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Correlation studies in Carnation (*Dianthus caryophyllus* L.) as influenced by organic and inorganic nutrients

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Abstract

Influence of eleven different combinations of organic and inorganic sources of nutrient with biofertilizers on Carnation (*Dianthus caryophyllus* L.) were studied. Relation between inorganic nutrients (NPK) with vegetative and flowering traits were analyzed to understand the association between vegetative characters and nutrients to flower yield. Flower yield per square meter showed highly significant association with plant height, number of branches, plant spread, leaf area, dry matter production and total chlorophyll content. Correlation between nitrogen with plant height, number of branches, plant spread, internodal length, leaf area, dry matter production, total chlorophyll content, stalk length, stalk girth, yield and vase life were highly significant. Potassium was found highly significant with flower bud initiation, flower bud diameter, yield and vase life, which found significant association with stalk length, stalk girth and flower diameter. Negative correlation was seen between flower bud initiation and all flowering parameters with nitrogen and phosphorus. Whereas, the nutrient status of soil with biofertilizers exhibited positive and highly significant correlation with yield and vase life of flowers.

Key words: Carnation, Correlation, Nutrients, Yield, Vase life

Introduction

Carnation (*Dianthus caryophyllus* L.) is one of the most beautiful flowers of the world due to its availability in wide range of attractive colours, sizes and long lasting vase life and remarkable ability to rehydrate after continuous shipping. It is estimated that more than 6000 hectare of land is under Carnation cultivation in the world. Carnation production in India (21000 ton) while, in Karnataka, production of flowers (690 MT) during 2013-14 (Anon., 2014) [1].

Knowledge of the nature of flower and the association with yield and nutrient supply are to be considered good and quality production. Balanced use of chemical fertilizers with organic manures and biofertilizers is known to improve physical, chemical and biological properties of soil, pH and water holding capacity which adds important nutrients to the soil. The study was undertaken to find the impact of organic, inorganic and biofertilizers on growth and flowering in Carnation. Hence, the vegetative and flowering parameters were analyzed to understand the extent of correlation with nutrients.

Materials and methods

An experiment was carried out at Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, Karnataka. Tissue cultured Carnation plants were grown on raised beds of 30 cm height, one meter width. Planted with the spacing of 20 X 15 cm, in randomized block design with three replications under naturally ventilated polyhouse.

The experimental design was comprised with eleven treatments viz., T₁ (100% RDF (250:80:200 g NPK + 2 kg FYM/m²), T₂ (*Azospirillum* + 75% RDN + 100% RDP & K), T₃ (PSB + 75% RDP + 100% RDN & K), T₄ (*Azospirillum* + FYM + 75% RDF), T₅ (*Azospirillum* + VC + 75% RDF), T₆ (PSB + FYM + 75% RDF), T₇ (PSB + VC + 75% RDF), T₈ (*Azospirillum* + PSB + 75% RDN & P + 100% RDK), T₉ (*Azospirillum* + PSB + FYM + 75% RDF), T₁₀ (*Azospirillum* + PSB + VC + 75% RDF), T₁₁ (*Azospirillum* + PSB + FYM + VC + 75% RDF)

Data on five randomly selected tagged plants from each replication were collected after 30 days of pinching from each treatment on various biometrical parameters and analyzed. Values for correlation coefficient (r) were calculated and the test of significance was applied as per Fischer and Yates (1963) [3].

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Results and discussion

Correlation coefficients were computed between character pairs for all the nineteen parameters studied, *i.e.*, flower yield and three nutrients with nine vegetative and seven flowering traits in eleven treatments and results are presented in tables 1, 2 and 3, respectively. Correlation for flower yield per square meter exhibited positive and highly significant with number

of branches (0.86), plant height (0.89), plant spread (0.81), dry matter production (0.86) and total chlorophyll content (0.84) and significant association with leaf length (0.78). Similar results were also obtained by Tarannum and Hemla Naik (2014) [7] in Carnation and Anuradha (1994) [2] in *Gladiolus*.

Table 1: Relationship between flower yield and growth parameters during plant growth in Carnation as influenced by organic and inorganic fertilizers

Sl. No.	Traits	1	2	3	4	5	6	7	8	9	10
1	Plant height (cm)	1									
2	Number of branches	0.82**	1								
3	Plant spread (cm)	0.86**	0.79*	1							
4	Internodal length (cm)	0.82**	0.68	0.81**	1						
5	Leaf length (cm)	0.72*	0.54	0.52	0.66	1					
6	Number of leaves per plant	0.61	0.60	0.66	0.74*	0.80**	1				
7	Leaf area (cm ²)	0.77*	0.80**	0.80**	0.80**	0.81**	0.95**	1			
8	Dry matter production (g/plant)	0.98**	0.85**	0.86**	0.83**	0.79*	0.73*	0.86**	1		
9	Total chlorophyll content (mg/g)	0.77*	0.79*	0.79*	0.78*	0.76*	0.86**	0.93**	0.85**	1	
10	Yield/m ²	0.82**	0.84**	0.81**	0.62	0.78*	0.68	0.83**	0.86**	0.84**	1

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Plant height (0.89), number of branches (0.86), plant spread (0.82), internodal length (0.86), leaf area (0.85), dry matter production (0.92) and total chlorophyll content (0.90) were found highly positive correlation with nitrogen status in the soil. Whereas, significant association was observed with leaf

length (0.79) and number of leaves per plant (0.71). Availability of phosphorus in soil has positive correlation with total chlorophyll content (0.82). These results were related to the findings of Mahesh, (1996) [4] and Shiragur *et al.* (2004) [6] in Carnation.

Table 2. Correlation between NPK status in soil and vegetative parameters during plant growth in Carnation as influenced by organic and inorganic fertilizers

Sl. No.	Traits	1	2	3	4	5	6	7	8	9	10	11	12
1	Plant height (cm)	1											
2	Number of branches	0.82**	1										
3	Plant spread (cm)	0.86**	0.79*	1									
4	Internodal length (cm)	0.82**	0.68	0.81**	1								
5	Leaf length (cm)	0.72*	0.54	0.72*	0.66	1							
6	Number of leaves per plant	0.61	0.60	0.66	0.74*	0.80**	1						
7	Leaf area (cm ²)	0.77*	0.80**	0.80**	0.80**	0.80**	0.95**	1					
8	Dry matter production (g/plant)	0.98**	0.85*	0.86**	0.83**	0.79*	0.73*	0.86**	1				
9	Total chlorophyll content (mg/g)	0.77*	0.79*	0.79*	0.78*	0.76*	0.86**	0.93**	0.85*	1			
10	Nitrogen (kg/ha)	0.89**	0.86**	0.82**	0.86**	0.79*	0.71*	0.85**	0.92**	0.90**	1		
11	Phosphorus (kg/ha)	0.67	0.69	0.62	0.70*	0.79*	0.70*	0.79*	0.75*	0.82**	0.87**	1	
12	Potassium (kg/ha)	0.81**	0.62	0.79*	0.86**	0.68	0.57	0.67	0.82**	0.73*	0.88**	0.82**	1

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Stalk length (0.90) and girth (0.92) were highly significant and positively correlated with the nitrogen status of soil. However, there was significant association in flower bud diameter (0.78) and flower diameter (0.75) with nitrogen. Highly positive correlation was found between potassium status in soil with flower bud initiation (0.85), flower bud diameter (0.82), yield (0.84) and vase life (0.83). Negative correlation was recorded between flower bud initiation with

stalk length (-0.76), stalk girth (-0.79), flower bud diameter (-0.69), flower diameter (-0.72), yield (-0.62) and vase life (-0.87). Similar estimates were reported by Tarannum and Hemla Naik (2014) [7], Patil (2001) [5] and Shiragur *et al.* (2004) [6] in Carnation. Flower bud initiation has recorded negative correlation with nitrogen (-0.67) and phosphorus (-0.70) status of the soil.

Table 3: Correlation between NPK status in soil, flower quality and yield in Carnation as influenced by organic and inorganic sources of fertilizers

Sl. No.	Traits	1	2	3	4	5	6	7	8	9	10
1	Flower bud initiation (Days)	1									
2	Stalk length (cm)	-0.76	1								
3	Stalk girth (cm)	-0.79	0.88**	1							
4	Flower bud diameter (cm)	-0.69	0.66	0.75*	1						
5	Flower diameter (cm)	-0.72	0.86**	0.76*	0.58	1					
6	Yield/m ²	-0.62	0.91**	0.82**	0.75*	0.64	1				
7	Vase life (days)	-0.87	0.85**	0.84**	0.81**	0.82**	0.76*	1			
8	Nitrogen (kg/ha)	-0.67	0.90**	0.92**	0.78*	0.75*	0.87**	0.83**	1		
9	Phosphorus (kg/ha)	-0.70	0.79*	0.77*	0.65	0.62	0.86*	0.80**	0.87**	1	
10	Potassium (kg/ha)	0.85**	0.75*	0.74*	0.82**	0.78*	0.84**	0.83**	0.88**	0.82**	1

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Conclusion

Correlation study revealed that, nitrogen and potassium availability shown positive relationship with vegetative and flowering traits of Carnation. Application of organic, inorganic with biofertilizers in integrated manner will make more availability of nutrients to plants which may helps to increase quality production of flowers throughout the year.

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