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Effect of potting media incorporated with Pusa hydrogel on growth and production of quality foliage plants of *Philodendron xanadu*

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ABSTRACT

The efficacy of potting media incorporated with different levels of Pusa hydrogel was tested on foliage plant species Philodendron xanadu for production of good quality plants at the Research Farm of Department of Floriculture and Landscaping, PAU, Ludhiana during 2016-17. The plants were planted in plastic pots consisted of potting mixtures of soil: farm yard manure: sand (1:1:1) and mixed with 0, 10, 20, 30 and 40 g concentrations of Pusa hydrogel/ 5 kg of potting media. The media supplemented with different levels of hydro gel resulted in significantly improved growth characters of vegetative growth of plants. Among all the treatments, Pusa hydrogel @ 40 g/5 kg potting media reduced the frequency of irrigation and quantity of water required. Further, improvement in foliage quality of plants with respect to plant height, plant spread, number of leaves per plants and longevity of leaves were observed. The maximum plant height (42.12 cm), number of leaves (29.16), leaf area (690.23 sq. cm), plant spread (48.20 cm) and leaf longevity (20.50 days) were recorded in media incorporated with Pusa hydrogel @ 40 g/5 kg potting media. The addition of Pusa hydrogel with media resulted in efficient use of water by reducing irrigation frequency and improved the quality of plants produced.

***Key words**: Philodendron, foliage plants, potting media, irrigation Pusa hydro gel.*

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INTRODUCTION

Floriculture and landscape gardening is gaining popularity in recent times due to urbanization and awareness among the people towards landscaping. Foliage plants as a pot plant are always valued for their foliage beauty, compactness of size and ability to survive under shady conditions. Pot plants are the only group of plants which can provide freshness even in a small space and development of flat system of housing. Philodendron (*Philodendron xanadu*) is a very beautiful foliage plant belonging to the family Araceae. It is prized for its attractive green colour foliage, most suitable as indoor ornamental plant and extensively used for indoor gardening to decorate focal points in living spaces. The wide diversity in size, leaf shape colour and growth habit makes *Philodendron* cultivars suitable for interior decoration, plantation in shade, hanging baskets, twiner plant and as floor plants. Foliage plants with limited potting media planted in pots require frequent irrigation to maintain adequate moisture content, particularly during the hot months of sub-tropical conditions when transpiration losses are high. Frequent watering in indoor potted plants is the major factor limiting their utility. Application of hydrophilic polymers can reduce the amount of water required and irrigation frequency particularly for light texture soil [1]. Polymers like hydro gels have enormous capacity to absorb water and to make it available to plants over time. Studies related to application of hydrogels in various horticultural crops have been reported long term back [4, 6, 13].

Pusa hydro gel is a natural polymer, developed and patented by IARI, New Delhi that absorbs 400 times its dry weight and also release the same. Pusa hydrogel reduces frequency of irrigation and quantity of water requirements by the plants, improved aeration and drainage, helps the plant to withstand

prolonged moisture stress and better root development leading to production of good quality foliage plants, improved physical properties of the soil [9]. Thus keeping in view the usefulness of Pusa Hydrogel, research trial was conducted to produce good quality foliage plant of *Philodendron xanadu.*

MATERIALS AND METHODS

The research trial was conducted at the Research Farm of Department of Floriculture and Landscaping, Punjab Agricultural University during 2016-2017. Plants of uniform size (approx. 20 cm) were selected as plant material to test the efficacy of different levels of Pusa hydrogel incorporated with potting media for production of quality foliage plant of *Philodendron.* The plants were planted in the month of September, 2016 in plastic- pots (10 inch) containing 5-kg of growing medium comprises of soil: farm yard manure: sand (1:1:1) as potting media. The potting media were incorporated with different levels of Pusa hydrogel @ 10, 20, 30 and 40 g/5 kg media. In control plants, potting media used was without gel. The newly planted pots were kept under 50 % shade net during the experiment. All the cultural practices like weeding and nutrition were performed to get good quality foliage plants. Need-based irrigation was applied to all the plants throughout the growth phase. The plants were critically observed in all the treatments and observations on various growth parameters like, plant height (cm), number of leaves per plant, leaf length (cm), leaf width (cm), leaf area (sq. cm), leaf production interval (days), leaf longevity (days) and number of roots per plant, plant spread (cm), petiole length (cm), petiole girth (mm), frequency of irrigation (days) and quantity of water applied (litre),were recorded. pH and EC of the potting media in all the treatments were recorded. The experiment consisted of four replications with ten pots in each replication. The data were statistically analysed by using completely randomized block design (CRD) and results were compiled and presented.

RESULTS AND DISCUSSION

Effect of Pusa hydrogel on plant growth parameters:

The effect of different levels of Pusa hydrogel incorporated to potting media(soil: farm yard manure: sand,1:1:1) resulted in improvement in plant height, number of leaves per plant, leaf length, leaf width and leaf area of foliage plant species of *Philodendron xanadu* (Table. 1). The significant increase in plant height was observed with increase in Pusa hydrogel level (Fig. 1). Among all the Pusa hydro gel levels, the maximum plant height (42.12 cm), number of leaves per plant (29.16) were obtained in potting media incorporated with 40 g of Pusa Hydro gel / 5 kg potting media, followed by second highest mean plant height (34.04 cm), number of leaves per plant (26.08 cm) with 30 g of Pusa Hydro gel / 5 kg potting media, 180 days after planting. The plant height (30.22 cm) and number of leaves per plant (16.91) were recorded to be the minimum in control where plants were planted in potting media without Pusa Hydro gel.

The incorporation of Pusa hydro gel resulted in an increase in plant height might be due to availability of sufficient quantity of water, moisture and indirectly nutrients provided by superabsorbent polymer, to increase the activity of cell division, cell expansion and cell elongation, ultimately leading to an increased plant height has been reported earlier by Dawlatzai *et al.* [3]. Similar to our findings, significant results have been reported earlier in chrysanthemum by Anupama *et al.,*[2]. The maximum average leaf length and width i.e. 12.99 cm and 6.00 cm respectively were recorded in treatment comprised of 40g of Pusa Hydrogel as compared to control where no hydrogel was used with leaf length and width of 8.55 cm and 4.25 cm respectively. Significant increase in leaf length and width was observed with increasing concentration of gel. The maximum number of leaves with more leaf length and leaf width resulted in production of plants having more leaf area. The maximum leaf area (690.23 sq. cm) was also been observed in plants planted in potting media with 40 g of Pusa hydro gel, whereas the minimum leaf area (489.77 sq. cm) was recorded in control plants without gel. Data presented in Table 2. depicted that leaf production interval also reduced significantly with increasing level of gel. The minimum number of days (12.60 days) taken for production of new leaf were observed in 40g of Pusa hydrogel/5kg of potting media as compared to control (without gel) where new leaf was emerged after 16.25 days. The data pertaining to leaf longevity, number of roots per plant, plant spread, petiole length and petiole girth is presented in Table 2. Significant increase in number of roots per plant, plant spread, petiole length and petiole girth was observed with increasing levels of Pusa hydrogel. The highest leaf longevity i.e. 20.50 days is the period for which the leaf remains turgid and fresh on the plants was recorded with 40 g of Pusa hydrogel, whereas, the minimum leaf longevity (14.58 days) was recorded on control plants where potting media was used without gel. The number of roots per plant were maximum (8.45) in plants planted in potting media incorporated with 40 g concentration of hydrogel, whereas the minimum roots (5.50) were reported in control plants planted without gel. Similarly, plant spread (48.20 cm), petiole length (25.54 cm) and petiole girth (5.84 mm) were also observed to be the highest with 40 g gel,

whereas the minimum plant spread (33.02 cm), petiole length (16.82 cm) and petiole girth (3.82 cm) were recorded in control plants. In the present study, plant spread, number of leaves per plant significantly increased with increased concentration of Pusa hydrogel that might be due to availability of significant amount of water and subsequently, putting the absorbed water into the soil around plant roots, thereby increasing water holding capacity and providing a buffer against the product loss during the time between two irrigations, [7]. The significant improvement in leaf characters has also been reported earlier by Verma *et al.,* [11] in gerbera. The variation with regard to leaf characters might be due to the uninterrupted water availability, plants obtained continuous supply of water and nutrients and thereby resulted in improvement of leaf characters and leaf longevity on the plant compared to control plants in coleus has been reported earlier Dawlatzai *et al.* [3] and Namita *et al.,* [10]. Similarly, the slowly release of stored water and nutrients as required by the plant to improve growth under limited water supply has been reported in *Pinus halepensis* by Huttermann *et al*.,[5].

Table 1. Effect of potting media incorporated with Pusa hydrogel on plant height, number of leaves, leaf length, leaf width leaf area of foliage plants (*Philodendron xanadu*)

PHG/ 5 kg media	Plant height (cm)	Number of leaves /plant	Leaf length (cm)	Leaf width (cm)	Leaf area (sq. cm)
Control	30.22	16.91	8.55	4.25	489.77
10 g	31.88	24.16	10.59	4.34	500.13
20 g	31.98	26.00	11.28	4.58	527.45
30 g	34.04	26.08	12.72	4.75	546.43
40 g	42.12	29.16	12.99	6.00	690.23
CD (5%)	**5.13**	**7.32**	**2.18**	**0.89**	**103.46**

*PHG: Pusa hydro gel

Table 2. Effect of potting media incorporated with Pusa hydrogel on leaf production interval, leaf longevity number of roots, plant spread, petiole length and petiole girth

PHG/ 5 kg media	Leaf production interval (day)	Leaf longevity (days)	Number of roots / plant	Plant spread (cm)	Petiole length (cm)	Petiole girth (mm)
Control	16.25	14.58	5.50	33.02	16.82	3.82
10 g	15.06	15.00	5.73	38.53	18.90	3.99
20 g	14.57	16.16	6.31	44.15	20.37	3.93
30 g	13.41	19.06	7.61	46.23	20.62	4.06
40 g	12.60	20.50	8.45	48.20	25.54	5.84
CD (5%)	**0.52**	**0.75**	**0.56**	**4.64**	**3.96**	**0.97**

Table 3. Effect of potting media incorporated with Pusa hydrogel on frequency of irrigation and quantity of water applied

PHG/ 5 kg media	Frequency of irrigation (day)	Quantity of water applied (liter)	pH of the medium	EC of the medium (m mhos/cm)
Control	1.62	20.31	8.5	0.23
10 g	1.75	19.93	8.4	0.23
20 g	2.75	18.46	8.4	0.22
30 g	3.67	17.18	8.5	0.25
40 g	4.55	16.51	8.4	0.30
CD (5%)	**0.44**	**0.41**	**--**	**--**

Effects of Pusa hydrogel on frequency of watering and quantity of water applied:

The application of hydrogel resulted in significant reduction in frequency of irrigation and quantity of water required by the plant as compared to the control is presented in the Table 3 and Fig. 2. The treatments comprised of 40 g and 30 g Pusa hydrogel resulted in 16.51 litre and 17.18 litre requirement of water per plant respectively for six month with frequency of irrigation of 4.55 days and 3.67 days respectively. During the experiment, it was observed that control plants require more water i.e. 20.31 litre at 1.62 days interval. All the treatments different significantly with regard to frequency of irrigation

and quantity of water applied to the plants. In the present study, application of hydrogel resulted in increased water use efficiency due to reduction in leaching and increasing frequency for irrigation. Significant reduction in frequency of irrigation and quantity of water in *Philodendron* with the incorporation of Pusa Hydrogel in potting media might be due to increase in moisture level and water holding capacity of media which is in accordance with the results reported by Dawlatzai *et al.* [3], Namita *et al.,* [10] in coleus and Koupai *et al*. [8] in *Cupressus.* Electrical conductivity (EC) and pH of the media incorporated with different concentration of Pusa Hydrogel were estimated (Table 3). Growth-related traits in foliage plant *Philodendron* were influenced by the application of Pusa hydrogel at different levels. Among the Potting media incorporated with different levels of Pusa hydrogel, medium incorporated with Pusa hydrogel @ 40 g/5 kg was the best media resulted in production of quality foliage plants of *Philodendron* with improved growth characters. Incorporation of hydrogel in potting media also reduced the frequency of irrigation and the quantity of water required. The use of Pusa hydrogel technology will help end-users in saving water and reducing irrigation frequency, in addition to obtaining plants of superior quality.

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