Stem Firmness and Flowering Response of Cut Lilies as Influenced by Medium Composition in Box Culture

Suh, Jeung-Keun*

College of Bio-resources science, Dankook University, Cheonan, 330-714, Korea

Abstract

Stem firmness and flowering response of cut lily as influenced by medium composition (Control: Upland soil, Pt: Peatmoss, Pe: Perlite, Ve: Vermiculite, Rrh: Rotted rice-hull, RPt: Russian Peatmoss) were studied. For 'Casa Blanca', plant height and length of flower stalk increased when bulbs were planted in Pt:Rrh:Ve(1:1:1, v/v), and dried leaves of lower part plants decreased by RPt:Pe:Rrh(1:1:1, v/v). In case of 'Marco Polo' plant height and length of flower stalk increased with Pt:Rrh(1:1, v/v) as compared to other treatment, number of leaves and dried leaves increased when bulbs were planted in RPt:Pe:Rrh(1:1:1, v/v) as compared to control. Flowering of 'Casa Blanca' was promoted in Pt:Pe:Ve(1:1:1, v/v) and 'Marco Polo' was accelerated in Pt:Rrh:Ve(1:1:1, v/v). Flower length of 'Casa Blanca' was increased by RPt:Pe:Rrh(1:1:1, v/v) as compared with control and 'Marco Polo' was increased when bulbs planted to Pt:Rrh(1:1, v/v). Flower-bud blasting of two cultivars was increased with Pt as compared with other treatment. Stem firmness of 'Casa Blanca' was increased by Pt:Pe:Ve (1:1:1, v/v), and especially, stem firmness of upper part plants was increased by Pt:Rrh(1:1, v/v) in 'Marco Polo' as compared to control plants. but generally, stem firmness of 'Casa Blanca' was not influenced with all cultural media as compared to control.

Key words : nutrient composition, flowering quality, special hydroponics, *tulip*

1. Introduction

Cut lilies have been grown around the world in an amazingly wide range of soil and media types both in the field and in containers, but recently use of media that have good water and fertilizer holding ability are increasing(Floriculture, 1999).

The quality of cut lily, firmness of flower stalk and leaf, and flowering will depend on the water capacity and moisture level of substrate in greenhouse. The major role of growing in lily production is a good water, no pathogenic disease organism and finally holding the plant during the greenhouse forcing phase. So composition media is very important to produce of high quality cut lily.

Recently, cut lily was cultivated to produce high quality of cut lily in greenhouse, but there was no data of good adequately media for planned production in box culture.

Therefore, this experiment was performed the effect of media composition treatment on stem firmness and flowering response of cut lily.

2. Materials and Methods

2.1 Plant material

Bulbs of lily(*Lilium* spp.) cv. 'Casa Blanca' and 'Marco Polo', 18~20cm in circumference, were obtained from a commercial grower in Onyang, Korea on May. 31, 1999, and were grown at the farm of the Dankook University and Floriculture Lab., Cheonan, Korea. Bulbs were treated at 2℃ for 12 weeks until the planting. Bulbs were soaked in 5% benomyl solution for 30 minutes before planted box(L×W×H=80×60×40cm).

2.2 Medium composition

The growing medium was composed of :

Control(Upland soil)

Peatmoss(Pt)

Peatmoss(Pt):Perlite(Pe) (1:1, v/v)

Peatmoss(Pt):Perlite(Pe):Vermiculite(Ve) (1:1:1, v/v)

Peatmoss(Pt):Rotted rice-hull(Rrh) (1:1, v/v)

Peatmoss(Pt):Rotted rice-hull(Rrh):Vermiculite(Ve) (1:1:1, v/v)

Peatmoss(Pt):Perlite(Pe):Rotted rice-hull(Rrh) (1:1:1, v/v)

Russian Peatmoss(RPt):Perlite(Pe):Rotted rice-hull(Rrh) (1:1:1, v/v)

Temperature range at the greenhouse varied from 15℃ to 29℃. The watering was automatic irrigation, and done 2.5ℓ per day. Osmocote(Scote, N:P:K=14:14:14, USA), controlled released fertilizer, was fertilized at 40g/box in the early growing period. Soil moisture characteristic curve, moisture tension and water content in all media were measured, and analysis methods were by Deboodt and Verdonck. Data collected from 48 plants, 8 plants per replication and 6 replication per treatment. Sprouting date was recorded when shoot emergenced, plant height, length of flower stalk, number of leaves and dried leaves, number of days from planting to flowering, length of flower, and number of flower and blasting were measured. Data were subjected to analysis of variance and means were separated with LSD(Least Significant Difference) at p=0.05.

3. Results and Discussion

Sprouting of 'Casa Blanca' was accelerated when bulbs were planted in peatmoss as compared to other mixed media, and 'Marco Polo' was decreased as compared to control(Table. 1). For 'Casa Blanca' plant height and length of flower stalk were increased when bulbs were planted in Pt:Rrh:Ve(1:1:1, v/v), and dried leaves of lower part plants was decreased by RPt:Pe:Rrh(1:1:1, v/v). In case of 'Marco Polo' plant height and length of flower stalk were increased with Pt:Rrh(1:1, v/v) as compared to other treatment, number of leaves and dried leaves were increased when bulbs were planted in RPt:Pe:Rrh(1:1:1, v/v) as compared to control. Flowering of 'Casa Blanca' was promoted in Pt:Pe:Ve(1:1:1, v/v) and 'Marco Polo' was accelerated in Pt:Rrh:Ve(1:1:1, v/v). Flower length of 'Casa Blanca' was increased by RPt:Pe:Rrh(1:1:1, v/v) as compared with control and 'Marco Polo' was increased

when bulbs planted to Pt:Rrh(1:1, v/v)(Table 2). Flower-bud blasting of two cultivars was increased with Pt as compared with other treatment. Stem firmness of 'Casa Blanca' was increased by Pt:Pe:Ve (1:1:1, v/v), and especially, stem firmness of upper part plants was increased by Pt:Rrh(1:1, v/v) in 'Marco Polo' as compared to control plants. But generally, stem firmness of 'Casa Blanca' was not influenced with all cultural media as compared to control(Table 3). Generally, for cultural media, the growth of cut lily was decreased by Pt:Pe:Rrh(1:1:1, v/v) treatment as compared to control or vermiculite mixed media. These results considered that uniformity supply of nutrient and water content, and bulk density was higher than 0.20 g/㎤ as compared to other media composition(Table 4). For soil moisture characteristic curve, water content of vermiculite mixed media(20~22%) was also similar to control(13%)(Fig. 1), available water content has an same inclination to moisture characteristic curve as well. According to this experiment results, it is assumed that vermiculite mixed media was holder available water than peatmoss mixed media, because of water lack, it was wickedness of cut lily quality that peatmoss was preserved lower water potential. In finally, selecting of growing media, it was assumed that vermiculite mixed media was profitable cultivation of lily. The regard will be paid to fact that bulk density, moisture characteristic curve and available water content.

Table 1. Effect of media composition on growth of *Lilium* oriental hybrid 'Casa Blanca' and 'Marco Polo' in box culture.

Cultivar	Medium[z]	Days to emergence (day)	Plant height (cm)	Length of flower stalk (cm)	No. of leaves (ea)	No. of dried leaves (ea)
Casa Blanca	Control	23.4 a[y]	104.0 c	86.5 b	50.7 a	11.8 b
	Pt	20.1 b	97.2 d	82.9 c	37.9 d	18.0 a
	Pt:Pe (1:1)	22.8 a	95.5 d	80.2 c	36.6 d	18.2 a
	Pt:Pe:Ve (1:1:1)	21.6 ab	109.9 b	94.4 a	46.3 b	9.3 c
	Pt:Rrh (1:1)	22.0 ab	106.3 c	87.9 b	51.0 a	6.6 d
	Pt:Rrh:Ve (1:1:1)	23.0 a	114.7 a	95.9 a	50.6 a	7.0 d
	Pt:Pe:Rrh (1:1:1)	23.6 a	91.1 e	76.7 d	42.2 c	8.0 cd
	RPt:Pe:Rrh (1:1:1)	23.0 a	90.6 e	76.3 d	44.8 bc	3.4 e
Marco Polo	Control	20.2 c	115.5 cd	87.3 bc	56.1 b	9.6 d
	Pt	20.3 c	110.8 de	85.3 c	48.4 cd	13.4 b
	Pt:Pe (1:1)	21.1 bc	101.0 f	75.3 e	45.5 d	16.5 a
	Pt:Pe:Ve (1:1:1)	21.8 ab	116.4 bc	86.3 c	54.7 b	10.3 cd
	Pt:Rrh (1:1)	21.2 bc	124.7 a	93.0 a	57.3 b	9.6 d
	Pt:Rrh:Ve (1:1:1)	20.9 bc	121.6 ab	90.8 ab	54.6 b	8.4 e
	Pt:Pe:Rrh (1:1:1)	22.2 ab	98.4 f	73.4 e	50.7 c	11.2 c
	RPt:Pe:Rrh (1:1:1)	22.9 a	109.1 e	79.7 d	60.6 a	6.7 f

[z] Control : Upland soil, Pt : Peatmoss, Pe : Perlite, Ve : Vermiculite, Rrh : Rotted rice-hull, RPt : Russian Peatmoss
[y] Means separation within columns by Duncan's multiple range test, 5% level.

Table 2. Effect of media composition on flowering of *Lilium* oriental hybrid 'Casa Blanca' and 'Marco Polo' in box culture.

Cultivar	Medium[z]	Days to flowering (day)	No. of flowers (ea)	Length of flower (cm)	No. of blasting (ea)
Casa Blanca	Control	110.8 a[y]	5.0 a	12.3 cd	0.2 d
	Pt	110.8 a	4.2 bc	12.2 d	1.3 a
	Pt:Pe (1:1)	110.6 a	4.5 b	12.1 d	0.9 ab
	Pt:Pe:Ve (1:1:1)	107.4 d	4.5 b	12.8 bc	0.6 bc
	Pt:Rrh (1:1)	108.7 c	4.5 b	12.8 bc	0.3 cd
	Pt:Rrh:Ve (1:1:1)	108.2 c	4.7 ab	13.2 ab	0.3 cd
	Pt:Pe:Rrh (1:1:1)	109.6 b	3.9 cd	12.8 bc	0.6 bc
	RPt:Pe:Rrh (1:1:1)	110.1 ab	3.7 d	13.9 a	0.5 bcd
Marco Polo	Control	100.1 ab	6.5 a	12.1 c	0.1 c
	Pt	99.8 ab	5.7 bc	12.3 bc	2.8 a
	Pt:Pe (1:1)	100.3 a	5.5 c	11.9 c	2.0 b
	Pt:Pe:Ve (1:1:1)	99.7 b	6.2 ab	12.1 c	0.1 c
	Pt:Rrh (1:1)	98.7 c	6.3 ab	13.0 a	0.2 c
	Pt:Rrh:Ve (1:1:1)	98.3 d	6.1 ab	12.9 a	0.0 c
	Pt:Pe:Rrh (1:1:1)	98.8 c	5.2 c	12.1 c	2.2 b
	RPt:Pe:Rrh (1:1:1)	98.8 c	6.3 ab	12.7 ab	0.0 c

[z] Control : Upland soil, Pt : Peatmoss, Pe : Perlite, Ve : Vermiculite, Rrh : Rotted rice-hull, RPt : Russian Peatmoss
[y] Means separation within columns by Duncan's multiple range test, 5% level.

Table 3. Effect of media composition on firmness and diameter of stem of *Lilium* orienta hybrid 'Casa Blanca' and 'Marco Polo' in box culture.

Cultivar	Medium[z]	Firmness of stem(Gf)[x]			Diameter of stem(mm)		
		Upper	Middle	Low	Upper	Middle	Low
Casablanca	Control	4596 a[y]	4872 ab	6743 a	5.10 a	6.40 a	7.51 a
	Pt	3159 b	4436 ab	5298 ab	3.69 d	4.78 b	5.95 c
	Pt:Pe (1:1)	4509	4380 ab	5318 ab	3.83 d	4.72	5.82 c
	Pt:Pe:Ve (1:1:1)	4458 a	5203 a	7451 a	4.13 cd	5.07 b	6.37 bc
	Pt:Rrh (1:1)	4049 ab	4830 ab	6426 ab	4.94 ab	6.19 a	7.15 a
	Pt:Rrh:Ve (1:1:1)	3305 b	3811 bc	5788 ab	4.76 ab	6.03 a	6.94 ab
	Pt:Pe:Rrh (1:1:1)	2192 c	2774 c	2818 c	3.72 d	5.37 b	5.86 c
	RPt:Pe:Rrh (1:1:1)	3217 b	3081 c	4120 bc	4.61 bc	6.00 a	7.02 a

Marcopolo	Control	4889 abc	7789 abc	7791 ab	4.96 a	6.63 a	7.33 a
	Pt	5426 ab	7186 bc	9441 a	4.46 bc	5.91 bc	6.54 ab
	Pt:Pe (1:1)	4440 bcd	6609 cd	7678 ab	4.26 c	5.73 c	6.23 b
	Pt:Pe:Ve (1:1:1)	5572 a	8852 a	8740 ab	4.84 ab	6.46 ab	7.21 a
	Pt:Rrh (1:1)	5807 a	7098 bc	8250 ab	5.11 a	6.99 a	7.23 a
	Pt:Rrh:Ve (1:1:1)	5157 ab	8183 ab	7500 ab	4.82 ab	6.63 a	6.92 ab
	Pt:Pe:Rrh (1:1:1)	3784 d	5701 d	6007 b	4.03 c	5.52 c	6.24 b
	RPt:Pe:Rrh (1:1:1)	4195 cd	6546 cd	7161 ab	4.28 c	6.32 ab	6.80 ab

z) Control : Upland soil, Pt : Peatmoss, Pe : Perlite, Ve : Vermiculite, Rrh : Rotted rice-hull, RPt : Russian Peatmoss
y) Means separation within columns by Duncan's multiple range test, 5% level.
x) Gf : Gram force

Table 4. Bulk density(BD) of the materials used in the experiment.

Materials(plot)	Bulk Density (g/㎤)
Control	1.25
Pt	0.15
Pt:Pe(1:1)	0.17
Pt:Pe:Ve(1:1:1)	0.21
Pt:Rrh(1:1)	0.16
Pt:Rrh:Ve(1:1:1)	0.20
Pt:Pe:Rrh(1:1:1)	0.16
RPt:Pe:Rrh(1:1:1)	0.18

z) Control : Upland soil, Pt : Peatmoss, Pe : Perlite, Ve : Vermiculite, Rrh : Rotted rice-hull, RPt : Russian Peatmoss

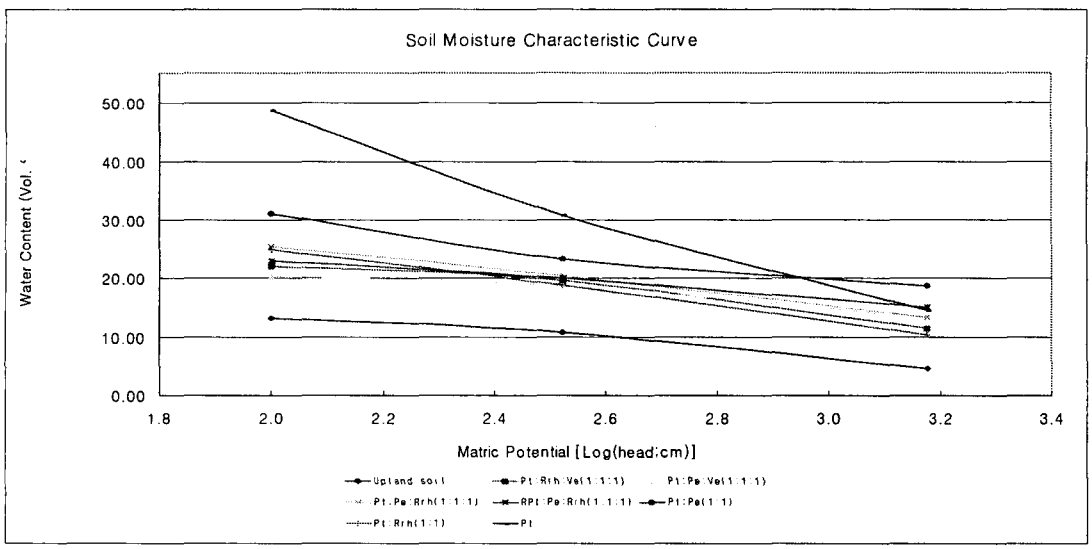

Fig. 1. Soil moisture characteristic curve of root media.

4. Literature cited

1. Biernbaum, J.A. 1992 Root-zone management of greenhouse container grown crops to control water and fertilizer use. HortTechnology 2:127-132.
2. Biattie, D.J. and J.W. White. 1993. Lilium-Hubrids and species, pp. 423-454. In: The physiology of flower bulbs, A. De Hertogh and M. Le Nard, editors. Elservier, Amsterdam.
3. DeBoodt, M. and O. Verdornck. 1972. The physical properties of the substractes in horticulture. Acta Hort. 26:37-44.
4. De Hertogh, A. 1989. Holland bulb forcer's guide. 4th ed. International flower bulb centre, Hillegom, Netherlands.
5. De Hertogh, A. 1996. Lilies (Asiatic and Oriental), pp. C95-121. In: Holland forcer's Guide. 5th International flower bulb centre, Hillegom, Netherlands.
6. Hasek, R.F. Sciaroni, R.H., and Branson, R.L., 1986. Water conservation and recycling in ornamental production. HortScience 21:35-38.
7. John, M.D., Harold, F.W., 1999. Floriculture. Prentice-Hall, Inc.
8. Lemaire, F. 1995. Physical, chemical and biological properties of growing medium. Acta Hort. 396:273-284.
9. Nelson, P.V. 1998. Root substrate, pp. 185-224. In: Greenhouse Operation and Management, 5th edition. Prentice-Hall, Upper Saddle River, New Jersey.
10. Roh, S.M. 1989. Control of flowering in *Lilium* - A review. Herbertia 45:65-69.
11. William R.A., John A.B., 1994. Irrigation requirements, root-medium pH, and nutrient concerntration of easter lilies grown in five peat-based media with and without an evaporation barrier. J. Amer. Soc. Hort. Sci. 119(6):1151-1156.