 25% anthesis

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_1P_1	23	21	25	69	23
L_1P_2	21	25	21	67	22
L_1P_3	20	22	20	62	20
L_1P_4	24	21	24	69	23
L_1P_5	22	23	24	69	23
L_1P_6	25	22	21	68	23
L_1P_7	21	25	26	72	24
L_1P_8	22	20	25	67	22
L_2P_1	21	23	22	66	22
L_2P_2	23	20	20	63	21
L_2P_3	25	22	24	71	24
L_2P_4	22	25	23	70	23
L_2P_5	21	23	21	65	22
L_2P_6	23	25	23	71	24
L_2P_7	26	21	25	72	24
L_2P_8	23	22	25	70	23
L_3P_1	24	24	21	69	23
L_3P_2	22	25	23	70	23
L_3P_3	25	24	24	70	23
L_3P_4	20	20	22	62	21
L_3P_5	24	21	25	70	23
L_3P_6	26	22	21	69	23
L_3P_7	24	25	23	72	24
L_3P_8	21	23	24	68	23

ANALYSIS OF VARIANCE

SOURCES OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Factor A	2	2.08	1.04	0.32^{*}	0.7251	
Factor B	7	19.11	2.73	0.85^{ns}	0.5535	
AXB	14	51.47	3.68	1.14^{ns}	0.3594	
ERROR	46	148.00	3.22			
TOTAL	71	222.00				

ns = Not significant
*= Significant
**= Highly significant

Coefficient of variation= 7.85 %

Appendix Table 7. Number of days from flower bud formation to tight bud stage 50% anthesis

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_1P_1	31	28	28	87	29
L_1P_2	29	28	31	88	29
L_1P_3	30	31	29	90	30
L_1P_4	27	32	30	89	30
L_1P_5	30	31	29	90	30
L_1P_6	32	28	30	90	30
L_1P_7	29	31	27	87	29
L_1P_8	30	28	31	89	30
L_2P_1	30	31	30	91	30
L_2P_2	26	30	28	84	28
L_2P_3	29	26	23	78	26
L_2P_4	31	23	29	83	28
L_2P_5	24	30	27	81	27
L_2P_6	32	29	31	92	31
L_2P_7	28	31	27	86	29
L_2P_8	30	31	25	86	29
L_3P_1	31	26	25	82	27
L_3P_2	31	29	30	90	30
L_3P_3	26	30	24	80	27
L_3P_4	22	22	21	65	22
L_3P_5	31	29	28	88	29
L_3P_6	24	30	24	78	26
L_3P_7	30	25	29	84	28
L_3P_8	29	31	30	90	30

ANALYSIS OF VARIANCE

SOURCES OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Factor A	2	58.69	29.34	5.86^{ns}	0.0054	
Factor B	7	64.89	9.27	1.85^{*}	0.1004	
AXB	14	150.19	10.73	2.14^{ns}	0.0268	
ERROR	46	230.55	5.01			
TOTAL	71	521.78				

ns = Not significant
*= Significant
**= Highly significant

Coefficient of variation= 7.87 %

Appendix Table 8. Length of flower bud at tight bud stage (cm)

TREATMENT	REPLICATION I	II	III	TOTAL	MEAN
L_1P_1	5.4	6.0	7.0	18.4	6
L_1P_2	6.0	6.0	6.0	18.0	6
L_1P_3	6.0	5.0	7.0	18.0	6
L_1P_4	5.0	8.0	8.3	21.3	7
L_1P_5	7.0	6.2	7.6	20.8	7
L_1P_6	7.0	6.0	7.0	20.0	7
L_1P_7	6.0	6.0	7.0	19.0	6
L_1P_8	7.0	5.0	6.0	18.0	6
L_2P_1	7.0	6.0	7.0	20.0	7
L_2P_2	9.0	8.0	6.0	23.0	8
L_2P_3	5.0	6.0	5.0	16.0	6
L_2P_4	8.0	7.0	7.0	22.0	7
L_2P_5	5.0	5.8	9.0	19.8	7
L_2P_6	6.0	6.0	5.0	17.0	6
L_2P_7	5.0	6.0	8.0	19.0	6
L_2P_8	6.0	7.0	10.0	23.0	8
L_3P_1	8.0	7.0	6.0	21.0	7
L_3P_2	6.0	5.0	6.0	17.0	6
L_3P_3	6.3	5.0	7.5	18.8	6
L_3P_4	6.0	10.0	7.0	23.0	8
L_3P_5	5.0	6.0	5.0	16.0	5
L_3P_6	6.0	6.0	8.3	20.3	7
L_3P_7	7.0	6.7	6.0	19.7	6
L_3P_8	6.0	5.0	9.0	20.0	7

ANALYSIS OF VARIANCE

SOURCES OF VARIANCE	DEGREE OF FREEDOM	SUM OF SQUARE	MEAN SQUARE	COMPUTED F	TABULATED F 0.05	0.01
Factor A	2	0.72	0.36	0.26^{ns}	0.7709	
Factor B	7	11.79	1.68	1.21^{*}	0.1354	
AXB	14	19.44	1.39	1.00^{ns}	0.4700	
ERROR	46	63.96				
TOTAL	71	105.23				

ns = Not significant
*= Significant
**= Highly significant

Coefficient of variation= 18.03 %

Appendix Table 7. Meteorological data

MONTH	RELATIVE HUMIDITY	TEMPERATURE (Min)	(Max)	RAINFALL	DAYLENGTH (Min)
Sept-09	90	24.7	17.6	18.2	735.0
Oct-09	96	23.0	15.3	2.8	708.3
Nov-09	84	24.7	13.8	00.0	605.0
Dec-09	81	23.7	10.9	1.0	673.4
Jan-10	81	23.0	12.5	00.0	780.0
Feb-10	83	23.5	12.0	00.0	700.3
March-10	83	25.0	16.0	1.2	728.2
April-10	80	26.1	18.1	21.7	731.0