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Standardization of foliar nutrients (NPK) spray in anthurium cv. Flame

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ABSTRACT

The present investigation was carried out at Green house Complex, Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari during the year 2009-2010 under 75% shade net. The experiment was conducted with twelve levels of NPK @ 0.2% as foliar spray along with two levels of frequencies (weekly once and weekly twice spray). The treatments were repeated thrice in completely randomized design with factorial concept. Among all treatment combinations, overall best performance was recorded in weekly once foliar spray of NPK nutrients with ratio of 30:20:40 (F_7W_1), which significantly improved the spathe length (4.99 cm), spathe width (3.99 cm), flower stalk length (21.98 cm) and suckers per plant (2.93). While, F_6W_1 treatment (weekly once spray of NPK with 20:20:40 ratio) resulted maximum flower longevity (46.83days) and vase-life (19.67 days). However, maximum number of flowers (4.99) was obtained with F_1W_1, and which was at par with F_7W_1treatment, where 4.94 flowers per plant were recorded.

Key words: Foliar spray, anthurium, NPK.

INTRODUCTION

Anthurium (*Anthurium andreanum* L.) commonly called as tail flower belongs to family Araceae, traditionally grown for its colourful long lasting unique flower and shining foliage. It is also an excellent plant for interior decoration and as cut flower, especially for flower arrangement. Anthurium grows well in properly drained medium under 70-80 per cent shade. It thrives best in day temperatures of 25° to 28°C and night temperature of 18° to 20°C. The optimum night temperature for vegetative growth is 18.3°C and at flowering 21° to 23.9°C is required (Higaki *et al*., 3). It is epiphytic in nature with creeping, climbing or arborescent stems including lots of aerial roots that aid in taping water and nourishment.

In India, growing of anthurium has been a hobby earlier but at present it has become an important export oriented crop. It requires a highly organic and aerated medium with good water retention capacity. However, success for commercial cultivation is to have better nutrition availability and efficient utilization by plant. Under suitable agro-climatic conditions, mineral nutrition is the main factor, which influences the growth yield and quality of anthurium flowers. Foliar application of nutrients is easy and quick approach to provide its requirement. Nutrient needs of anthurium can be met through different sources, of which, major source chemical fertilizers. The nutrients supplied by the macro- and micro-elements are necessary for the various biochemical processes and normal plant growth and development that occur within the plant (Darling, 1). Considering the need of this, the present investigation was undertaken.

MATERIALS AND METHODS

The experiment was conducted at the Green House Complex, Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry**,** Navsari (Gujarat), during the year 2009-2010. The investigation was carried out under 75% shade net house conditions with 12 different NPK levels as foliar spray (0.2%) at the frequencies of weekly once and twice. All together were 24 treatment combinations.

The foliar application of nutrients were applied in the form of urea (46:00:00), mono ammonium phosphate (00:52:34) and sulphate of potash (00:00:50) for N, P and K, respectively. These sources of nutrients are water soluble and easily available in market. Required amount of NPK dose, e.g., for preparation of 10:20:30 ratio, 21.74 g urea, 38.46 g mono ammonium phosphate and 33.86 g sulphur of potash were diluted in water and final solution of 1000 ml prepared. Two ml of the prepared solution was further used to spray as 0.2%. Similarly, all other combinations were made and applied on plant till run-off point and surfactant was also added as wetting agent. The water soluble fertilizers of calcium nitrate (0.5 g/l) and magnesium sulphate (0.5 g/l) at 15 days intervals were used during the course of investigation. The micronutrient mixture was also applied once in a fortnight interval at 0.5 g/l. The data on vegetative

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growth parameter, *viz*., plant height, leaves per plant, leaf area, suckers per plant and flowering parameters like spathe length, spathe width, spadix length, flower stalk length, flower longevity on the plant, vase-life of flower and flowers per plant were recorded. Estimation of nitrogen, phosphorus and potash were determined by Micro Kjeldahl method, vando molybdate method, Flame photometric method, respectively (Jackson, 5) using third leaf of each tagged plant.

RESULTS AND DISCUSSION

Application of different levels of nutrients and their frequencies per week failed to exhibit any significant effect on various vegetative growth parameters, *viz*., plant height, number of leaves and leaf area (Table 1).

The data presented in the Table 2 revealed that the interaction effect of NPK foliar spray and frequencies were significant in case of flowering characters, except spadix length. The minimum days required for first flower opening (92.00) was recorded in F_7W_1 treatment, which was at par with F_1W_1 (93.00 days), F_9W_1 (100.00 days) and F_5W_1 (101.67 days). The maximum spathe length (4.99 cm) and spathe width (3.99 cm) was observed in F_7W_1, which were at par with F_1W_1 (4.98 cm) and F_5W_1 (3.95 cm), respectively. Moreover, the maximum stalk length (21.98 cm) was also recorded in F_7W_1, which was at par with F_5W_1 (21.97 cm), F_1W_1 (21.97 cm) and F_9W_1 (21.90 cm) treatments. It might be due to optimum availability of the nutrients. Moreover, a suitable foliar nutrient combination such as nitrogen, phosphorus and potash, which is necessary for the synthesis of protein and cytokinin, consequently affects cell division. Similar results were obtained by Srinivasa and Reddy (11). The maximum flower longevity (46.83 days) was recorded in F_6W_1 treatment, which was at par with F_8W_1 (46.80 days). Furthermore, the maximum vase-life (19.67 days) was recorded in the same treatment F_6W_1, which was at par with F_8W_1 where 19.63 days were observed. The higher vase life might be due to optimum availability of nutrients and higher level of potash. Since, potash enhances the synthesis, metabolism and translocation of carbohydrates, synthesis of protein with rapid cell division and differentiation, which results in better post harvest life of flowers (Haque *et al*., 2). However, increased nitrogen reduced the post-harvest life as also revealed by Paull *et al*. (8). The treatment combination of F_1W_1 (where leaf tissue levels are 2.00% N and 2.02% K) recorded maximum flowers per plant (4.99), which was at par with F_7W_1 (4.94). It might be due to balance dose of NPK which increase the vegetative growth, favourable for the synthesis of peptide bond, protein and carbohydrate metabolism that are essential for flower development (Meyer *et al*., 7). The results obtained are similar to Poole and Greaves (10), Poole *et al*. (9), and Highaki *et al*. (4). Interaction effect of F_7W_1 in weekly once spray gave significantly maximum number of suckers per plant

Table 1. Effect of foliar spray of nutrients and frequency on vegetative characteristics of anthurium.

Treatment	Plant height (cm)		Leaves per plant		Leaf area (cm^2)	
	W_1	W_2	W_1	W_2	W_1	W_2
F_1 (30:30:40)	18.92	19.57	4.17	4.13	93.92	96.92
F_2 (10:20:40)	16.82	17.51	4.12	4.17	79.21	86.18
F_3 (20:30:30)	17.83	18.24	4.29	4.22	84.94	90.91
F_4 (10:30:40)	16.82	17.51	4.24	4.32	78.99	86.18
F_5 (30:30:30)	18.92	19.57	4.19	4.16	93.92	96.92
F_6 (20:20:40)	17.83	18.24	4.22	4.43	85.07	90.91
F_7 (30:20:40)	18.92	19.58	4.17	4.14	93.92	96.92
F_8 (20:30:40)	17.83	18.24	4.19	4.32	85.00	90.91
F_9 (30:20:30)	18.92	19.57	4.18	4.21	93.91	96.91
F_{10} (10:30:30)	16.82	17.51	4.15	4.29	79.21	86.18
F_{11} (20:20:30)	17.83	18.24	4.17	4.42	84.94	90.91
F_{12} (10:20:30)	16.82	17.50	4.15	4.14	79.21	86.18
CD at 5%	NS		NS		NS	
CV %	3.99		3.18		3.64	

Table 2. Effect of foliar application of different nutrients (NPK) spray and frequency on flowering and yield of anthurium cv. Flame.

Treatment	Days to flower opening		Flower longevity (days)		Spathe length (cm)		Spathe width (cm)		Spadix length (cm)		Stalk length (cm)		Vase-life (days)		Flowers per plant		Suckers per plant	
	W_1	W_2	W_1	W_2	W_1	W_2	W_1	W_2	W_1	W_2	W_1	W_2	W_1	W_2	W_1	W_2	W_1	W_2
F_1 (30:30:40)	93.00	176.67	40.67	39.31	4.98	3.00	3.97	2.00	3.13	3.12	21.97	15.47	13.67	12.30	4.99	3.11	2.50	1.17
F_2 (10:20:40)	154.67	144.67	42.94	44.17	3.75	4.21	2.75	3.21	3.13	3.14	13.95	19.12	15.93	17.17	2.90	3.84	1.53	2.03
F_3 (20:30:30)	123.33	172.00	45.63	40.69	3.94	3.68	2.94	2.68	3.13	3.13	19.17	17.54	18.67	13.67	3.13	3.30	2.19	1.20
F_4 (10:30:40)	154.00	147.00	42.94	44.13	3.79	4.26	2.79	3.26	3.14	3.13	14.22	19.04	15.94	17.07	2.95	3.84	1.28	2.50
F_5 (30:30:30)	101.67	175.00	39.67	38.65	4.98	3.20	3.95	2.20	3.13	3.13	21.97	15.49	12.67	11.67	4.70	3.09	2.39	1.43
F_6 (20:20:40)	118.00	170.00	46.83	41.69	3.93	3.69	2.93	2.69	3.13	3.13	19.19	17.56	19.67	14.67	3.24	3.23	2.23	1.70
F_7 (30:20:40)	92.00	175.33	40.69	39.33	4.99	3.30	3.99	2.30	3.14	3.13	21.98	15.58	13.67	12.33	4.94	3.07	2.93	1.47
F_8 (20:30:40)	117.00	172.00	46.80	41.69	3.94	3.64	2.94	2.64	3.13	3.13	19.22	17.44	19.63	14.63	3.24	3.40	2.16	1.26
F_9 (30:20:30)	100.00	175.00	39.68	38.67	4.95	3.31	3.94	2.31	3.13	3.14	21.90	15.60	12.67	11.67	4.70	3.05	2.23	1.27
F_{10} (10:30:30)	162.07	149.00	42.70	43.20	3.78	4.26	2.78	3.26	3.14	3.14	14.17	19.08	15.67	16.23	2.75	3.73	1.20	2.63
F_{11} (20:20:30)	124.00	174.00	45.67	40.68	3.93	3.73	2.94	2.73	3.13	3.13	19.16	17.42	18.67	13.67	3.10	3.13	1.77	1.60
F_{12} (10:20:30)	164.00	150.00	42.68	43.17	3.70	4.15	2.70	3.15	3.13	3.13	13.08	19.16	15.67	16.17	2.77	3.70	1.37	2.40
CD at 5%	11.28		0.89		0.06		0.06		NS		0.32		0.90		0.21		0.15	
CV %	4.73		1.29		0.86		1.15		0.61		1.08		3.61		3.62		4.93	

Table 3. Effect of different nutrients (NPK) and frequency of the spray on leaf nitrogen and potash contents.

Treatment	Nitrogen (%)		Potash (%)	
	W_1	W_2	W_1	W_2
F_1 (30:30:40)	2.00	2.37	2.02	2.17
F_2 (10:20:40)	1.64	2.22	1.47	2.02
F_3 (20:30:30)	1.77	2.36	1.80	2.09
F_4 (10:30:40)	1.63	2.25	1.46	2.05
F_5 (30:30:30)	2.00	2.37	1.97	2.12
F_6 (20:20:40)	1.75	2.33	1.85	2.11
F_7 (30:20:40)	2.00	2.36	2.01	2.17
F_8 (20:30:40)	1.77	2.36	1.85	2.10
F_9 (30:20:30)	1.99	2.36	1.95	2.11
F_{10} (10:30:30)	1.63	2.23	1.37	1.95
F_{11} (20:20:30)	1.77	2.35	1.81	2.09
F_{12} (10:20:30)	1.65	2.24	1.37	1.95
CD at 5%	0.09		0.06	
CV %	2.53		2.07	

(2.93) which was followed by F_1W_1 (2.50), which might be due to balanced application of nutrients. Similar results were also reported by Jawaharlal *et al.* (6), and Srinivasa and Reddy (11) in anthurium.

In leaf tissue analysis (Table 3), maximum nitrogen (2.37%) was recorded in F_5W_2 and F_1W_2, which were at par with F_6W_2 (2.33 %), $F_{11}W_2$ (2.35 %), F_3W_2 (2.36 %), F_8W_2 (2.36%), F_7W_2 (2.36%), F_1W_2 (2.37%) and F_9W_2 (2.36%), whereas minimum content of nitrogen (1.63%) was recorded in both treatment combinations of F_4W_1 and $F_{10}W_1$. The maximum nitrogen content obtained in the present investigation is above the range of critical level, *i.e.*, 1.70 to 2.11% like Poole *et al*. (9), for the maximum yield. However, the other observations are in support of yield characters. Similar results were obtained by Poole *et al.* (9), Poole and Greaves (10) and Highaki *et al*. (4) in anthurium. Whereas, interaction effect of nutrients spray and its frequencies was found to be non significant on phosphorus content in leaf. In the other case of the interaction, the maximum potash content (2.17%) was observed in treatment combinations of F_1W_2 and F_7W_2, which were at par with F_5W_2, F_6W_2 and F_9W_2. The results obtained in the interaction effect of nutrient and frequency also showed that maximum contents of N and K, which is higher than Poole and Greaves (10) but within the range of Poole *et al*. (9). Poole *et al.* (9) found that N, P, and K levels in leaf blades generally decreased with an increase in leaf age. The results showed that foliar fertilization of nitrogen, phosphorus and potash at suitable concentration (0.2%) at once weekly spray had a considerably beneficial effect for improving the quantitative and the qualitative characteristics of *Anthurium andreanum* cv. Flame under shade net house conditions.

REFERENCES

1. Darling, R.M. 1975. *Plant Physiology* (3rd Edn.), Affiliated East west Press Pvt. Ltd., New Delhi.
2. Haque, I. and Jakhro, A.A. 2001. Soil and fertilizer potassium. **In**: *Soil Science* National Book Foundation, Islamabad, Pakistan, pp. 261-63.
3. Higaki, T., Watson, D.P. and Leonhard, K.W. 1979. Anthurium culture in Hawaii. Univ. Hawaii, CTAHR C.E.S Circ. No. 420.
4. Higaki, T., Imamura, J.S. and Paull, R.E. 1992. N, P and K rates and leaf tissue standards for optimum *Anthurium andreanum*. *HortSci.* **27**: 909-12.
5. Jackson, M.L. 1967. *Soil Chemical Analysis*. Prentice Hall, New Jersey, 498 p.
6. Jawaharlal, M., Joshua, P.J., Arumugam, T., Subramanian, S. and Vijaykumar, M. 2001. Standardization of nutrients and growth regulators to reduce pre blooming period and to promote growth and flowering in anthurium

(*Anthurium andreanum*) under protected shade net house. *South Indian Hort*. **49** (Special isssue): 323-25.

7. Meyer, B.S., Banderson, D., Bohning, R.H. and Frantiane, D.G. 1973. *Introduction to plant Physiology*., D. Van. Nostrand Company, New York, pp. 193-322.

8. Paull R.E., Higaki T. and Imamura, J.S. 1992. Season and fertilization affect the post-harvest flower life of anthurium. *Scientia Hort.*, **49**: 125-34

9. Poole, R.T., Sakuoka, R. and Silva, J.A. 1968. Nutrition of *Anthurium andreanum*. *Proc. Trop. Reg. American Soc. Hort. Sci.* **12**: 284-87.

10. Poole, R.T. and Greaves, B.A. 1969. Nitrogen, phosphorus and potassium fertilization of *Anthurium andreanum* 'Nitta' and 'Kaumana'. *Proc. Trop. Reg. American Soc. Hort. Sci.* **13**: 367-72.

11. Srinivasa, V. and Reddy, T.V. 2005. Effect of fertilizers on growth and flowering in anthurium cv. Chaco. *Prog. Hort.*, **37**: 82-84.

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