

Research Paper

Effects of Growth Medium and Planting Density on Growth and Flowering Characteristics Carnation

Robabeh Asghari

Institute of Applied Scientific Higher Education of Jahad-e Agriculture, Imam Khomeini Agricultural Higher Education Center, Karaj, Iran

Corresponding author, e-mail: (fariba2022@yahoo.com)

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Abstract: *This research was done to investigate the comparative effects of different potting media with different compositions and planting density on growth and flowering of carnation chaubad. Different substrates including cocopeat+ pearlit+ vermicompost (10,60,30%), cocopeat+ pearlit+ vermicompost(20,60,20%), and cocopeat+ pearlit (40,60%), with density one and three plant in each pot were used. The experiment was carried out in completely randomized design. The data for parameters analyzed statistically showed significant effect of media combinations and density. Each treatment was consisted of 1 or 3 plants and was replicated thrice. Plants parameters of growth and flowering such as Flower length(cm), Flower diameter (cm), Root length (cm), Stem length (cm), Fresh weight (g) and Longevity (day) indicated using of growth medium content 20%vermeecompost with density one in each pot is more useful than the other medium and density that were used in the study.*

Keywords: Carnation, Growth medium, Planting density, Dianthus caryophyllus.

Introduction

The carnation (*Dianthus caryophyllus* L.) cultivars offer a diversity of colors, shapes and sizes not available in other flowering plants. Carnations are cultivated on a large scale in the Mediterranean area. However, it can be produced all over the world in greenhouse. The commercial production of carnations as one of the most used flowers for florists cut flower arrangement due to its excellent keeping quality, wide range of forms, ability to withstand long distance transportation. (Stack *et al.*,

1986). Therefore, paying a great attention to improve both qualitative and quantitative characteristics of carnations, especially, to be grown under greenhouse condition is essential. (El-Naggr, 2009)

Different types of factors affect the growth and development of carnation plants. Among them potting media is one of the most important factors which play a key role in quality production of carnation flower. For proper shoot and root growth, a root medium must serve four functions: provide water, supply nutrients, permit gas exchange to and from the roots and provide support for the plants (Nelson, 1991). Different growing media can be used to grow carnation while the physical and chemical properties of media like structure, texture, pH as well as nitrogen, phosphorus and potassium are the dominant factors for the growth and development of plant (Larson, 1980; Riaz et al., 2008; Younis et al., 2007). These properties determine the availability of nutrients to plants, mobility of water into or through soil and penetration of roots in the soil. Soil mixture plays an important role in pot plant production. Their chemical and physical properties determine the nutritional status of potting media to sustain better plant growth (Gabriels *et al.*, 1986; Grigatti, 2008). Organic matter contents of the planting medium have a profound effect on its biological, chemical and physical properties (Raviv, 2008; Papafotiou et al., 2004). When after the decomposition of the organic matter, chemical elements become available for the plants. Organic matter provides food and energy to the micro organisms and they help to build good soil structure. All organic matter, except for a small fraction, comes from plants remain Kambooh (1984) . The choice of the growing media can be made best by using detailed study of the physical and hydraulic characteristics of the growing media (Raviv *et al.* 2001).

The purpose of this study was to investigate the influence of different growing media with different combinations in different planting density on the growth and flowering of carnation plant grown as potted plant with studying and determination of morphological characteristics of carnation.

Materials and Methods

This study was conducted in November to April 2013-2014, at an experimental greenhouse of the plant production department, Imam Khomeini higher educational center Karaj, Iran. To evaluate the performance of different potting media for the commercial variety of carnation Chaubad. Different substrates: Cocopeat, perlite and vermicompost were used as main sources for preparation of media in different proportions and combinations to check the best suitable media for carnation growth and development. Different treatments combinations were, M1: cocopeat+pearlit+vermicompost (10, 60, 30%), M2: cocopeat+pearlit+vermicompost (20, 60, 20%), M3: cocopeat+pearlit (40, 60%), with density one and three plants in each pot (Kazar et al., 2011)

Seedlings were purchased from the nursery having 4 leave stage and were transplanted in 20 cm plastic pots in the November. The experiment was laid out in completely randomized design. Total six treatments were used where each treatment consisting of 9 plants was replicated three times. Data were collected fortnightly. Observations on the following parameters were recorded using the standard procedure: flower length (cm), flower diameter (cm), root length (cm), stem height (cm), fresh weight (g) and longevity (day). (Yasmeen et al., 2012)

The experimental plots were arranged following a completely randomized design, and analysis of variance was performed on the collected data by one way ANOVA using Mminitab[®] release 13.2 (Minitab Inc).

Result

The results of substrate type and density effect on dianthus characters were showed in the tables. Based on the results planting density on flower diameter, root length, stem length fresh weight and longevity had significant effect ($P < 0.01$) and except root length that increased the other characters decreased when plant density has been incensed (table 1, 2). Substrate type changed significantly root

length, longevity ($P < 0.01$), stem length and fresh weight ($P < 0.05$), however about flower length and flower diameter changes were not detectable (table 1). According to information in table 3, in substrate content cocopeat and perlite (40, 60%) the regarded characters (root length, stem length and fresh weight) except flower longevity showed higher amounts.

Table 1: Analysis of variance of different treatments

Changes resources	df	Flower length(cm)	Flower diameter (cm)	Root length (cm)	Stem length (cm)	Fresh weight (g)	Longevity (day)
Density	1	0.014ns	2.337**	9.696**	62.926**	383.705**	41.654**
Growth medium	2	0.015ns	0.385ns	9.552**	32.007*	52.388*	13.831**
Den.×Growth M.	2	0.681ns	4.781*	10.813**	70.951**	24.179ns	6.754**
Error	12	0.208	0.223	1.114	6.723	15.167	0.909
CV		10.3	9.8	6.9	4.8	13.9	10.1

*= $P < 0.05$, **= $P < 0.01$

Table 2: The effect of density on the flower characters

Density	Flower length(cm)	Flower diameter (cm)	Root length (cm)	Stem length (cm)	Fresh weight (g)	Longevity (day)
D1	4.4a	5.2a	14.4b	56.4a	32.9a	11.2a
D3	4.3a	4.4b	16.0a	51.6b	23.3b	7.8b

Table 3: The effect of growth medium on the flower characters

Growth medium	Flower length(cm)	Flower diameter (cm)	Root length (cm)	Stem length (cm)	Fresh weight (g)	Longevity (day)
10%co+60%per+30%ver	4.3a	4.5a	13.5c	54.4ab	26.0b	8.3b
20%co+60%per+20%ver	4.3a	4.8a	15.7b	51.5b	25.8b	11.7a
40%co+60%per	4.4a	5.1a	16.4a	56.1a	32.5a	8.5b

Considering the effects interaction of density and growth medium on the characters exhibited except flower length and fresh weight the other characters were affected significantly by its interaction (table 1).

Discussion

As was showed in table 4 and figures1-6 flower length is equal in all condition and the highest flower longevity and flower diameter in this experiment was observed in growth medium content 20%cocopeat+60%perlite+20%vermeecompost with density one stem in each pot. Aspect of fresh weight growth bed content cocopeat and perlite (40, 60%) with density one stem in each pot can be the best condition and about stem length more than substrate type density the plant in each pot changed it, however growth bed content cocopeat and perlite stem length were not affected by density. About root

length the highest amount was observed in substrate content cocopeat and perlite (40, 60%) with density three plant in each pot (table 4).

Table 4: The effect of growth medium and density together on the flower characters

Growth medium	Density	Flower length(cm)	Flower diameter (cm)	Root length (cm)	Stem length (cm)	Fresh weight (g)	Longevity (day)
10%co+60%per+30% ver	D1	4.5a	4.5cd	11.5d	56.5a	30.5b	11.0b
	D2	4.3a	4.5cd	15.3c	52.3b	21.5d	5.7e
20%co+60%per+20% ver	D1	4.7a	5.7a	16.3b	57.0a	28.7bc	13.3a
	D2	4.0a	4.0d	15.0c	49.0c	23.0d	10.1bc
40%co+60%per	D1	4.0a	5.3ab	15.3c	55.7ab	39.7a	9.3c
	D2	4.7a	4.8bc	17.5a	56.5a	25.3cd	7.7d

As has already been reported by Khasa *et al.* (2005) and Carlile (2008) composition and nutritional status of the media to be helpful for the production of good quality flowering plants with more number of flowers and greater size.

Figure 1: The effect of interaction density and growth medium on flower length

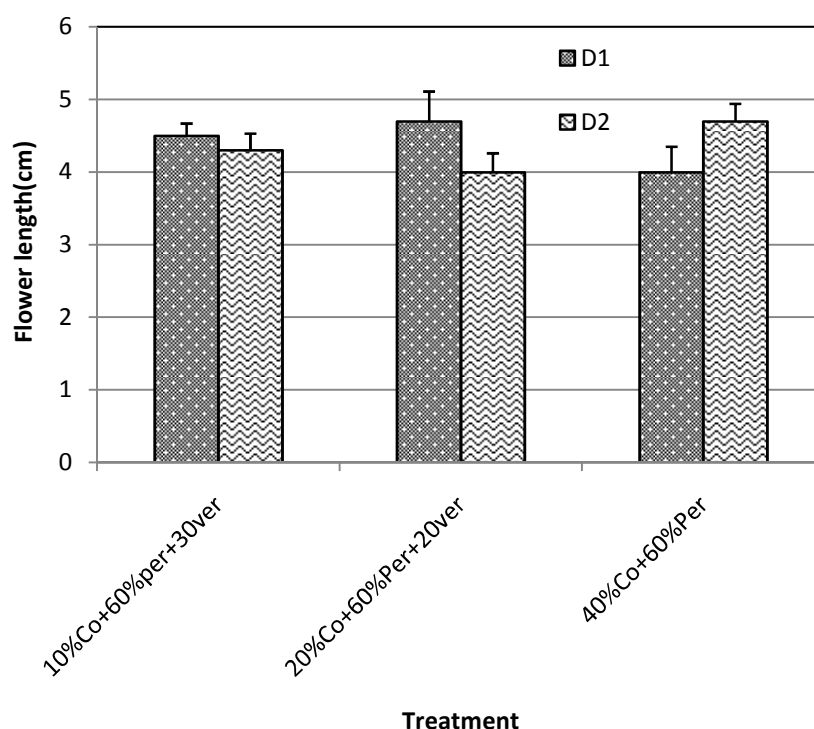


Figure 2: The effect of interaction density and growth medium on flower diameter

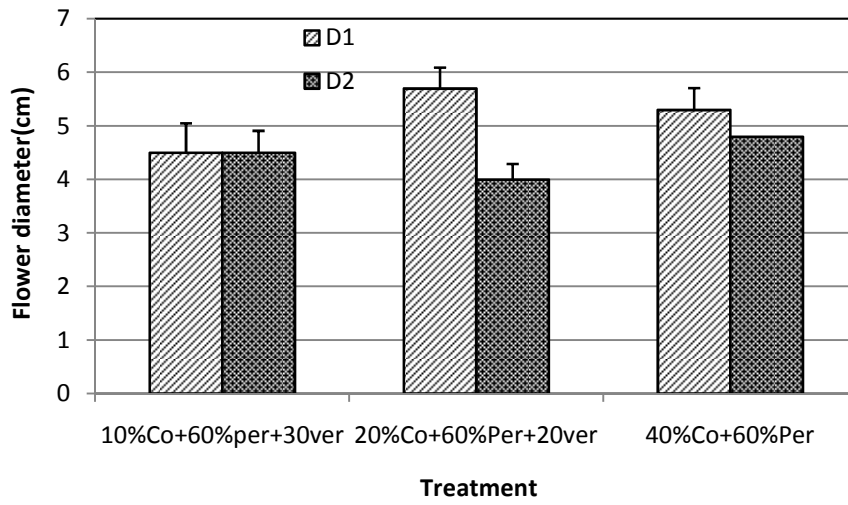


Figure 3: The effect of interaction density and growth medium on root length

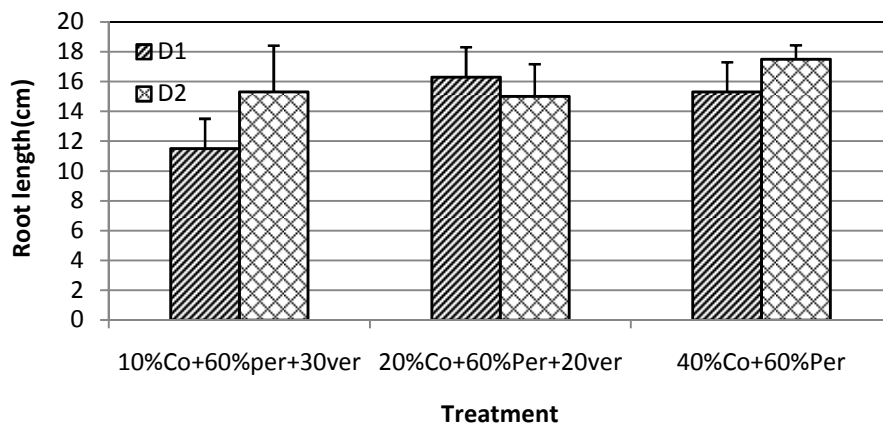


Figure 4: The effect of interaction density and growth medium on stem length

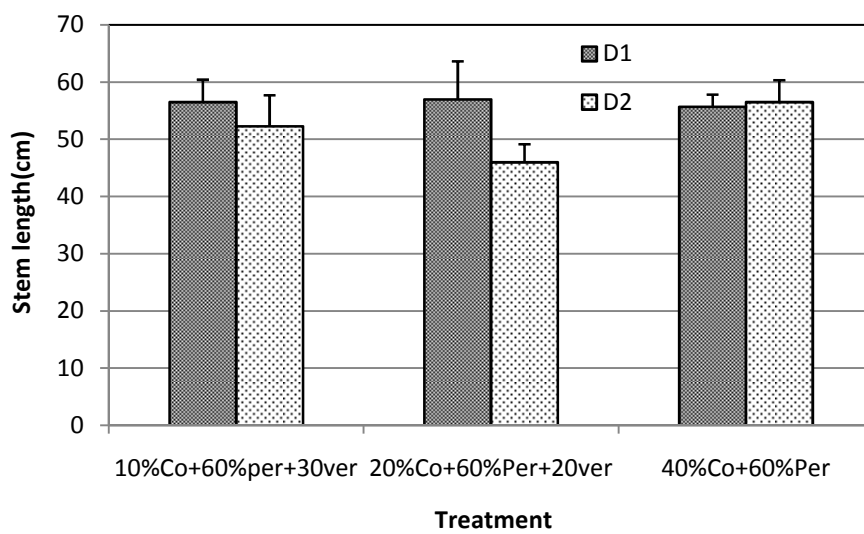


Figure 5: The effect of interaction density and growth medium on fresh weight

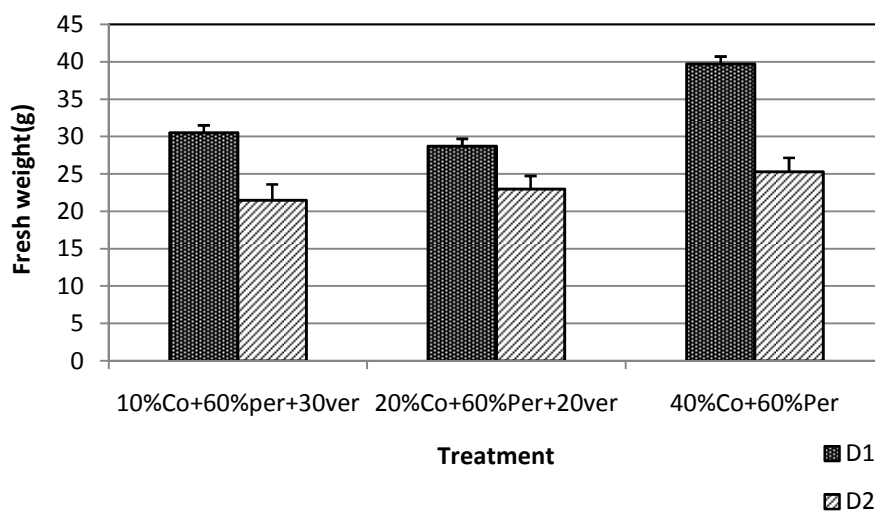
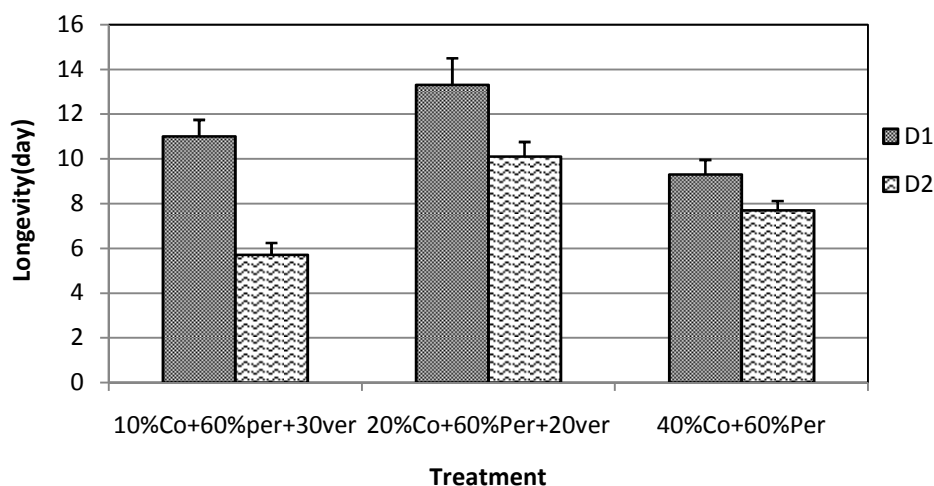


Figure 6: The effect of interaction density and growth medium on longevity



Conclusions

According to the results the flower characters, flower diameter and longevity; have been influenced by both growth medium type and density, whereas flower length did not show any changes. So the best substrate and density can be 20% cocopeat+60% perlite+20% vermicompost and one stem in each pot. The other characters that regarded in the study showed the highest amount estimated in growth bed content cocopeat and perlite with density three plants, of course fresh weight with increasing plant in each pot decreased and about stem length density is more important of growth medium. Therefore seemed using of growth medium including 20% vermicompost with density one in each pot is more useful than the other medium and density that were used in the studied.

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