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Effect of NPK nutrients through foliar spray on vegetative growth parameters of carnation (*Dianthus caryophyllus* L.) varieties under protected condition

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Abstract

An investigation was carried out to find out the effect of NPK nutrients through foliar spray on vegetative growth parameters of carnation (*Dianthus caryophyllus* L.) varieties under protected condition was carried out under polyhouse. The experiment consisted of three varieties with five levels of fertilizers and it was laid out in Factorial Completely Randomized Design (FCRD) with three replications. The results of present investigation on vegetative growth parameters revealed that variety Don Pedro Rapido with nutrient level 6000 N: 4000 P₂O₅: 2000 K₂O ppm recorded highest plant height, fresh and dry weight of plant, internodes per stem and internodal length.

Keywords: Carnation, nutrients, varieties

Introduction

Carnation (*Dianthus caryophyllus* L.) belongs to family Caryophyllaceae and native of Mediterranean region, is one of the commercially important cut flowers of the world and ranks second in the cut flower trade after rose. The modern carnation cultivars offer a diversity of colors, shapes, sizes and fragrance available in very few flowering plants. It is grown all over the world in greenhouse. The commercial production of carnations as one of the most used flowers for florist cut flower arrangement due to its excellent keeping quality, wide range of forms and ability to withstand long distance transportation. Foliar fertilization technique may also be a good alternative to the conventional soil application to avoid the risk of fixation or leaching of nutrients. It also reduced thereby minimizing ground water pollution, application of the fertilizer at the same time as an insecticide, fungicide, etc., Smaller quantities of the fertilizer material are required, reduces labour costs and machinery costs, thereby reducing the cost of crop production. The nutrients are absorbed more rapidly than when applied to the soil. Foliar application provides a means of quickly correcting plant nutrient deficiencies, when identified on the plant.

Materials and methods

The experiment was carried out in polyhouse at Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh during the year 2013. There were fifteen treatment combinations comprising of three varieties viz., V₁ (Don Pedro Rapido), V₂ (Bacarat) and V₃ (Madame Colette) and five levels of nutrients levels viz., F₁(0 N : 0 P₂O₅ : 0 K₂O ppm) (control), F₂ (1000 N: 600 P₂O₅ : 300 K₂O ppm), F₃(2000 N: 1200 P₂O₅ : 600 K₂O ppm), F₄ (4000 N: 2400 P₂O₅ : 1200 K₂O ppm) and F₅ (6000 N: 4000 P₂O₅ : 2000 K₂O ppm) were allocated in Completely Randomized Design with Factorial concept in three replications. The foliar applications of nutrients were applied in the form of urea, mono ammonium phosphate and sulphate of potash for nitrogen, phosphorus and potassium respectively. These sources of nutrients are water soluble and easily available in market. The treatment solutions were applied in five sprays at an interval of 25 days during the growth period which started five days after first pinching of the plants and applied uniformly to the subtending leaves till they were wet with the help of hand sprayer.

Results and discussion

The plant height plays an important role in flowering span and productivity of any genotype. Significantly maximum plant height at 80, 120 and 120 DAT (37.22, 79.13 and 106.98 cm, respectively), internodes per stem at flowering (20.20), internodal length per stem (8.06 cm) at

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flowering, fresh and dry weight of plant (285.93 and 45.34 g per plant, respectively) were observed in variety Don Pedro Rapido (V₁). This might be due to genetic variation, growing environmental conditions, production technology and cultural practices. Similar variations have also been recorded by Bhautkar (2000) [2], Patil (2001) [7], Ryagi *et al.* (2007) [8], Dwivedi and Kareem (2004) [4], Bhalla *et al.* (2007) [1], Kazaz *et al.* (2011) [6] and Gharge *et al.* (2011) [5] in carnation.

The treatment 6000 N: 4000 P₂O₅ : 2000 K₂O ppm at 80, 120 and 160 DAT recorded significantly maximum plant height (38.53, 78.23 and 110.16 cm, respectively), number of internodes per stem at flowering (21.35), internodal length at flowering (7.86 cm) and fresh and dry weight of plant (334.25 and 57.16 g per plant). This might be due, the phosphorus, is a main constituent of chlorophyll and is involved in many physiological processes including cell division, development of meristematic tissue, photosynthesis, metabolism of carbohydrates, fats and proteins for synthesis of nucleic acids and main role in stimulation of roots. Potassium which is necessary for nitrogen assimilation into protein and major osmotically active component in the plant cells contributing to cell turgor and enhances the capacity of plant cell to retain

water and nutrients, In this function K⁺ seems to be particularly important in young tissue. The turgor in the young leaves has direct effect on the cell size and growth rate of entire plant. Activating apical meristems beside the protoplasm formation, division and elongation of meristems cell, might have enhanced the biosynthesis of proteins and carbohydrates. These together led to enhance the growth. Similar variations in growth parameters have also been recorded by Devi *et al.* (2003) [3], Verma *et al.* (2003) [10] and Sunitha *et al.* (2005) [9] in carnation plants. Significantly maximum number of internodes per stem at flowering (22.40) and maximum internodal length at flowering (8.50 cm) was found in the treatment combination variety Don Pedro Rapido with foliar spray of nutrients 6000 N: 4000 P₂O₅ : 2000 K₂O ppm.

Conclusions

From foregoing discussion, it can be inferred that under polyhouse condition for better vegetative growth parameters of carnation the variety Don Pedro Rapido was found best with five spray of nutrients 6000 N: 4000 P₂O₅ : 2000 K₂O ppm at an interval of 25 days after first pinching of the plants.

Table 1: Effect of varieties and nutrients levels on vegetative growth parameters of carnation under protected condition

Treatment details	Plant height(cm)			No of internodes per stem	Internodal length (cm)	Fresh weight of plant (g)	Dry weight of plants (g)	
	80 (days)	120 (days)	160 (days)					
A. Varieties (V)								
V ₁	Don Pedro Rapido	37.22	79.13	106.98	20.20	8.06	285.93	45.34
V ₂	Bacarat	33.57	65.16	98.33	16.36	7.15	272.133	40.67
V ₃	Madame Colette	33.48	60.04	91.54	15.74	7.01	258.48	37.44
	S.Em.±	0.34	1.18	0.77	0.09	0.04	4.36	0.87
	C.D. at 5%	0.99	3.43	2.23	0.26	0.13	12.60	2.53
B. Nutrients levels (N, P₂O₅, K₂O ppm) (F)								
F ₁	0 : 0 : 0 Control (Water Spray)	31.57	61.62	89.29	14.53	6.83	212.77	26.72
F ₂	1000 : 600 : 300	33.06	63.37	94.38	15.73	7.24	237.44	40.23
F ₃	2000 : 1200 : 600	34.60	67.11	98.51	17.06	7.44	265.33	41.95
F ₄	4000 : 2400 : 1200	36.02	70.20	102.40	18.48	7.67	311.11	44.85
F ₅	6000 : 4000 : 2000	38.53	78.23	110.16	21.35	7.86	334.25	57.16
	S.Em.±	0.44	1.53	0.99	0.11	0.06	5.63	1.13
	C.D. at 5%	1.28	4.42	2.88	0.34	0.17	16.26	3.27
Interaction								
	S.Em.±	0.76	2.65	1.72	0.20	0.10	9.75	1.96
	C.D. at 5%	NS	NS	NS	SIG	SIG	NS	NS
	C.V.%	3.82	6.75	3.02	2.03	2.50	6.20	8.26

Table 2: Interaction effect of varieties and nutrients levels on internodes per stem and internodal length of carnation at flowering

Treatments	Internodes per stem	Internodal length (cm)
V ₁ F ₁	17.80	7.76
V ₁ F ₂	19.33	7.92
V ₁ F ₃	20.60	7.94
V ₁ F ₄	20.86	8.19
V ₁ F ₅	22.40	8.50
V ₂ F ₁	13.13	6.14
V ₂ F ₂	14.33	7.10
V ₂ F ₃	15.80	7.13
V ₂ F ₄	17.33	7.47
V ₂ F ₅	21.20	7.63
V ₃ F ₁	12.66	6.32
V ₃ F ₂	13.53	6.71
V ₃ F ₃	14.80	7.24
V ₃ F ₄	17.26	7.34
V ₃ F ₅	20.46	7.44
S.Em.±	0.20	0.10
C.D. at 5%	0.59	0.31
C.V.%	2.03	2.50

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