

EFFECT OF GROWING SUBSTRATES ON PERFORMANCE OF LILIUM (*LILIUM LONGIFLORUM* L.) CV. BACH

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ABSTRACT

To investigate the effect of growing substrates on performance of Lilium (*Lilium longiflorum* L.) cv. 'Bach' an experiment was conducted at Model Floriculture Center, GBPUAT, Pantnagar, India during 2014-15. Results indicated that plant height (104.90 cm), stem diameter (9.51 mm), number of flower buds (3.46), flower bud length (11.47 cm), flower bud diameter (33.50 mm), flower diameter (16.16 cm) and vase life (11.26 days) were recorded maximum with T₂ (100% cocopeat) treated plants. However, number of days to bud appearance (29.53) and number of days to first flower opening (59.33) were recorded maximum with T₁ (soil) treated plants. Among bulbous attributes bulb diameter (51.97 mm), number of bulblets (3.96), stem roots (13.60 cm) and basal roots length (24.96 cm) were found maximum in T₂. Results of investigation showed that cocopeat enriched substrate is best suitable for lilium cultivation in container system.

INTRODUCTION

Genus Lilium (*Lilium longiflorum* L.) includes herbaceous flowering plants growing from non tunicated scaly bulbs, belongs to family Liliaceae. With having different shape, size, colour and fragrance lilium holds 4th position among top 10 cut flowers in world floriculture trade (Bahr and Compton, 2004). In India, lilioms are popularizing among growers of Himanchal Pradesh, Jammu Kashmir, Uttarakhand and Ooty because of its high profitability within a short growing periods (4 months).

In recent years, soilless culture recognized as an advance system for ornamental horticulture crop production and lilium forcing (Oki and Lieth, 2004) because it has been observed that field soil are generally unsatisfactory for the production of plants in containers, primarily because they do not provide the required aeration and water retention status that are essential to maintain equilibrium between moisture content and gaseous exchange in a limited volume of pot (Kuklal *et al.*, 2012). The soil cropping system traditionally used for horticultural crops production but the main problem with soil is the loss of plants due to infection by soil born diseases caused by *Phytophthora sp.* (Durner *et al.*, 2002), nematodes and the occurrence of soil limited factors. The properties of different substrates used as soilless growing media exhibit direct and indirect effects on growth, productivity (Puri, 2012) and quality of plants (Kumar *et al.*, 2014).

The crop production using substrates also allows a better control of the root environment (Abad *et al.*, 2001). Thus, selection of an ideal substrate is one of the most important key

for success of soilless culture system (Olympios, 1995). Cocopeat has good physical properties, high total pore space, high water holding capacity, slow water and nutrient releasing ability, low shrinkage, low bulk density and slow biodegradation (Evans *et al.*, 1996) which are desirable for proper plant growth and development, bulb development, uptake of nutrients and water. Erwin, (1998) reported that lilium forced in cocopeat and rice hulls have produced superior crops as compare to soil. However, in India information regarding this aspect is scanty. Therefore, the primary objective of present investigation was to determine the performance of lilium in substrates culture under container system.

MATERIALS AND METHODS

Present research was conducted during 2014-15 at Model Floriculture Center, GBPUA & T Pantnagar located in Tarai region in foothills of Himalaya at an altitude of 243.84 meter above mean sea level. The experiment was laid out in Completely Randomized Design ensuring uniformity to all the treatments. Four treatments were T₁: Garden soil, T₂: Cocopeat, T₃: Cocopeat + Sand (1:1) and T₄: Soil + Sand (1:1). However, bulbs (vernalized) of cv. 'Bach' were imported from VWS EXPORT IMPORT FLOWERBULBS B.V. Holland. Ten bulbs of 'Bach' 14-16 cm grades were planted in plastic containers (60x40x15 cm) containing 20 liters (on volume basis) of substrates and randomized inside greenhouse during first week of November. The bulbs treated with 0.01% Bavistin solution before transplanting to check bulb and root rot. Cocopeat and sand procured from local supplier. During active

growth flowering attributes were recorded on mean flower plant height (cm), stem diameter (mm), number of flower buds, number of days to bud appearance, flower bud length (cm), flower bud diameter (mm), flower diameter (cm), number of days to first flower opening, vase life (days). At the end of the growing season, five plants were uprooted and evaluated in terms of bulb diameter, number of bulblets, stem roots (cm) and basal roots length (cm). The results were statistically evaluated through ANOVA with the help of using online OPSTAT (Statistics Analytical Software) developed by department of computer section, CCS, HAU Hisar.

RESULTS AND DISCUSSION

There were significant differences in the vegetative and floral attributes with respect to the different growing substrates (Table 1 and figure 1). Maximum stem length (104.90 cm), stem diameter (9.51 mm), number of flower buds (3.46), flower bud length (11.47 cm), flower bud diameter (33.50 mm), flower diameter (16.16 cm) and vase life (11.26 days) were observed with cocopeat (T_2) treated plants. The significant increase in all these attributes might be due to better plant growth, resulting maximum production and utilization of photo-assimilates. These finding are in convenience with Jhon *et al.*, (2005) in tulip. However, minimum number of days to flower bud appearance (29.53) and minimum number of days to first flower opening (59.33) were recorded maximum with soil (T_1) treated plants. The similar results were reported by Tehranifar *et al.* (2011) in Lilium. Treder (2002) reported that Lilium cv. Star Gazer grown in cocopeat flowered earlier flowering, had better quality expressed as higher fresh and dry weight of flowers and leaves, had longer flower buds, compared to these grown in the control substrate.

Likewise flowering attributes, the effect of various potting media on bulbous attributes of lilium cv. Bach shows significant difference (Table 2). Maximum flower bulb diameter (51.97 mm) and number of bulblets (3.96) were recorded with T_2 (cocopeat) treated plants that was significantly higher than T_3 (cocopeat + sand) and followed by T_4 (cocopeat + sand). This

might be due to the better water retention, air filled porosity, gas diffusion and nutrient availability to the roots in soilless cultivation system (Abad *et al.*, 2001). However, minimum bulb diameter (41.50 mm) and minimum number of bulblets (3.00) were recorded with T_1 (soil).

The pooled data in Table 2 shows that minimum Stem root length (5.88 cm) and basal root length (7.22cm) were recorded with T_1 (soil) treated plants, this might be due to the high compactness, bulk density and low porosity of T_1 (soil) that leads poor root growth and development. Lipiec *et al.* (2003) also reported that with increasing growing media compaction result in decrease in length and number of the root and increasing irregularity of root distribution system. However, maximum stem root length (13.60 cm) and basal root length (24.96 cm) were measured with T_2 (cocopeat) treated plants (Table 2). The findings are in accordance with the earlier findings of Sharma *et al.* (2015).

As lilium is a short duration (3-4 month) crop, substrate selection is most critical factor for successful production. This



Figure 1: Effect of growing substrates on growth and development of lilium plants

Table 1: Effect of growing media on flowering attributes of lilium cv. Bach

Treatment	Plant height (cm)	Stem diameter (mm)	No. of days to bud appearance	Number of flower buds per plant	No. of days to first flower opening	Bud length (cm)	Bud dia (mm)	Flower dia (cm)	Vase life (Days)
T_1 : Soil (100%)	93.13	8.49	32.00	2.40	61.53	10.34	28.55	14.40	7.46
T_2 : Cocopeat (100%)	104.90	9.51	29.53	3.46	59.33	11.47	33.50	16.16	11.26
T_3 : Cocopeat + Sand (1:1)	102.13	8.76	30.33	3.26	61.00	10.59	32.57	15.05	8.40
T_4 : Cocopeat + Soil (1:1)	98.80	8.62	30.40	2.60	61.40	10.47	30.11	14.89	7.60
CD at 5%	1.94	0.072	0.84	0.36	0.65	0.10	0.45	0.26	0.59

Table2: Effect of growing media on bulb and rooting behaviour of lilium cv. Bach

	Bulb Dia (mm)	Number of bulblet per plant	Length of Stem/feeder roots (cm)	Length of basal roots (cm)
T_1 : Soil (100%)	41.50	3.00	5.88	7.22
T_2 : Cocopeat (100%)	51.97	3.96	13.60	24.96
T_3 : Cocopeat + Sand (1:1)	49.33	3.83	8.67	17.00
T_4 : Cocopeat + Soil (1:1)	45.87	3.43	8.20	15.34
CD at 5%	0.36	0.47	0.22	0.87

studies revealed that substrate like cocopeat can be use for hitech lilium production in container system.

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