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Rachel Vanlalhruaii
Department of Floriculture and Landscape Architecture, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India, India

BP Sharma
Department of Floriculture and Landscape Architecture, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India, India

YC Gupta
Department of Floriculture and Landscape Architecture, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India, India

Corresponding Author:
Rachel Vanlalhruaii
Department of Floriculture and Landscape Architecture, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India, India

Green farming of Boston fern (*Nephrolepis exaltata* (L.) Schott) under polyhouse condition

Rachel Vanlalhruaii, BP Sharma and YC Gupta

Abstract
The present investigation was carried out at Research Farm of Department of Floriculture and Landscape Architecture, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan (H.P) during 2018-2019 under polyhouse condition with the objective to optimize the dose of jeevamrit for frond growth, production and longevity of *Nephrolepis exaltata*. Treatments comprised of different concentration of Jeevamrit applied both as drenching and foliar spray and *Trichoderma* spp @ 1kg/q FYM + Foliar application of Neem seed kernel extract and Garlic extract @ 5% each at 15 days interval, alternatively. The experiment was laid out in Randomized Block Design with 11 treatment combinations replicated thrice. The results revealed that treatment T_5 i.e. Jeevamrit @ 5% (Drench) + Foliar application of Jeevamrit @ 10% recorded maximum number of fronds per plant, frond length, length of the longest frond, plant spread, leaf area and number of pinnae per frond. Maximum frond width was recorded with Jeevamrit @ 2.5% (Drench) + Foliar application of Jeevamrit @ 10% application (T_2) which was found to be at par with T_5. Maximum number of frond yield per square metre, weight of individual frond and vase life were also registered in treatment T_5.

Keywords: Boston fern, *Nephrolepis exaltata*, jeevamrit, organic farming, green farming

Introduction
Nephrolepis exaltata (L.) Schott is one of the widely cultivated plants in home gardens and is the most popular cut foliage used in India. Boston fern is an epiphytic or epilithic fern belonging to the family Nephrolepidaceae. It is an evergreen fern that has long, graceful and drooping fronds. *Nephrolepis exaltata* is native to tropical regions throughout the world (Hovenkamp and Miyamoto, 2005; Ramona, 2012) [7, 10]. Boston fern is a fast growing plant. It is a tender fern that grows in a tight clump and produces arching, featherlike fronds which spread over the ground by means of thin green runners. It grows beautifully in humid locations that receive plenty of indirect sun light but when the threat of frost arrives in the fall, it must be brought indoors to survive (Thomas and Schumann, 1993) [13]. It thrives well in clay loam soils which are warm and evenly moist conditions having pH range of 5.5 and 6.5. The plant of Boston fern is drought-tolerant but grows better and retains deep, rich and green colour, if watered regularly. Hence sprinklers irrigation is the best option for cut foliage production of fronds (Stamps, 1992) [9].

Organic agriculture is now finding place in the mainstream of development and shows great promise commercially, socially and environmentally. Jeevamrit is a cheaper ecofriendly organic preparation made by cow products namely dung and urine. It is used to activate soil micro-flora and fauna and to protect the plants from diseases and also increase the nutritional quality of fruits and vegetables. It is used as a foliar spray, as soil application along with irrigation water, seed or seedling treatment etc. Jeevamrit promotes immense biological activity in soil and makes the nutrients available to crop (Devakumar *et al.*, 2008) [2]. Cow urine has got anti-fungal properties and also good source of plant nutrients. It is being used in crop production since ages.

In view of the above-mentioned facts and lack of information regarding the production of cut foliage of ferns, the present study on the effect of jeevamrit application for frond growth, production and longevity of Boston fern has been taken up.

Materials and Methods
The present investigation was carried out at the Research Farm of the Department of Floriculture and Landscape Architecture, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.) during 2018-19 which is located at an elevation

of 1276 m above mean sea level at a latitude of 30º51'0" North and longitude of 77º11'30" East. The area falls in the mid zone of Himachal Pradesh. The climate of the area is typically sub-temperate to sub-tropical and is characterized by mild summers and cool winters. May and June are the hottest months while January and February are the coldest. Maximum rainfall is received during July to September (Monsoon season). The soil under study was found with 6.97 pH which was in normal range, electrical conductivity was 1.18 dS m^{-1} which was normal and organic carbon percentage was very high i.e. 1.69%. Among available NPK, nitrogen and potassium were in medium range i.e. 357.5 and 287.3 kg/ha, respectively whereas, phosphorus was available in higher amount i.e. 42.15 kg/ha. There were 11 treatments tried and replicated thrice in a Randomized Block Design (RBD). The treatments were as follows: T_0 = Control, T_1 = Jeevamrit @ 2.5% (Drench) + Foliar application of Jeevamrit @ 5%, T_2 = Jeevamrit@ 2.5% (Drench) + Foliar application of Jeevamrit @ 10%, T_3 = Jeevamrit@ 2.5% (Drench) + Foliar application of Jeevamrit @ 15%, T_4 = Jeevamrit@ 5% (Drench) + Foliar application of Jeevamrit @ 5%, T_5 = Jeevamrit @ 5% (Drench) + Foliar application of Jeevamrit @ 10%, T_6 = Jeevamrit @ 5% (Drench) + Foliar application of Jeevamrit @ 15%, T_7 = Jeevamrit @ 7.5% (Drench) + Foliar application of Jeevamrit @ 5%, T_8 = Jeevamrit @ 7.5% (Drench) + Foliar application of Jeevamrit @ 10%, T_9 = Jeevamrit @ 7.5% (Drench) + Foliar application of Jeevamrit @ 15%, T_{10} = Soil treatment with *Trichoderma* spp @ 1 kg/q FYM + Foliar application of Neem seed kernel extract and Garlic extract @ 5% each at 15 days interval, alternatively. Treatment combinations of jeevamrit were applied at 15 days interval, alternatively. For controlling insect pests, regular spray with Neemastra @ 2.5% and Bramhastra @ 2.5% at 7 days intervals, alternatively will be followed for all treatments except T_{10}. Soil, Sand and FYM (2:2:1) was used as growing medium. Then, raised beds of 1.0 m x 1.0 m x 15 cm (L x B x H) size were made and leveled properly. Planting was done under polyhouse condition during evening time on 3rdJune, 2018 and uniform sized plants were used for planting in small pits of about 5-6 cm depth in raised beds with row to row and plant to plant spacing of 45 cm X 45 cm, thus accommodating 4 plants/plot with four fronds in each plant. Ferns were harvested after 300 days of planting. All the cultural practices were kept uniform for all the treatments and standard practices were adopted. The data were analyzed by simple statistical methods for interpretation of the data using the procedures described by Gomez and Gomez (1984) [4]. The analytical error of individual samples was generally below 5%.

Results and Discussion

Application of Jeevamrit @ 5% (Drench) + Foliar application of Jeevamrit @ 10% (T_5) to the plants resulted in maximum number of fronds per plant (27.73 and 45.64 at 150 and 300 DAP, respectively), frond length (43.21 cm at 150 DAP) and length of the longest frond (53.80 and 55.45 cm at 150 and 300 DAP, respectively) which might be due to better uptake of macro and micro nutrients by Boston fern. Since nitrogen is a constituent of chlorophyll, which ascertained increased synthesis of photosynthates leading to better vigour. Phosphorus being essential constituent of cellular protein and nucleic acid might have encouraged meristematic activity of plants may increase length. Maximum frond width (4.00 cm at 30 DAP) was found in plants receiving Jeevamrit @ 2.5% (Drench) + Foliar application of Jeevamrit @ 10% (T_2) which was found to be at par with T_5 (3.93 cm) i.e. Jeevamrit @ 5% (Drench) + Foliar application of Jeevamrit @ 10% (Table 1). This might be due to the accumulation of constituents and nutrients from jeevamrit which contained 0.16% nitrogen, 0.02% phosphorus and 0.123% potassium (Chadha *et al*., 2012) [1] which resulted in stimulated cell division in the meristematic tissue and ultimately increase in the frond emergence with the application of jeevamrit at 15 days intervals. Jeevamrit is also known to contain micronutrients apart from the major nutrients. Therefore, the availability of higher quantity of nutrients, improvement in physical properties of soil and increased microbial activity might have helped in increasing number and length of fronds. These findings are in line with the findings of Koppala (2018) [8] in potted chrysanthemum and Singh *et al.* (2015) [11] in marigold**.** Table 2 revealed that maximumplant spread (55.80 and 57.34 cm at 150 and 300 DAP, respectively) was recorded in T_5. Plant spread is an important character in Boston fern. This could be ascribed to the fact that nutrients *viz.* N (0.16%), P (0.02%) and K (0.123%) available in jeevamrit act as a source of strong promoter of growth. Nitrogen helped in improving structural parameters because it is an important constituent of proteins. Phosphorus on the other hand is an important structural component of phospholipids helping in absorbing and translocation of food material which significantly increased root geometry, nutrient access and supply resulting in the development of sound and healthy rhizosphere, thus, increased plant spread (Chadha *et al.*, 2012) [1]. Maximum leaf area (171.41, 188.58 and 210.87 cm^2 at 30, 150 and 300 DAP, respectively) and number of pinnae per frond (90.63 at 150 DAP) were also recorded with the application of Jeevamrit @ 5% (Drench) + Foliar application of Jeevamrit @ 10% (T_5). Number of frond yield per square metre (110.92 and 182.55 at 150 and 300 DAP, respectively) was also recorded maximum in T_5 i.e. Jeevamrit @ 5% (Drench) + Foliar application of Jeevamrit @ 10%. Improvement in yield and yield attributes might be due to stimulation in growth by nutrients *viz.* nitrogen, phosphorus and potassium in jeevamrit through soil application and foliar spray at regular intervals. Among NPK, nitrogen is main serving force behind life processes in association with more nitrogen fixing and phosphorus solubilizing proficiency (Chadha *et al.*, 2012) [1]. These findings are in line with Singh (2018) [12] who reported better growth and yield parameters in gerbera with the application of jeevamrit at 20 days intervals. Similar results were reported by Harshavardhan *et al.* (2016) [6] in carnation cv. 'Big Mama'; Singh *et al.* (2015) [11] in marigold and George (2012) [3] in gerbera cv. 'Galileo Red'.

The chlorophyll content of Boston fern was not influenced by the application of jeevamrit. Maximum weight of individual frond (3.20 g) was noticed in the plants supplied with a combination of Jeevamrit @ 5% (Drench) + Foliar application of Jeevamrit @ 10% (T_5) and maximum vase life (15.33 days) was recorded in both treatments T_5 (Jeevamrit @ 5% (Drench) + Foliar application of Jeevamrit @ 10%) and T_8 (Jeevamrit @ 7.5% (Drench) + Foliar application of Jeevamrit @ 10%) which proved to be statistically at par with treatments T_2, T_3, T_4, T_6, T_7 and T_9 where the vase life of 14.56, 14.33, 14.67, 14.22, 14.00 and 14.00 days were recorded, respectively whereas the minimum vase life (12.33 days) was registered in T_0 (Control) which was observed

statistically at par with T_1 (13.44 days) and T_{10} (13.67 days) (Table 3). The probable reason could be the availability of better food reserve, nutrients and growth promoting substances like Gibberlic Acid and Indole Acetic Acid (Gore and Sreenivasa, 2011) [5] in fronds after harvesting which enhanced the vase life of the fronds as compared to fronds without application of jeevamrit. However, no such work has been undertaken using jeevamrit so far, so no support from research advocated in Boston fern.

Table 1: Effect of jeevamrit on the growth of *Nephrolepis exaltata* (L.) Schott at different intervals after planting

Treatments	Number of fronds per plant			Frond length (cm)			Length of the longest frond (cm)			Stipe (petiole) length (cm)			Frond width (cm)		
	30 DAP	150 DAP	300 DAP	30 DAP	150 DAP	300 DAP	30 DAP	150 DAP	300 DAP	30 DAP	150 DAP	300 DAP	30 DAP	150 DAP	300 DAP
T_0	3.67	17.25	31.23	37.36	40.00	40.21	46.29	49.75	50.54	3.16	3.20	3.40	3.07	3.53	3.90
T_1	3.67	21.16	35.62	36.19	41.40	42.33	45.03	51.32	52.07	3.75	3.27	3.43	3.37	3.73	3.77
T_2	4.68	24.88	36.56	38.78	41.27	43.51	50.57	50.72	52.14	3.67	3.39	3.83	4.00	4.03	4.23
T_3	4.83	18.40	35.07	37.01	40.68	42.39	48.93	50.19	52.29	4.01	3.83	3.93	3.87	3.83	3.97
T_4	4.75	23.27	39.74	36.57	42.67	44.09	52.40	53.77	54.00	3.37	3.87	3.40	3.09	3.53	3.80
T_5	5.37	27.73	45.64	39.28	43.21	45.17	52.90	53.80	55.45	3.43	3.80	3.73	3.93	4.07	4.10
T_6	4.16	24.56	38.66	37.47	41.90	42.43	49.57	51.07	52.87	3.36	3.77	3.93	3.77	3.93	4.03
T_7	4.39	25.81	38.99	36.94	40.30	42.33	49.70	53.50	54.23	3.43	3.80	3.83	3.07	3.57	3.67
T_8	3.97	23.96	37.18	34.20	40.73	41.27	49.30	52.81	53.17	3.33	3.69	3.77	3.83	3.90	3.93
T_9	4.00	26.92	40.68	35.71	41.23	43.85	50.30	50.96	51.55	3.38	3.40	3.80	3.03	3.47	3.83
T_{10}	4.31	20.51	35.48	35.80	40.27	41.09	48.53	50.69	51.23	3.80	4.07	4.13	3.40	3.77	3.98
$CD_{0.05}$	NS	1.19	1.18	NS	1.13	NS	NS	0.85	0.99	NS	NS	NS	0.44	NS	NS

*DAP: Days after Planting

Table 2: Effect of jeevamrit on the development of *Nephrolepis exaltata* (L.) Schott at different intervals after planting

Treatments	Plant spread (cm)			Leaf area (cm^2)			Number of pinnae per frond			Frond yield/m^2 (number)		
	30 DAP	150 DAP	300 DAP	30 DAP	150 DAP	300 DAP	30 DAP	150 DAP	300 DAP	30 DAP	150 DAP	300 DAP
T_0	35.31	46.32	51.04	162.50	181.16	199.89	83.58	86.89	88.89	14.67	69.01	124.92
T_1	40.68	49.82	52.63	165.53	182.93	208.67	83.33	86.50	86.69	14.67	84.63	142.49
T_2	45.59	49.24	54.78	163.26	181.88	203.51	78.63	84.99	87.56	18.72	99.53	146.23
T_3	44.20	47.52	52.51	167.48	181.85	204.98	87.00	87.17	87.05	19.33	73.60	140.27
T_4	47.67	55.23	56.77	168.76	183.26	205.28	78.39	86.23	88.55	19.00	93.08	158.96
T_5	45.90	55.80	57.34	171.41	188.58	210.87	75.73	90.63	90.67	21.47	110.92	182.55
T_6	40.28	53.18	55.41	167.49	187.26	210.06	77.87	83.60	86.50	16.63	98.24	162.72
T_7	35.52	47.40	53.60	165.63	183.81	208.66	73.42	81.72	85.32	17.56	103.23	155.97
T_8	37.77	51.65	56.86	167.14	187.21	208.73	80.86	88.43	87.67	15.89	95.85	148.72
T_9	47.48	55.38	56.02	165.70	185.31	209.91	80.23	87.33	89.33	16.00	107.67	154.65
T_{10}	35.75	46.33	50.39	163.03	181.27	197.95	79.26	80.11	86.33	17.23	82.03	141.93
$CD_{0.05}$	NS	2.82	2.31	3.04	2.73	1.74	NS	1.12	NS	NS	4.76	4.72

*DAP: Days after Planting

Table 3: Effect of jeevamrit on the quality of *Nephrolepis exaltata* (L.) Schott

Treatments	Chlorophyll content (mg/g)			Weight of frond (g)	Vase life (Days)
	Chlorophyll 'a'	Chlorophyll 'b'	Total chlorophyll content		
T_0	1.18	0.53	1.71	2.13	12.33
T_1	1.18	0.52	1.70	2.29	13.44
T_2	1.17	0.55	1.72	2.67	14.56
T_3	1.17	0.53	1.70	2.64	14.33
T_4	1.17	0.51	1.68	3.19	14.67
T_5	1.20	0.54	1.74	3.20	15.33
T_6	1.19	0.51	1.70	2.68	14.22
T_7	1.19	0.54	1.73	2.38	14.00
T_8	1.19	0.54	1.73	2.43	15.33
T_9	1.19	0.55	1.74	2.80	14.00
T_{10}	1.18	0.50	1.68	2.20	13.67
$CD_{0.05}$	NS	NS	NS	0.45	1.42

Conclusion

From the present investigation, it can be concluded that the application of jeevamrit at different concentrations (drench and foliar spray) influenced the growth and productivity of Boston fern. Jeevamrit @ 5% (Drench) + Foliar application of Jeevamrit @ 10% (T_5) significantly improved the growth parameters, number of frond yield per square metre and vase life.

References

1. Chadha S, Rameshwar, Ashlesha, Saini JP, Paul YS. Vedic Krishi: Sustainable livelihood option for small and marginal farmers. Indian Journal of Traditional Knowledge. 2012;11(3):480-486.

2. Devakumar N, Rao GGE, Nagaraj S, Shubha S, Khan I, Gouder SB. Activities of Organic Farming Research Centre. Navile, Shimoga. University of Agricultural Sciences, Bangalore, 2008.
3. George E. Integrated nutrient management on growth, flower yield and postharvest quality of gerbera (*Gerbera jamesonii* Bolus.) cv. 'Galileo red' under poly house condition. Ph.D. Thesis., Division of Horticulture, University of Agricultural Sciences, Dharwad, 2012, pp. 124.
4. Gomez KA, Gomez AA. Statistical Procedures for Agricultural Research. Second Edition. John Willey & Sons, Inc., New York, 1984, 680p.
5. Gore NS, Sreenivasa MN. Influence of liquid organic manures on growth, nutrient content and yield of tomato (*Lycopersicon esculentum* Mill.) in the sterilized soil. Karnataka Journal of Agricultural Science. 2011;24(2):153-157.
6. Harshavardhan M, Kumar DP, Rajesh AM, Yathindra HA, Hongal S. Effect of integrated nutrient management on floral attributes of carnation (*Dianthus caryophyllus* L.). The Bioscan. 2016;11(2):1163-1166.
7. Hovenkamp PH, Miyamoto F. A conspectus of the native and naturalized species of *Nephrolepis* (Nephrolepidaceae) in the world. *BLUMEA* 2016;50(2):279-322.
8. Koppala D. Effect of controlled release fertilizers and organic amendments on pot mum production. M.Sc. Thesis, Department of Floriculture and Landscape Architecture, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan. 2018, 51p.
9. Stamps RH. Prodiamine controlled Florida betony (*Stachys floridana*) in leatherleaf fern (*Rumohra adiantiformis*). Weed Tech. 1992;6:961-967.
10. Ramona PM. The morphogenesis of *Nephrolepis exaltata* Schott vitrocultures prevailed from Stolons apexes, cultivated on aseptic media with citokinine content. Analele Universitatii din Oradea. Fascicula Protectia Mediului 2012;18:436-443.
11. Singh M, Dwivedi DH, Kumar M. Efficiency of organic and biodynamic manures on growth and flowering in marigold (*Tagetes patula* L.). Indian Journal of Agricultural Science. 2015;15:134-137.
12. Singh S. Effect of jeevamrit and different growing media on growth and flowering of gerbera (*Gerbera jamesonii* Bolus ex. Hook). M.Sc. Thesis, Department of Floriculture and Landscape Architecture, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan. 2018, 45p.
13. Thomas MG, Schumann DR. Income opportunities in special forest products: Self-help suggestions for rural entrepreneurs. Diane Publishing Co., 1993, 206p.