Effect of integrated nutrient management on growth and floral attributes of nerium (*Nerium oleander* L)

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ABSTRACT

The study was conducted to standardize the integrated nutrient management approach for improving growth and floral attributes of nerium (*Nerium oleander* L). The experiment was laid out in randomized block design with ten treatments and three replications. One year old pruned plants of three nerium cultivars (Red, White and Pink) were planted at a spacing of 3 x 1 m accommodating five plants per plot. The results revealed that integrated management approach showed significant differences for growth and floral attributes of the plant. Among all the nutrients, organic manures and their combination treatment NPK 120:160:160 g/plant/year along with farmyard manure and biofertilizers exhibited better performance in respect of growth and floral characters viz plant height (152.39 cm), number of primary and secondary branches (6.05 and 14.22 respectively), minimum days taken to flowering from pruning (56.33), increased number of flowers per inflorescence (114.78) and number of inflorescence per plant (25.22), highest length of inflorescence (23.34 cm), single flower weight (0.277 g) and 100-flower weight (26.17 g). Hence the application of inorganic fertilizers combined with organic manures and biofertilizers proved to be a better option for enhancing the growth and flowering characters in one year old pruned plants of nerium as compared to the application of inorganic fertilizers alone.

Keywords: Nerium; biofertilizers; organic manures; growth; flowering

INTRODUCTION

Nerium oleander L is an evergreen and sun-loving shrub of immense ornamental significance. It is one of the traditionally cultivated loose flower crops for its bell-shaped flowers of various colours. It is generally used in garlands and as loose flowers in temples for worshiping. Besides nerium is a useful plant in all types of urban arrangements, gardens, parks and motorway median floorings (Pagen 1988). It is a heavy feeder of nutrients which requires NPK in large quantities both in the form of organic and inorganic fertilizers.

In present days nutrient management is viewed skeptically in relation to the sustainable horticulture and environment perfection. Though total organic farming may be a desirable proposition for improving the quality of horticultural produce and soil health it is difficult to convene the nutrient necessity of the crops exclusively through organic farming. The use of organic manures and bio-fertilizers along with the balanced use of chemical fertilizers has been proven to improve the physico-chemical and biological properties of soil besides improving the efficiency of applied chemical fertilizers (Verma et al 2011). The proper development and quality of flowers are greatly prejudiced by several edaphic factors like soil type and accessibility of nutrients.

Exploitation of the synergistic effect of entire potential of organic manures, composts, crop residues, bio-fertilizers with chemical fertilizers is imperative for improving reasonable nutrient supply (Wani et al 2017). The overall strategy for increasing flower yield and sustainability of nerium production must have an

integrated approach for nutrient management as a part of it. Since nerium has become an important loose flower crop among the south Indian farmers its nutritional requirement under pruning condition was investigated for commercial flower production.

MATERIAL and METHODS

The experiment was carried out at Botanical Garden, Department of Floriculture and Landscaping, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during 2017-2018. The experiment was laid out in randomized block design with ten treatments and three replications. Removal of one third of the plant was done as pruning in one year old plant. Generally flowering in nerium commences throughout the year and the peak flowering is during April to August. One year old nerium cultivars planted at a spacing of 3 x 1 m that were pruned to a height of 90 cm from the base were subjected to different treatments [T_1: NPK 90:120:120 g/plant/year, T_2: NPK 120:160:160 g/plant/year, T_3: NPK 150:200:200 g/plant/year, T_4: T_1 through nutrient pellets, T_5: T_2 through nutrient pellets, T_6: T_1 + FYM + *Azospirillum* + phosphobacteria (PSB), T_7: T_2 + FYM + *Azospirillum* + PSB, T_8: T_1 + vermicompost + *Azospirillum* + PSB, T_9: T_2 + vermicompost + *Azospirillum* + PSB, T_{10}: NPK 85-85-85 g/plant/year (Control)].

Organic manures, bio-fertilizers and NPK were mixed and applied in the 10 cm deep pits 20-30 cm away from the basal portion of the plant in four splits in a year. Cultural practices were kept uniform for all the treatments and standard practices of cultivation were adopted. Observations on growth and floral attributes viz plant height, plant spread, increase in number of leaves, number of primary and secondary branches, inter-nodal length, minimum days taken to flowering from pruning, increased number of flowers per inflorescence, number of inflorescence per plant, highest length of inflorescence, single flower weight and 100-flower weight were recorded from five randomly selected plants of each replication using standard procedure.

RESULTS and DISCUSSION

Growth attributes

Vegetative parameters viz plant height, increase in number of leaves, number of primary and secondary branches and inter-nodal length were recorded at 150 days from pruning and the results are given in Table 1.

The plant height varied significantly among the treatments. The highest plant height (152.39 cm) was recorded in the plants treated with NPK 120:160:160 g/plant/year + FYM + *Azospirillum* + PSB (T_7) at 150th day after pruning which was on par with the plants treated with NPK 90:120:120 g/plant/year + vermicompost + *Azospirillum* + PSB (T_8).

More number of primary and secondary branches per plant (6.05 and 14.22) was recorded in the treatment T_7 on 150th day after pruning. Parya et al (2010) also confirmed that FYM, vermicompost and bio-fertilizers improved morphological characters in golden rod.

The highest increase in the number of leaves (52.91%) was recorded in T_7 followed by T_9 (NPK 120:160:160 g/plant/year + vermicompost + *Azospirillum* + PSB) and the lowest (12.41%) in T_{10} (NPK 85-85-85 g/plant/year). The organic manures act as the chelating agents and normalize the availability of nutrients through improved microbial activity of the bio-fertilizers and synthesis of maximum metabolites and photosynthates thus encouraging quicker growth (Pandey and Sinha 2006).

Plant spread was also highest ie 162.33 cm (N-S) and 178.00 cm (E-W) under treatment T_7. Inter-nodal length though was highest (4.99 cm) in T_4 (NPK 90:120:120 g/plant/year through nutrient pellets) it was closely followed by T_7 and T_9.

Floral attributes

Flower characters viz days taken to flowering, number of flowers per inflorescence, number of inflorescence per plant, length of inflorescence, single flower weight and 100-flower weight were recorded from the initiation of flowering in the plants and the results are given in Table 2.

Number of days taken to first flowering was minimum (56.33) in T_7 followed by T_6 (NPK 90:120:120 g/plant/year + FYM + *Azospirillum* + PSB) (60.75 days). Similar results were obtained by Jayamma et al (2014) in *Jasminum auriculatum* and Anand et al (2016) in cymbidium.

Number of flowers per inflorescence was also maximum (114.78) in T_7 followed by T_3 (NPK

Table 1. Effect of nutrient combinations on growth characters on 150th day after pruning in nerium (*Nerium oleander* L)

Treatment	Plant height (cm)	Plant spread (cm)		Number of branches		Increase in number of leaves (%)	Inter-nodal length (cm)
		N-S	E-W	1°	2°		
T_1	142.33	144.11	152.33	4.67	11.50	16.93 (0.42)*	4.42
T_2	140.78	138.00	162.00	4.83	11.61	30.27 (0.58)	5.40
T_3	142.89	148.55	164.44	4.93	11.11	46.22 (0.75)	4.67
T_4	138.00	132.89	161.89	4.82	12.00	37.44 (0.66)	4.99
T_5	143.33	135.44	160.00	5.17	11.50	33.40 (0.62)	4.35
T_6	142.00	150.67	162.17	5.39	11.96	30.70 (0.59)	4.28
T_7	152.39	162.33	178.00	6.05	14.22	52.91 (0.81)	4.79
T_8	148.05	151.00	166.11	4.89	11.78	34.77 (0.63)	4.38
T_9	145.89	154.03	171.67	5.89	13.50	50.09 (0.79)	4.79
T_{10}	136.77	136.89	148.22	4.33	11.11	12.41 (0.36)	4.28
Mean	143.24	145.39	162.68	5.10	12.01	34.51	4.63
SEd	2.81	2.85	3.17	0.10	0.23	0.01	0.09
$CD_{0.05}$	5.91	5.99	6.66	0.21	0.49	0.02	0.19

*Per cent values converted to square root values for analysis of variance

T_1: NPK 90:120:120 g/plant/year, T_2: NPK 120:160:160 g/plant/year, T_3: NPK 150:200:200 g/plant/year, T_4: T_1 through nutrient pellets, T_5: T_2 through nutrient pellets, T_6: T_1 + FYM + *Azospirillum* + PSB, T_7: T_2 + FYM + *Azospirillum* + PSB, T_8: T_1 + vermicompost + *Azospirillum* + PSB, T_9: T_2 + vermicompost + *Azospirillum* + PSB, T_{10}: NPK 85-85-85 g/plant/year (Control)

Table 2. Effect of nutrient combinations on floral characters on 150th day after pruning in nerium (Nerium oleander L)

Treatment	Number of days taken to flowering	Number of flowers/ inflorescence	Number of inflorescence/ plant	Length of inflorescence (cm)	Single flower weight (g)	100-flower weight (g)
T_1	71.50	95.67	16.89	20.44	0.213	23.33
T_2	61.00	80.33	20.33	21.89	0.230	23.50
T_3	65.67	109.33	20.44	22.55	0.253	24.83
T_4	64.25	79.00	19.56	17.78	0.240	23.08
T_5	78.00	102.00	17.00	19.22	0.243	23.83
T_6	60.75	98.79	20.33	21.89	0.207	24.00
T_7	56.33	114.78	25.22	23.34	0.277	26.17
T_8	67.67	90.33	18.78	21.78	0.243	24.17
T_9	76.75	105.68	22.00	23.00	0.247	25.59
T_{10}	71.00	87.67	16.78	20.44	0.223	23.00
Mean	67.29	96.36	19.73	21.23	0.238	24.15
SEd	1.34	1.91	0.38	0.42	0.005	0.47
$CD_{0.05}$	2.81	4.02	0.80	0.87	0.010	0.99

T_1: NPK 90:120:120 g/plant/year, T_2: NPK 120:160:160 g/plant/year, T_3: NPK 150:200:200 g/plant/year, T_4: T_1 through nutrient pellets, T_5: T_2 through nutrient pellets, T_6: T_1 + FYM + *Azospirillum* + PSB, T_7: T_2 + FYM + *Azospirillum* + PSB, T_8: T_1 + vermicompost + *Azospirillum* + PSB, T_9: T_2 + vermicompost + *Azospirillum* + PSB, T_{10}: NPK 85-85-85 g/plant/year (Control)

150:200:200 g/plant/year) (109.33) and minimum (79.00) in T_4 (NPK 90:120:120 g/plant/year through nutrient pellets). Maximum number of inflorescence per plant (25.22) was in T_7 and minimum (16.78) in T_{10} (Control).

Length of inflorescence was maximum (23.34 cm) in T_7 which was at par with T_9 (NPK 120:160:160 g/plant/year + vermicompost + *Azospirillum* + PSB) (23.00 cm) and T_3 (NPK 150:200:200 g/plant/year) (22.55 cm) and minimum (17.78 cm) in T_4.

The same treatment T_7 also resulted in highest (0.277 g) single flower weight and lowest (0.207 g) was recorded in T_6 (NPK 90:120:120 g/plant/year + FYM + *Azospirillum* + PSB). The 100-flower weight was also maximum (26.17 g) in the treatment T_7 which was at par with T_9 (NPK 120:160:160 g/plant/year + vermicompost + *Azospirillum* + PSB) (25.59 g) and minimum (23.00 g) was observed in case of control. This is in conformity with the findings of Sunitha and Hunje (2010) and Yadav et al (2017) that the improvement in yield might have been due to the stimulation in root growth which helped in better absorption of water and mineral nutrients from the soil.

Phosphorus is associated with phosphorylation and is a constituent of energy-rich compounds like ATP, ADP, NADH and NADPH. These energy-rich metabolites would have been utilized for flower production and ultimately increased the number of flowers per plant and fresh weight of flowers.

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