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# EFFECT OF HARVESTING AT DIFFERENT NODES ON SUCCESSIVE FLOWERING OF CARNATION (*DIANTHUS CARYOPHYLLUS* LINN)

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## Abstract

The present study was undertaken 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. The data was recorded on different floral parameters with harvesting at 2nd, 3rd, 4th and 5th nodes of carnation flower stalk from the ground level. The data recorded on days to first flower bud appearance revealed that harvest of flower stalk at 3rd node recorded significantly minimum number of days. Length of flower stalk, flower length, number of commercially acceptable flower stalks per plant and vase life of cut flower was maximum with harvesting of flower stalk at 3rd node than harvesting at 2nd, 4th and 5th nodes from the ground level.

***Key words :*** Carnation, harvesting of flower stalk, nodes, cultivars.

## Introduction

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.

## Materials and 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, India.

In this experiment, selected first season flower stalks of carnation were harvested at 2nd, 3rd, 4th and at 5th node 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 the recommended holding solution.

## Results and Discussion

The data on number of days for first flower bud appearance in carnation (table 1) revealed that harvesting

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of flower stalk at 3rd node recorded minimum number of days for first flower bud appearance (106.7 days), which was significantly superior to harvesting of flower stalk at 4th (111.51 days), 5th (121.63 days) and at 2nd node (132.76 days) from the ground level. Among the cultivars, cv. Domingo (109.13 days) registered minimum number of days for first flower bud appearance, which was significantly superior to rest of the Cvs. Dover (116.08 days) and Keiro (128.75 days).

The interaction between harvesting at different nodes of flower stalk and cultivars studied differed significantly on number of days for first flower bud appearance. Harvesting of flower stalk at 3rd node recorded minimum number of days for first flower bud appearance in all Cvs. Domingo (95.63 days), Dover (102.16 days) and Kiero (120.41 days), respectively. Cultivar Domingo being vigorous growing in nature which resulted in early sprouting of buds. Maximum utilization of available food reserves might have encouraged attaining flowering stage early over other cultivars studied.

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 Gaint 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 of flower stalk at 3rd node (121.08 days) recorded minimum number of days for colour break stage. This could be due to less number of shoots and maximum utilization of photosynthates. These results are in conformity with Srivastava *et al*. (2002) in marigold cv. Pusa Narangi Gainda.

The data in table 1 also revealed that the number of days for harvesting in carnation has differed significantly due to harvesting of flower stalk at 3rd node (127.97 days) recorded minimum number of days for harvest, which was significantly superior to harvesting of flower stalk at 4th (136.76 days), 5th (143.93 days) and at 2nd node (154.43 days) from the ground level. Among the cultivars cv. Domingo (131.90 days) registered minimum number of days for harvesting, which was significantly superior to rest of the cvs. Dover (139.85) and Keiro (150.57 days).

The interaction between harvesting at different nodes of flower stalk and cultivars studied differed significantly on number of days for harvest. Harvesting of flower stalk at 3rd node recorded minimum number of days for harvesting in all cvs. Domingo (118.16 days), Dover (123.30 days) and Kiero (142.46 days), respectively. 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. Both the cultivars are slow growing in habit and very sensitive to frequent changes in climate due to these both the cultivars might have performed poorly. 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 3rd node (85.19 cm) recorded maximum length of flower stalk at the time of harvest, which was significantly superior to harvesting of flower stalk at 4th (82.04 cm), 5th (80.01

**Table 1 :** Effect of harvesting at different nodes 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 harvest (days) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Domingo | Keiro | Dover | Mean | Domingo | Keiro | Dover | Mean | Domingo | Keiro | Dover | Mean |
| 2nd node | 125.08$^{a}$ | 140.28$^{c}$ | 132.93$^{b}$ | 132.76$^{d}$ | 141.28$^{a}$ | 154.33$^{c}$ | 146.36$^{b}$ | 147.32$^{d}$ | 148.50$^{a}$ | 161.43$^{c}$ | 153.38$^{b}$ | 154.43$^{d}$ |
| 3rd node | 95.63$^{a}$ | 120.41$^{c}$ | 102.16$^{b}$ | 106.07$^{a}$ | 111.53$^{a}$ | 135.40$^{c}$ | 116.33$^{b}$ | 121.08$^{a}$ | 118.16$^{a}$ | 142.46$^{c}$ | 123.30$^{b}$ | 127.97$^{a}$ |
| 4th node | 100.33$^{a}$ | 125.38$^{c}$ | 108.83$^{b}$ | 111.51$^{b}$ | 115.46$^{a}$ | 140.46$^{c}$ | 132.27$^{b}$ | 129.40$^{b}$ | 122.60$^{a}$ | 148.10$^{c}$ | 139.60$^{b}$ | 136.76$^{b}$ |
| 5th node | 115.56$^{a}$ | 128.93$^{c}$ | 120.40$^{b}$ | 121.63$^{c}$ | 130.63$^{a}$ | 143.16$^{c}$ | 135.40$^{b}$ | 136.40$^{c}$ | 138.36$^{a}$ | 150.28$^{c}$ | 143.15$^{b}$ | 143.93$^{c}$ |
| Mean | 109.13$^{a}$ | 128.75$^{c}$ | 116.08$^{b}$ | 117.98 | 124.72$^{a}$ | 143.34$^{c}$ | 132.59$^{b}$ | 133.55 | 131.90$^{a}$ | 150.57$^{c}$ | 139.85$^{b}$ | 140.89 |
| | Cultivars | Nodes | Cultivars × Nodes | | Cultivars | Nodes | Cultivars × Nodes | | Cultivars | Nodes | Cultivars × Nodes | |
| SEm± | 0.22 | 0.25 | 0.44 | | 0.32 | 0.37 | 0.65 | | 0.46 | 0.54 | 0.93 | |
| CD (5%) | 0.65 | 0.75 | 1.31 | | 0.96 | 1.11 | 1.92 | | 1.37 | 1.59 | 2.75 | |

**Table 2 :** Effect of harvesting at different nodes on length of flower stalk and 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) | | | | Length of flower at the time of harvest (cm) | | | | 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 |
| 2nd node | 61.53 | 54.93 | 58.93 | 58.46$^{d}$ | 2.40 | 2.25 | 2.33 | 2.32$^{c}$ | 4.61 | 4.10 | 4.35 | 4.35$^{d}$ | 10.55 | 9.81 | 10.15 | 10.17$^{c}$ |
| 3rd node | 88.20 | 81.83 | 85.20 | 85.19$^{a}$ | 3.00 | 2.75 | 2.88 | 2.87$^{a}$ | 6.84 | 6.25 | 6.65 | 6.58$^{c}$ | 14.00 | 12.00 | 11.50 | 12.50$^{a}$ |
| 4th node | 85.66 | 78.30 | 82.16 | 82.04$^{b}$ | 2.70 | 2.50 | 2.60 | 2.60$^{b}$ | 9.63 | 9.10 | 9.26 | 9.33$^{b}$ | 12.00 | 11.23 | 11.00 | 11.41$^{b}$ |
| 5th node | 83.20 | 77.43 | 79.40 | 80.01$^{c}$ | 2.50 | 2.40 | 2.45 | 2.45$^{b}$ | 12.10 | 11.37 | 11.75 | 11.74$^{a}$ | 11.00 | 10.60 | 9.86 | 10.48$^{c}$ |
| Mean | 79.65$^{a}$ | 73.12$^{c}$ | 76.42$^{b}$ | 76.39 | 2.65 | 2.47 | 2.56 | 2.56 | 8.29$^{a}$ | 7.70$^{b}$ | 8.00$^{c}$ | 8.00 | 11.88$^{a}$ | 10.91$^{b}$ | 9.20$^{c}$ | 11.14 |
| | Cultivars | Nodes | Cultivars × Nodes | | Cultivars | Nodes | Cultivars × Nodes | | Culti-vars | Nodes | Cultivars × Nodes | | Cultivars | Nodes | Cultivars × Nodes | |
| SEm± | 0.55 | 0.65 | 1.14 | | 0.07 | 0.08 | 0.15 | | 0.06 | 0.07 | 0.13 | | 0.29 | 0.33 | 0.58 | |
| CD(5%) | 1.65 | 1.95 | — | | — | 0.26 | — | | 0.20 | 0.23 | — | | 0.85 | 0.98 | — | |

cm) and at 2nd node (58.46 cm) from the ground level. The interaction between harvesting at different nodes of flower stalk and cultivars studied differed significantly on length of flower stalk at the time of harvest. It might be due to harvesting at lower nodes resulted in production of minimum number of flower stalks with maximum stalk length. Flower stalks harvested at higher nodes resulted in maximum number of flower stalks, which might have resulted in recording minimum length of flower stalk. 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.

There were significant differences in length of flower at the time of harvest of carnation due to harvesting at different heights of flower stalk and cultivars studied (table 2). Harvesting of flower stalk at 3rd node (2.87 cm) recorded maximum length of flower at the time of harvest, which was significantly superior to harvesting of flower stalk at 4th (2.60 cm), 5th (2.45 cm), and at 2nd node (2.32 cm) from the ground level. The cultivars studied did not differ significantly on length of flower.

The data in table 2 also revealed that number of flower stalks harvested per plant of carnation has differed significantly due to harvesting at different heights of flower stalk and cultivars studied. Harvesting of flower stalk at 5th node recorded significantly maximum number of flower stalks harvested per plant (11.74) followed by harvesting at 4th (9.33), 3rd (6.58) and at 2nd node (4.35) from the ground level.

Imamura and Suto (2001) working with carnation cv. Francesco indicated that pinching the shoots at higher nodes recorded maximum flower yield compared to pinching at lower nodes from the ground level. Sawwan and Samawi (2000) working with carnation cv. White Opale also indicated that progressive increase in total number of flower stalks with pinching at higher nodes. Groshkov and Angelov (1981) working with carnation indicated that pinching at 4th node recorded maximum number of flower stalks for both Scania and Arthur sim cultivars of carnation. Similar results were also reported by Singh and Baboo (2003) in chrysanthemum cv. Jayanthi.

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 3rd node (12.50 days) recorded maximum vase life of cut flower which was significantly superior to harvesting of flower stalk at 4th (11.41 days), 5th (10.48 days) and at 2nd node (10.17 days) from the

ground level. Among the cultivars, cv. Domingo (11.88 days) registered maximum vase life of cut flower, which was significantly superior to rest of the cvs. Keiro (10.91 days) and Dover (9.20 days). Flower stalks harvested 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.

The results obtained in the present study indicated that in carnation, harvesting of flower stalk at different nodes especially at 3rd node has shown early flowering, maximum number of flower stalks per plant and vase life.

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