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Interaction effect of variety and pinching in carnation (*Dianthus caryophyllus* L.)

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Abstract

An investigation was carried out to study the interaction effect of different varieties of carnation (*Dianthus caryophyllus* L.) to different levels of pinching under natural ventilated polyhouse during 2014-2015. Treatment V₁P₀ exhibited significantly highest plant height, number of internodes per stem and internodal length, while V₄P₃ showed significantly highest number of shoots per plant. Significantly minimum number of days to first flower bud initiation and days to 50 per cent flowering were recorded by V₄P₀. Longest duration of flowering was exhibited by V₄P₂. V₂P₀ showed highest flower bud diameter, length of flower stalk and stalk girth, while V₁P₀ recorded highest bud length. Treatments V₄P₃ recorded highest number of flowers per plant and plot.

Keywords: Carnation, varieties, pinching, quality, yield

Introduction

Carnation (*Dianthus caryophyllus* L.), native of the Mediterranean region belongs to the family Caryophyllaceae. It is genetically a quantitative long day plant (Blake, 1955). Today, carnation occupies the top slot in the global flower trade. In exports, carnation stands next only to rose and chrysanthemum in European markets (Sangita Ladha, 2008) [8]. The performance of carnation varieties varies with region, season, genotypes and growing environment. Testing of the available varieties for suitability and adaptability with respect to flowering, flower quality and yield parameters are of prime importance. Apical dominance is one of the serious problems for commercial carnation growers, as it does not permit the lateral buds to develop, resulting in limited number of lateral branches and flowers (Pathania *et al.*, 2000) [4]. Pinching refers to the removal of apical portion of the plant. In view of the above mentioned facts, the experiment was designed to standardize the best type of pinching for different varieties of carnation to study growth, quality and flowering in south Gujarat agroclimatic condition.

Materials and Methods

The experiment was carried out at Greenhouse Complex, Department of Floriculture and Landscape Architecture, Navsari Agricultural University, Navsari during the year 2014-15. The experiment was laid out in Completely Randomized Design (CRD) with factorial concept. The varieties under evaluation were Baltico (V₁), Domingo (V₂), Penelope (V₃) and Kiro (V₄); four levels of pinching were no pinch (P₀), single pinch (P₁), single and half pinch (P₂) and double pinch (P₃). In case of no pinch, plants were not pinched. In single pinching, pinching was done 25 days after transplanting at 6th node. In single and half pinch, half of the total shoots produced after single pinch were pinched by retaining 2 nodes after one month of single pinch. In case of double pinch, all shoots produced after single pinch were pinched by retaining 2 nodes after one month of single pinch.

All experimental plants received identical fertilizers, irrigation and other cultural practices during the period of investigation, except pinching. The data on various vegetative and flowering observations were recorded during the course of investigation were statistically analyzed using Completely Randomized Design (FCRD) with factorial concept as described by Panse and Sukhatme (1967) [3]. The appropriate standard error of mean (S. Em.±) and the critical difference (C.D.) were calculated at 5 per cent level of probability.

Results and Discussions**Vegetative parameters**

Maximum plant height (53.21 cm, 113.21 cm) was recorded in V₁P₀, followed by V₄P₀ (49.61 cm, 109.61 cm) while minimum plant height (22.89 cm, 82.89 cm) in V₂P₃ at 3 months after

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transplanting and final harvesting, respectively while the number of shoots per plant was significantly highest (8.31) in V_4P_3 , followed by V_1P_3 (7.98) while minimum (1.00) were in no pinch treatment of all varieties. V_1P_0 showed significantly highest (15.98) number of internodes per stem, followed by V_2P_0 (15.44), while the lowest (6.09) number of internodes per stem were obtained in V_2P_3 . Treatment V_1P_0 showed significantly highest internodal length (6.70 cm) followed by (6.38 cm) V_1P_2 . Variability in plant height, number of shoots per plant, internodal length and number of internodes among the varieties is mainly due to genetic makeup which differs from one variety to another. This was in accordance with the reports of Mahesh (1996) [2], Sathisha (1997) [9], Patil (2001) [5] and Shiragur (2002) [10] in carnation. Ryagi *et al.* (2007) [7] and Rao *et al.* (2008) [6] also confirmed these results which are due to interaction effect of varied genetic makeup of variety coupled with absence of pinching leading to higher concentration of auxins in the stem promoting upright growth.

Flowering and yield parameters

Significantly minimum days to first flower bud initiation (47.18 days) were observed in V_4P_0 while maximum days to first flower bud initiation (158.36 days) was recorded in V_2P_3 . V_4P_0 recorded least number of days to first flower bud initiation and days to 50 per cent flowering which is due to early accumulation of assimilates in non-pinched plants in combination of genetic behaviour of variety Penelope. Similar inferences were concluded from the work of Ryagi *et al.* (2007) [7] and Rao *et al.* (2008) [6].

V_4P_2 recorded significantly highest (207.28 days) duration of flowering while minimum duration of flowering was exhibited by V_1P_0 (130.44). The interaction effect of $P \times V$ was significant on diameter of flower with V_3P_0 showing significantly highest flower size (5.94 cm) followed by V_2P_0 (5.80 cm). Treatment V_1P_0 exhibited significantly highest bud length (3.13 cm) followed by V_3P_0 (2.98 cm). Significantly highest bud diameter (21.18 mm) and stalk girth (5.19 mm) were obtained in V_2P_0 . $P \times V$ interaction effect was significant

on length of flower stalk (cm) with maximum (87.56 cm) length of flower stalk in treatment P_0V_1 followed by P_0V_2 (86.32 cm). Unpinched plants of variety Domingo recorded significantly highest weight of flower (21.96 g) followed by V_2P_1 (20.11 g).

Longest duration of flowering was exhibited by V_4P_2 which is due to the combined effect of presence of productive shoots throughout the season which is facilitated by pinching half of the lateral shoots produced after single pinch and inherent character of the variety Penelope. Highest flower and bud diameter in V_2P_0 and bud length in V_1P_0 is due to the mutualistic effect of genetic variation and absence of pinching leading to consumption of assimilates by single flower stalk.

Unpinched plants of variety Domingo showed highest stalk girth, length of flower stalk, highest weight of flower and number of petals per flower which was due to mutualistic effect of hereditary variation in variety Domingo which was shown to have higher sugar accumulation capacity and the absence of pinching

V_2P_0 gave significantly longest (19.11 days) *in situ* longevity of flowers followed by V_1P_0 (18.64 days), while lowest was in V_3P_3 (14.58 days). Unpinched plants of variety Domingo recorded significantly longest (8.64 days) vase life followed by unpinched plants of variety Baltico (8.44 days), while lowest vase life (6.80 days) was recorded in V_1P_3

Treatment V_4P_3 produced significantly highest (10.93) number of flowers per plant followed by V_3P_3 (9.84), while minimum was obtained in V_2P_0 (3.38). Significantly highest (175.67) number of flowers per net plot was recorded in double pinched plants of variety Penelope followed by (151.11) double pinched plants of the cv. Kiro. Double pinched plants of variety Penelope (V_4P_3) recorded significantly highest number of flowers per plant and net plot. This increase in yield is due to the interaction effect of double pinch that led to the production of more number of shoots per plant due to the cessation of apical dominance and the inherent makeup of variety Penelope enabling it to produce maximum yield.

Table 1: Interaction effect of variety and pinching on growth, flowering and yield parameters of carnation

Parameters	P0				P1				P2				P3				CD at 5%
	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4	V1	V2	V3	V4	
Plant height (cm) at 3 MAP	53.21	43.04	45.50	49.61	38.16	25.65	31.40	36.37	38.35	25.85	31.69	36.31	27.84	22.89	24.12	30.10	0.78
Plant height (cm) at final harvest	113.21	103.04	105.50	109.61	98.16	85.65	91.40	96.37	98.35	85.85	91.69	96.31	87.84	82.89	84.12	90.10	0.78
Shoots per plant	1.00	1.00	1.00	1.00	6.29	3.31	4.33	4.64	7.53	5.14	5.64	6.47	7.98	6.91	7.82	8.31	0.11
Internodes per stem	15.98	15.44	14.07	14.89	12.33	11.67	12.44	13.67	12.49	11.64	12.51	13.51	6.89	6.09	7.09	6.62	0.13
Internodal length (cm)	6.70	4.53	5.92	5.82	6.37	4.53	5.66	5.62	6.38	4.53	5.64	5.60	6.12	4.53	5.47	5.52	0.05
Days to first flower bud initiation	50.29	66.27	53.07	47.18	95.24	124.87	93.02	88.13	94.87	124.64	92.47	87.51	136.96	158.36	141.73	123.38	0.55
Days to 50% flowering	69.51	90.42	79.24	70.62	142.98	179.04	163.98	147.73	117.11	150.09	120.4	106.8	117.84	149.71	119.27	105.76	0.51
Duration of flowering (days)	130.44	132.81	131.00	138.94	158.14	159.92	158.97	163.28	200.04	202.06	201.0	207.2	148.90	152.38	149.38	155.56	0.44
Bud diameter (mm)	17.94	21.18	16.03	17.53	15.69	20.14	15.07	15.91	15.89	19.70	15.16	15.83	15.12	18.75	14.31	15.51	0.28
Flower diameter (cm)	5.25	5.80	5.94	5.14	5.30	5.79	5.51	4.92	4.61	5.50	5.03	4.60	4.44	5.56	4.98	4.38	0.09
Stalk girth (mm)	4.25	5.19	4.85	3.85	3.91	4.80	4.44	3.50	3.80	4.62	4.47	3.47	3.39	4.32	4.26	3.35	0.01
Stalk length (cm)	87.56	86.32	84.93	84.66	81.43	84.05	81.02	81.34	80.98	83.12	80.80	80.91	65.97	67.24	67.43	66.19	0.50
Flower longevity (days)	18.64	19.11	17.51	16.62	15.69	17.58	15.38	15.33	15.78	17.22	14.76	15.29	15.09	16.53	14.58	14.71	0.23
Vase life (days)	8.44	8.64	7.62	7.78	7.51	7.53	7.38	7.44	6.96	7.38	7.24	7.24	6.80	7.13	6.87	7.09	0.11
Flowers per plant	4.13	3.38	4.33	5.11	5.29	5.53	6.24	7.18	7.51	6.58	8.20	8.36	9.42	7.09	9.84	10.93	0.15
Flowers per plot	68.22	54.33	69.89	76.56	84.33	87.11	101.00	114.56	126.89	105.89	132.1	131.7	150.22	113.22	151.11	175.67	1.24

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