



Research Paper

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Effect of harvesting at different heights on successive flowering of carnation (*Dianthus caryophyllus* Linn)

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ABSTRACT : The present study was under taken in a commercial floriculture farm under protected cultivation with three cultivars of carnation during July 2010 to February 2011. The experiment was laid out in Randomized Block Design with factorial concept. Harvesting of carnation flower stalk at 10cm height from the ground level recorded minimum number of days to sprouting of buds than other harvesting heights *i.e.*, at 5, 15 and 20 cm height from the ground level. Days to first flower bud appearance, color break stage and days to harvest were also minimum with harvesting at 10 cm height in cultivars Domingo, Dover and Keiro. And the length of lateral, length of flower stalk and flower, diameter of flower stalk and flower, number of flower stalks per plant, fresh flower weight and vase life was maximum with harvesting 10 cm height than other harvesting heights in cultivar Domingo.

KEY WORDS : Carnation, Harvesting of flower stalk, Heights, Cultivars

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Carnation (*Dianthus caryophyllus* Linn, Fy: Caryophyllaceae), has been extensively cultivated for cut flowers in Columbia, Japan, Israel, Netherlands *etc.*, A study indicated that about 34% of the total flower consumers expressed their liking for carnation compared to only 20% of the people who favoured roses (Staby *et al.*, 1978). The maximum area under cultivation of carnation (2500 ha) is in Columbia (Bhattacharjee, 2006). In India, carnations are being grown in places like Nasik, Pune, Jammu & Kashmir, Himachal Pradesh and surrounding areas of Hyderabad in Andhra Pradesh (Mukherjee, 1996).

Application of various special horticultural practices after standardization can be one of the means to achieve the target of quality flower production. Carnation is a plurannual commercial cut flower crop exhibits apical dominance and development of lateral shoots and flower production are influenced by the presence of apical dominance (Cline, 1997). Generally carnation flowers are harvested at different heights or at different nodes without knowing its impact on growth and flower production in successive crop. To induce early sprouting of buds and transformation of laterals, the

levels of harvest plays an important role and also have an impact on number of buds sprouting at the bottom or top of the left over harvested shoots, which finally determines the number of flower stalks produced per harvested stalk.

The buds sprouted at different levels have direct impact on the quality of flower stalk and flower bud. Organized research work in these lines on commercial cultivars of carnation is not available.

RESEARCH METHODS

The experiment was conducted in three cultivars of carnation *i.e.*, Domingo, Keiro and Dover during July 2010 to February 2011 in a commercial floriculture farm at Mudimyal, Ranga Reddy district of Andhra Pradesh.

In this experiment, selected first season flower stalks of carnation were harvested at 5, 10, 15 cm and at 20 cm height from the ground level. Observations were recorded on number of days for first flower bud appearance, color break stage, days to harvest, length of flower stalk, flower length, number of flower stalks harvested per plant and vase life of cut flower in 8-HQS 300 ppm + AgNO₃ 50 ppm + 5%

sucrose holding solution.

RESEARCH FINDINGS AND DISCUSSION

The data on number of days to first flower bud appearance in carnation (Table1) revealed that harvesting at 10 cm height from the base recorded minimum number of days (105.17 days) which was significantly superior to harvesting of flower stalk at 15 cm (120.00 days), 20 cm (128.02 days) and at 5 cm height (139.71 days) from the ground level. Among the cultivars, cv. Domingo (119.97 days) registered minimum number of days for first flower bud appearance which was significantly superior to rest of the cvs. Dover (122.74 days) and Keiro (129.50 days). Cultivar Domingo being vigorous growing in nature resulted in early sprouting of buds. Maximum utilization of available food reserves might have encouraged attaining flowering stage early over other cultivars studied.

The interaction between harvesting at different heights of flower stalk and cultivars studied differed significantly on number of days for first flower bud appearance. Harvesting of flower stalk at 10 cm height recorded minimum number of days for first flower bud appearance in all cvs. Domingo (101.16 days), Dover (104.33 days) and Kiero (110.01 days). It could be due to early physiological maturity of shoots after harvest. These results are in conformity with Arora and Khanna (1986) in marigold cv. African Giant Double Orange. According to Ubukata (1999) working with carnation indicated that early raised shoots took less time to attain physiologically mature which in turn bear flowers. Pinching at 10 cm height resulted in early initiation of first flower bud (86.52 days) due to early breakage of apical dominance Rao *et al.* (2008) in carnation.

There were significant differences in number of days for colour break stage of carnation due to harvesting at different heights of flower stalk, cultivars and their interactions studied (Table1). Harvesting of flower stalk at 10 cm height (120.01 days) from the ground level recorded minimum number of days for colour break stage which was significantly superior to harvesting of flower stalk at 15 cm (133.79 days), 20 cm (142.08 days) and at 5 cm height

(153.20 days). This could be due to less number of shoots and maximum utilization of photosynthates. The interaction between harvesting heights of flower stalk and cultivars studied differed significantly on number of days for colour break stage. These results are in conformity with Srivastava *et al.* (2002) in marigold cv. PUSANARANGI GAINDA.

The data (Table1) also revealed that the number of days for harvesting in carnation has differed significantly due to harvesting at different heights, cultivars and their interaction. Harvesting of flower stalk at 10 cm height from the ground level recorded minimum number of days for harvest (127.01 days) which was significantly superior to harvesting of flower stalk at 15 cm (141.27 days), 20 cm (149.50 days) and at 5 cm height (159.82 days) from the ground level. Among the cultivars, cv. Domingo (138.29 days) registered minimum number of days for harvesting which was significantly superior to rest of the cvs. Dover (143.85 days) and Keiro (151.07 days). Cultivar Domingo being vigorous growing in nature, on removal of apical dominance through harvesting resulted in early sprouting of axillary buds and also early in flowering in turn leading to early harvest over cvs. Dover and Kiero. The interaction between harvesting heights of flower stalk and cultivars studied differed significantly on number of days for harvest. Harvesting of flower stalk at 10 cm height recorded minimum number of days for harvest in all cvs. Domingo (122.23 days), Dover (126.50 days) and Kiero (132.30 days), respectively. These results are in conformity with Rao *et al.* (2008) in carnation.

The data presented in Table 2 indicated significant differences in flower stalk length at the time of harvest in carnation due to harvesting of flower stalk at different heights, cultivars and their interaction. Harvesting of flower stalk at 10 cm height recorded maximum length of flower stalk at the time of harvest (87.66 cm). Harvesting of flower stalk at 10 cm height cv. Domingo (98.30 cm) recorded significantly maximum length of flower stalk at the time of harvest compared to cvs. Dover (84.36 cm) and Kiero (80.33 cm) were at par. Flower stalks harvested at higher nodes resulted in maximum number of flower stalks which might have resulted in recording minimum length of flower stalk.

Table 1 : Effect of harvesting at different heights on days for flowering to harvesting in three cultivars of carnation												
Treatments	Days to first flower bud appearance(days)				Days to colour break stage(days)				Days to harvesting (days)			
	Domingo	Keiro	Dover	Mean	Domingo	Keiro	Dover	Mean	Domingo	Keiro	Dover	Mean
5cm	134.85 ^a	146.60 ^b	137.70 ^a	139.71 ^d	148.16 ^a	160.23 ^b	151.20 ^a	153.20 ^d	155.20 ^a	167.05 ^b	157.23 ^a	159.82 ^d
10 cm	101.16 ^a	110.01 ^c	104.33 ^b	105.17 ^a	115.66 ^a	125.16 ^c	119.53 ^b	120.01 ^a	122.23 ^a	132.30 ^c	126.50 ^b	127.01 ^a
15 cm	110.16 ^a	128.33 ^c	121.50 ^b	120.00 ^b	124.11 ^a	142.16 ^c	135.10 ^b	133.79 ^b	131.46 ^a	149.50 ^c	142.85 ^b	141.27 ^b
20cm	123.56 ^a	133.06 ^c	127.43 ^b	128.02 ^c	130.33 ^a	147.63 ^c	141.30 ^b	142.08 ^c	144.26 ^a	155.45 ^c	148.80 ^b	149.50 ^c
Mean	119.97 ^a	129.50 ^c	122.74 ^b	121.45	131.31 ^a	143.80 ^c	136.70 ^b	137.27	138.29 ^a	151.07 ^c	143.85 ^b	144.40
	Cultivars	Heights	Cultivars x Heights		Cultivars	Heights	Cultivars x Heights		Cultivars	Heights	Cultivars x heights	
S.E. ±	0.58	0.67	1.17		0.65	0.75	1.31		0.71	0.82	1.43	
C.D. (P=0.05)	1.71	1.98	3.43		1.92	2.22	3.86		2.08	2.41	4.17	

These results are in conformity with Dubois and Devries (1994) in rose cv. Minima and Borreli (1988) in rose cv. Superstar and with Grawal *et al.* (2004) in chrysanthemum cv. FLIRT.

Harvesting of flower stalk at 10 cm height recorded maximum diameter of flower at the time of harvest (3.05 cm) which was significantly superior to harvesting of flower stalk at 15 cm (2.91 cm), 20 cm (2.83 cm) and at 5 cm height (2.47 cm) from the ground level. Among the cultivars, cv. Domingo (3.01 cm) registered maximum diameter of flower at the time of harvest which was significantly superior to rest of the cvs. Dover (2.83 cm) and Keiro (2.61 cm). The interaction between harvesting heights of flower stalk and cultivars studied did not differ significantly on diameter of flower at the time of harvest. Harvesting of flower stalk at 10 cm height from the ground level resulted in early breakage of apical dominance and maximum utilization of food reserves lead to maximum flower size. These results are in conformity with the findings of Uma and Gowda (1987) in rose cv. SUPERSTAR.

The data (Table 2) also revealed that number of flower stalks harvested per plant of carnation differed significantly due to harvesting at different heights of flower stalk and cultivars studied. Harvesting of flower stalk at 20 cm height from the ground level recorded significantly maximum number of flower stalks harvested per plant (11.80) followed by harvesting at 15 cm (9.87), 10 cm (8.54) and at 5cm height (5.70) from the ground level. Among the cultivars studied, cv. Domingo (9.19) registered maximum number of flower stalks harvested per plant which differed significantly over the cvs. Dover (8.73) and Keiro (9.02). The interaction between harvesting at different heights of flower stalk and cultivars studied differed significantly on number of flower stalks harvested per plant at the time of harvest. These results are similar to Malhotra and Kumar (2000) in rose cv. Raktagandha that pruning at 60 cm length resulted in production of maximum number of flowers. Laxmi Prasanna *et al.* (2001) also reported that maximum number of flowers per plant was noticed with 40 cm pruning and minimum were recorded with 20 cm pruning in rose cv. Gladiator. Severe pruning where most of the photosynthetic area was removed resulted in decreased number of flowers per plant. This could be a result of high respiration rate and loss of food reserves in the plant, finally flower yield reduced in severely pruned plants (Zieslin and Halevy, 1976).

There was significant difference in vase life of cut flower of carnation due to harvesting at different heights of flower stalk and cultivars studied (Table 2). Harvesting of flower stalk at 10 cm height recorded maximum vase life of cut flower (11.83 days). Among the cultivars, cv. Domingo (12.25 days) registered maximum vase life of cut flower which was significantly superior to rest of the cvs. Keiro (10.79 days) and Dover (9.46 days). Flower stalks harvested

Table 2: Effect of harvesting at different heights on length of flower stalk, diameter of flower, number of flower stalks and vase life of cut flower (days) in three cultivars of carnation

Treatments	Length of flower stalk at the time of harvest (cm)				Diameter of flower (cm) at the time of harvest				Number of flower stalks harvested per plant				Vase life of cut flower (days)			
	Domingo	Keiro	Dover	Mean	Domingo	Keiro	Dover	Mean	Domingo	Keiro	Dover	Mean	Domingo	Keiro	Dover	Mean
5cm	79.33 ^a	71.86 ^b	73.43 ^b	74.87 ^d	2.61	2.32	2.48	2.47 ^d	6.00 ^a	5.26 ^b	5.86 ^a	5.70 ^d	11.20	10.06	8.71	9.99 ^c
10 cm	98.30 ^a	80.33 ^b	84.36 ^b	87.66 ^a	3.26	2.82	3.09	3.05 ^a	8.77 ^a	8.33 ^c	8.53 ^b	8.54 ^c	14.00	11.50	10.00	11.83 ^a
15 cm	92.29 ^a	79.53 ^b	81.30 ^b	84.37 ^b	3.15	2.71	2.89	2.91 ^b	10.01 ^a	9.72 ^b	9.89 ^b	9.87 ^b	12.00	10.84	10.16	11.00 ^b
20cm	84.80 ^a	76.70 ^b	77.83 ^b	79.77 ^c	3.03	2.60	2.88	2.83 ^c	11.98 ^a	11.63 ^c	11.80 ^b	11.80 ^a	11.80	10.76	9.00	10.52 ^b
Mean	88.68 ^a	77.10 ^b	79.23 ^b	81.67	3.01 ^a	2.61 ^c	2.83 ^b	2.81	9.19 ^a	8.73 ^c	9.02 ^b	8.97	12.25 ^a	10.79 ^b	9.46 ^c	10.88
	Cultivars	Heights	Cultivars x Heights	Heights	Cultivars	Heights	Cultivars x Heights	Heights	Cultivar	Heights	Cultivars x Heights	Heights	Cultivars	Heights	Cultivars x Heights	Cultivars x Heights
S.E. ±	0.58	0.67	1.16	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.05	0.05	0.24	0.28	0.28	0.48
C.D. (P=0.05)	1.71	1.98	3.43	0.04	0.04	0.04	--	0.08	0.08	0.09	0.16	0.16	0.71	0.82	0.82	--

at lower levels recorded maximum vase life than flower stalks harvested at higher levels. It might be due to better quality flowers produced by harvesting at lower levels which has maximum length and diameter of flower.

Conclusion:

The results obtained in the present study indicated that in carnation, harvesting of flower stalk especially at 10 cm height was the optimum level of harvesting to get good quality flowers and for advancement of flowering for capturing early market.

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