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## Flowering parameters of carnation (*Dianthus caryophyllus* L.) varieties under protected condition influenced by NPK nutrients through foliar spray

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### Abstract

Studies were conducted on the flowering parameters of carnation (*Dianthus caryophyllus* L.) varieties under protected condition influenced by NPK nutrients through foliar spray. 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 flowering parameters revealed that variety Don Pedro Rapido with nutrient level 6000 N: 4000 P<sub>2</sub>O<sub>5</sub>: 2000 K<sub>2</sub>O ppm recorded significantly maximum harvesting span of flowers, fresh and dry weight of single cut flower, number of petals per flower, minimum days taken to flower bud initiation and minimum days taken to open of first flower.

**Keywords:** Carnation, nutrients, protected condition, varieties

### Introduction

Carnation (*Dianthus caryophyllus* L.) is one of the commercially important cut flowers of the world and ranks second in the cut flower trade after rose. Carnation having great commercial value as a cut flower due to its excellent keeping quality, wide array of colour and forms. Carnation, apart from producing cut flowers can also become useful in gardening for bedding, edging, borders, pots and rock gardens. From medicinal point of view, the carnation flowers are considered to be cardiotoxic, diaphoretic and alexiteric (Shiragur *et al.*, 2004). Plants absorb nutrients through both roots and foliage. Foliar application of nutrients is gaining more importance in fertilization of various field and flower crops. The advantages of the foliar fertilizers were more obvious under growing conditions restricting the absorption of nutrients from the soil, as reported by Verma *et al.* (2003) [30]; on carnation. The application of foliar fertilizer is the quickest way to deliver nutrients to the tissues and organs of the crops.

### 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., V<sub>1</sub> (Don Pedro Rapido), V<sub>2</sub> (Bacarat) and V<sub>3</sub> (Madame Colette) and five levels of nutrients levels viz., F<sub>1</sub>(0 N : 0 P<sub>2</sub>O<sub>5</sub> : 0 K<sub>2</sub>O ppm) (control), F<sub>2</sub> (1000 N: 600 P<sub>2</sub>O<sub>5</sub> : 300 K<sub>2</sub>O ppm), F<sub>3</sub>(2000 N: 1200 P<sub>2</sub>O<sub>5</sub> : 600 K<sub>2</sub>O ppm), F<sub>4</sub> (4000 N: 2400 P<sub>2</sub>O<sub>5</sub> : 1200 K<sub>2</sub>O ppm) and F<sub>5</sub> (6000 N: 4000 P<sub>2</sub>O<sub>5</sub> : 2000 K<sub>2</sub>O ppm) were allocated in Completely Randomized Design with Factorial concept in three replications. The foliar application 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

#### Effect of varieties

This study revealed that flowering parameters like days taken to bud initiation, days taken to open first flower, harvesting span, fresh weight of single cut flower, dry weight of single cut flower and number of petals per flower were differed significantly among the varieties. Significantly maximum harvesting span of flowers (78.58 days), fresh and dry weight of single

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cut flower (18.00 and 1.27 g, respectively), maximum number of petals per flower (74.24) and minimum days taken to flower bud initiation and open of first flower (111.69 and 129.21 DAT, respectively) was observed in variety Don Pedro Rapido (V<sub>1</sub>). Such a range of variability in flowering parameters among the varieties is mainly due to early to reach their peak grand growth stage, as a result it flower bud initiated and development was early, hence, flower bud opening was also early. Variation in harvesting span due to genotype of the plant with the influence of environment and other management factors are responsible for increase in harvesting span. The ultimate effect of all these factors resulted into strong and large sized buds and flower and finally increase in fresh and dry weight of flower. Similar variations have also been recorded by Atanassova and Batchvarova (1995) [1], Krishnappa (2000) [8], Mahesh (1996) [10], Naveenkumar *et al.* (1999) [12], Patil (2001) [15], Sahakar and Sable (2003) [18], Reddy *et al.* (2004) [17], Shiragur (2002) [23], Singh and Sangama (2003) [27] and Shiragur *et al.* (2004) [24], Gill and Arora (1988) [4], Sanjay (2004) [19], Simrat (2008) [25] in carnation; Luna (2009) [9] in gerbera and Krishanswaroop (2005) [7] in China aster.

### Effect of nutrient levels

This study revealed that, flowering parameters like days taken to bud initiation, days taken to open first flower, harvesting span, fresh weight of single cut flower, dry weight of cut flower and number of petals per flower were differed significantly by spraying different concentration of nutrient levels. Significantly maximum fresh and dry weight of single cut flower (22.35 and 1.36 g), harvesting span of flowers (81.01 days), number of petals (77.08) and minimum days

taken for the early appearance of first flower bud (117.86 DAT) and days taken for the early open of first flower (132.40 DAT) in the treatment F<sub>5</sub> (6000 N: 4000 P<sub>2</sub>O<sub>5</sub>: 2000 K<sub>2</sub>O ppm). Such a range of variability due to optimum availability of the nutrients which are necessary for the synthesis of protein and cytokinin, consequently affect the cell division. Accumulation of carbohydrates coupled with a relatively lesser vegetative growth rate and promotes the translocation of phytohormones to the shoots which probably induce early flower bud differentiation and eventual initiation of flowering. Similar variation in flowering parameters due to the different levels of nutrient concentration was observed previously by Naggar (2009) [11], Papadimitrio and Manios (1984) [14], Starck *et al.* (1991) [29] and Ramesh *et al.* (2002) [16] in carnation; Singatkar *et al.* (1995) [26], Jamwal *et al.* (2008) [6], Gurjar *et al.* (2012) [5], Srinivasa and Reddy (2005) [28] and Dufour and Guerine (2005) [2] in anthurium; Pal and Biswas (2005) [13] in tuberose; Ghule *et al.* (2003) [3] in spider lily; Sehrawat (2003) [20] in gladiolus and Sekar *et al.* (1995) [21] in gerbera.

### Interaction effect

Significantly minimum days taken for the appearance of first flower bud and open of first flower (105.53 and 123.46 DAT) was found in V<sub>1</sub>F<sub>4</sub> [Don Pedro Rapido + (4000 N: 2400 P<sub>2</sub>O<sub>5</sub> : 1200 K<sub>2</sub>O ppm)].

From foregoing discussion, it can be inferred that under polyhouse condition for better flowering parameters of carnation the variety Don Pedro Rapido was found best with five spray of nutrients 6000 N: 4000 P<sub>2</sub>O<sub>5</sub> : 2000 K<sub>2</sub>O ppm at an interval of 25 days after first pinching of the plants.

**Table 1:** Effect of varieties and nutrients levels on flowering parameters of carnation under protected condition

Treatment details		Days to appearance of first flower bud	Days to open of first flower	Harvesting span (Days)	Fresh weight of single cut flower(g)	Dry weight of single cut flower(g)	Number of petals per flower
<b>A. Varieties (V)</b>							
V <sub>1</sub>	Don Pedro Rapido	111.69	129.21	78.58	18.00	1.27	74.24
V <sub>2</sub>	Bacarat	132.89	142.29	75.00	17.48	1.24	72.60
V <sub>3</sub>	Madame Colette	126.44	139.46	73.34	17.08	1.19	74.08
S.Em.±		0.20	0.32	0.92	0.05	0.02	0.19
C.D. at 5%		0.59	0.93	2.68	0.16	0.04	0.57
<b>B. Nutrients levels (N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O ppm) (F)</b>							
F <sub>1</sub>	0 : 0 : 0 Control (Water Spray)	129.84	142.61	69.51	14.82	1.08	68.48
F <sub>2</sub>	1000 : 600 : 300	127.06	139.86	72.75	15.62	1.19	73.33
F <sub>3</sub>	2000 : 1200 : 600	123.95	137.04	75.122	16.77	1.25	74.31
F <sub>4</sub>	4000 : 2400 : 1200	119.64	133.02	78.14	18.02	1.27	74.97
F <sub>5</sub>	6000 : 4000 : 2000	117.86	132.40	81.01	22.35	1.36	77.08
S.Em.±		0.26	0.41	1.20	0.07	0.02	0.25
C.D. at 5%		0.76	1.20	3.46	0.21	0.05	0.74
<b>Interaction</b>							
S.Em.±		0.45	0.72	2.07	0.12	0.03	0.44
C.D. at 5%		SIG	SIG	NS	NS	NS	NS
C.V. %		0.64	0.91	4.78	1.27	4.74	1.05

**Table 2:** Interaction effect of varieties and nutrients levels on days to appearance of first flower bud and days to open of first flower of carnation

Treatment details	Days to appearance of first flower bud	Days to open of first flower
V <sub>1</sub> F <sub>1</sub>	118.60	135.00
V <sub>1</sub> F <sub>2</sub>	115.53	131.80
V <sub>1</sub> F <sub>3</sub>	111.00	129.40
V <sub>1</sub> F <sub>4</sub>	105.53	123.46
V <sub>1</sub> F <sub>5</sub>	107.80	126.40
V <sub>2</sub> F <sub>1</sub>	138.33	146.13
V <sub>2</sub> F <sub>2</sub>	136.53	143.86
V <sub>2</sub> F <sub>3</sub>	134.20	142.06
V <sub>2</sub> F <sub>4</sub>	129.80	140.80
V <sub>2</sub> F <sub>5</sub>	125.60	138.60
V <sub>3</sub> F <sub>1</sub>	132.60	146.70
V <sub>3</sub> F <sub>2</sub>	129.13	143.93
V <sub>3</sub> F <sub>3</sub>	126.66	139.66
V <sub>3</sub> F <sub>4</sub>	123.60	134.80
V <sub>3</sub> F <sub>5</sub>	120.20	132.20
S.Em.±	0.45	0.72
C.D. at 5%	1.32	2.09
C.V.%	0.64	0.91

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