

## Effect of Harvesting at Different Heights on Growth and Flower Yield of Carnation (*Dianthus caryophyllus* L.) in Second Season Crop

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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 10 cm height from the ground level recorded minimum number of days to sprouting of buds than other harvesting heights i.e., 5, 15 and 20 cm height. Days to first flower bud appearance, color break stage and days to harvest was 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.

**Keywords:** Carnation; Harvesting of flower stalk; Heights; 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 [1] The maximum area under cultivation of carnation (2500 ha) is in Columbia [2].

In India, carnations are being grown in places like Nasik, Pune, Jammu & Kashmir, Himachal Pradesh and surrounding areas of Hyderabad in Andhra Pradesh [3] 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 plur annual commercial cut flower crop exhibits apical dominance and development of lateral shoots and flower production are influenced by the presence of apical dominance [4].

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.

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 sprouting of buds after harvest of flower stalk, number of buds sprouted per node, number of buds sprouted per plant, length of lateral at 20, 30, 40, 50, 60, 70 and 80 days after harvest of flower stalk and internodal length of flower stalk at the time of harvest, 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+AgNO<sub>3</sub> 50 ppm+5% sucrose holding solution.

### Results and Discussion

The data (Table 1) on the effect harvest of flower stalk on number of days for sprouting of buds in carnation. Harvest of flower stalk at 10 cm height from the ground level registered significantly minimum number of days for sprouting of buds (9.62 days) followed by harvest of flower stalk at 15 cm height (10.88 days), 20 cm height (12.88 days) and at 5 cm height (15.65 days). Among the cultivars studied, cv. Domingo registered significantly minimum number of days for sprouting of buds (11.03 days) compared to Cvs. Dover (12.15 days) and Kiero (13.57 days). Both the cultivars are slow growing in habit and very sensitive to frequent changes in climate due to this both the cultivars might have performed poorly.

The interaction between harvesting heights and cultivars differed significantly on number of days for sprouting of buds. Harvest of flower stalk at 10 cm height from the ground level might have helped in early sprouting of axillary buds which could be due to the fact that the apical dominance in carnation can be removed by harvesting at shorter heights than at longer heights. These results are in conformity with [5] in chrysanthemum cv. Rao et al. [6] in carnation pinching at 10 cm height recorded early sprouting of buds in cv. Domingo than other Cvs. Angelica and Golden Boy.

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| Treatments | Number of days for sprouting of buds after harvest (days) |                    |                     |                    | Number of buds sprouted per node |                   |                     |                   | Number of buds sprouted per plant |                   |                     |                   |
|------------|---|--------------------|---------------------|--------------------|----------------------------------|-------------------|---------------------|-------------------|-----------------------------------|-------------------|---------------------|-------------------|
|            | Cultivars   |                    |                     |                    | Cultivars                        |                   |                     |                   | Cultivars                         |                   |                     |                   |
|            | Domingo   | Keiro              | Dover               | Mean               | Domingo                          | Keiro             | Dover               | Mean              | Domingo                           | Keiro             | Dover               | Mean              |
| 5 cm       | 14.08 <sup>a</sup>  | 17.38 <sup>c</sup> | 15.50 <sup>b</sup>  | 15.65 <sup>d</sup> | 1.05                             | 1.01              | 1.02                | 1.02 <sup>c</sup> | 2.20                              | 2.05              | 2.10                | 2.11 <sup>d</sup> |
| 10 cm      | 8.68 <sup>a</sup>   | 10.40 <sup>c</sup> | 9.80 <sup>b</sup>   | 9.62 <sup>a</sup>  | 1.20                             | 1.05              | 1.10                | 1.12 <sup>a</sup> | 3.60                              | 3.20              | 3.26                | 3.35 <sup>c</sup> |
| 15 cm      | 9.97 <sup>a</sup>   | 12.16 <sup>c</sup> | 10.51 <sup>b</sup>  | 10.88 <sup>b</sup> | 1.08                             | 1.03              | 1.05                | 1.05 <sup>b</sup> | 4.23                              | 4.10              | 4.20                | 4.17 <sup>b</sup> |
| 20 cm      | 11.40 <sup>a</sup>  | 14.36 <sup>c</sup> | 12.78 <sup>b</sup>  | 12.85 <sup>c</sup> | 1.10                             | 1.02              | 1.05                | 1.05 <sup>b</sup> | 5.23                              | 5.10              | 5.10                | 5.14 <sup>a</sup> |
| Mean       | 11.03 <sup>a</sup>  | 13.57 <sup>c</sup> | 12.15 <sup>b</sup>  | 12.25              | 1.10 <sup>a</sup>                | 1.03 <sup>b</sup> | 1.05 <sup>b</sup>   | 1.05              | 3.81 <sup>a</sup>                 | 3.61 <sup>b</sup> | 3.66 <sup>b</sup>   | 3.69              |
|            | Cultivars   | Heights            | Cultivars x Heights |                    | Cultivars                        | Heights           | Cultivars x Heights |                   | Cultivars                         | Heights           | Cultivars x Heights |                   |
| SEm ±      | 0.06  | 0.07               | 0.13                |                    | 0.01                             | 0.02              | 0.03                |                   | 0.04                              | 0.06              | 0.09                |                   |
| CD (5%)    | 0.20  | 0.23               | 0.40                |                    | 0.05                             | 0.06              | --                  |                   | 0.13                              | 0.15              | --                  |                   |

Table 1: Effect of harvesting at different heights on sprouting of buds in three cultivars of carnation.

| Treatments | Length of lateral at 80 days after harvest of flower stalk |                    |                     |                    | Internodal length at the time of harvest of flower stalk |                   |                     |                   |
|------------|--|--------------------|---------------------|--------------------|--|-------------------|---------------------|-------------------|
|            | Cultivars  |                    |                     |                    | Cultivars  |                   |                     |                   |
|            | Domingo  | Keiro              | Dover               | Mean               | Domingo  | Keiro             | Dover               | Mean              |
| 5 cm       | 52.18 <sup>a</sup>   | 45.30 <sup>b</sup> | 47.56 <sup>b</sup>  | 48.35 <sup>d</sup> | 6.80   | 6.03              | 6.30                | 6.37 <sup>c</sup> |
| 10 cm      | 74.53 <sup>a</sup>   | 59.36 <sup>c</sup> | 62.30 <sup>b</sup>  | 65.40 <sup>a</sup> | 7.80   | 7.30              | 7.40                | 7.50 <sup>a</sup> |
| 15 cm      | 71.31 <sup>a</sup>   | 55.33 <sup>c</sup> | 61.00 <sup>b</sup>  | 62.55 <sup>b</sup> | 7.35   | 6.90              | 7.21                | 7.15 <sup>b</sup> |
| 20 cm      | 57.23 <sup>a</sup>   | 50.88 <sup>b</sup> | 52.33 <sup>b</sup>  | 53.48 <sup>c</sup> | 7.20   | 6.70              | 7.16                | 7.04 <sup>b</sup> |
| Mean       | 63.81 <sup>a</sup>   | 52.72 <sup>c</sup> | 55.79 <sup>b</sup>  | 57.44              | 7.28 <sup>a</sup>  | 6.75 <sup>c</sup> | 7.04 <sup>b</sup>   | 7.01              |
|            | Cultivars  | Heights            | Cultivars x Heights |                    | Cultivars  | Heights           | Cultivars x Heights |                   |
| SEm ±      | 0.46   | 0.53               | 0.92                |                    | 0.09   | 0.10              | 0.19                |                   |
| C.D        | 1.36   | 1.57               | 2.72                |                    | 0.28   | 0.32              | --                  |                   |

Table 2: Effect of harvesting at different heights on length of lateral (cm) and internodal length (cm) in three cultivars of Carnation.

The data (Table 1) also revealed that the number of buds sprouted per node in carnation has differed significantly due to harvesting at different heights and cultivars. Harvest of flower stalk at 10 cm height recorded maximum number of buds sprouted per node (1.12). The influence of harvesting on number of buds sprouted per harvested stalk was significant (Table 1). The maximum number of buds sprouted per harvested stalk was recorded with harvest of flower stalk at 20 cm height (5.14). Harvest of flower stalk at 20 cm height could help to break apical dominance in carnation which might have resulted in sprouting of more number of axillary buds. Similar results were observed in rose by Uma and Gowda [7] these results are in conformity with Beniwal et al. [8] in chrysanthemum and Narayana Gowda and Jayanth [9] in China aster.

The data on effect of harvesting on length of lateral and internodal length of lateral are presented in Table 2. There were significant differences in length of lateral at 80 days after harvest of flower stalk of carnation due to harvesting at different heights, cultivars and their interaction. Harvest of flower stalk at 10 cm height registered maximum length of lateral (65.40 cm) which was significantly superior to rest of the treatments. As the number of laterals per shoot was reduced the nutrient supplied through the roots to the individual shoot on a plant was much more with harvesting at shorter heights as compared with harvesting of flower stalk at higher levels. These results are in conformity with Jadhav et al. [10] in rose cv. First Red and Malhotra and Kumar [11] in rose cv. Raktagandha. Similar results were also observed by Nanjan and Muthuswamy [12] in Edward rose and Rao et al. [6] in carnation.

The internodal length of lateral at the time of harvest of flower stalk of carnation was significant due to harvesting at different heights and cultivars. Maximum internodal length of lateral (7.50 cm) was recorded with harvesting at 10 cm height which was significantly superior to other treatments. Out of the three cultivars studied, maximum

internodal length was observed in cv. Domingo (7.28 cm) which was significantly superior to Cvs. Dover (7.04 cm) and Keiro (6.75 cm). The maximum internodal length might be due to early sprouting of buds and better utilization of resources that might have resulted in better internodal length. Harvesting at lower nodes resulted in less number of flower stalks in turn supply of more food reserves to flowers leading to maximum internodal length. These results are in conformity with Mukhopadhyay et al. in rose cv. Happiness.

The data on number of days to first flower bud appearance in carnation (Table 3) 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 Keiro (110.01 days) respectively. It could be due to early physiological maturity of shoots after harvest. These results are in conformity with Arora and Khanna [13] in marigold cv. African Giant Double Orange. According to Ubukata [14] 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

| 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 <sup>a</sup>                       | 146.60 <sup>b</sup> | 137.70 <sup>a</sup> | 139.71 <sup>d</sup> | 148.16 <sup>a</sup>              | 160.23 <sup>b</sup> | 151.20 <sup>a</sup> | 153.20 <sup>d</sup> | 155.20 <sup>a</sup>       | 167.05 <sup>b</sup> | 157.23 <sup>a</sup> | 159.82 <sup>d</sup> |
| 10 cm      | 101.16 <sup>a</sup>                       | 110.01 <sup>c</sup> | 104.33 <sup>b</sup> | 105.17 <sup>a</sup> | 115.66 <sup>a</sup>              | 125.16 <sup>c</sup> | 119.53 <sup>b</sup> | 120.01 <sup>a</sup> | 122.23 <sup>a</sup>       | 132.30 <sup>c</sup> | 126.50 <sup>b</sup> | 127.01 <sup>a</sup> |
| 15 cm      | 110.16 <sup>a</sup>                       | 128.33 <sup>c</sup> | 121.50 <sup>b</sup> | 120.00 <sup>b</sup> | 124.11 <sup>a</sup>              | 142.16 <sup>c</sup> | 135.10 <sup>b</sup> | 133.79 <sup>b</sup> | 131.46 <sup>a</sup>       | 149.50 <sup>c</sup> | 142.85 <sup>b</sup> | 141.27 <sup>b</sup> |
| 20cm       | 123.56 <sup>a</sup>                       | 133.06 <sup>c</sup> | 127.43 <sup>b</sup> | 128.02 <sup>c</sup> | 130.33 <sup>a</sup>              | 147.63 <sup>c</sup> | 141.30 <sup>b</sup> | 142.08 <sup>c</sup> | 144.26 <sup>a</sup>       | 155.45 <sup>c</sup> | 148.80 <sup>b</sup> | 149.50 <sup>c</sup> |
| Mean       | 119.97 <sup>a</sup>                       | 129.50 <sup>c</sup> | 122.74 <sup>b</sup> | 121.45              | 131.31 <sup>a</sup>              | 143.80 <sup>c</sup> | 136.70 <sup>b</sup> | 137.27              | 138.29 <sup>a</sup>       | 151.07 <sup>c</sup> | 143.85 <sup>b</sup> | 144.40              |
|            | Cultivars                                 | Heights             | Cultivars x Heights |                     | Cultivars                        | Heights             | Cultivars x Heights |                     | Cultivars                 | Heights             | Cultivars x Heights |                     |
| SEm ±      | 0.58                                      | 0.67                | 1.17                |                     | 0.65                             | 0.75                | 1.31                |                     | 0.71                      | 0.82                | 1.43                |                     |
| CD (5%)    | 1.71                                      | 1.98                | 3.43                |                     | 1.92                             | 2.22                | 3.86                |                     | 2.08                      | 2.41                | 4.17                |                     |

**Table 3:** Effect of harvesting at different heights on days for flowering to harvesting in three cultivars of carnation.

flower bud (86.52 days) due to early breakage of apical dominance Rao et al. [6] 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 (Table 1). 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. [15] in marigold cv. Pusa Narangi Gaiinda.

The data (Table 3) 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. [6] in carnation.

The data presented in Table 4 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) which was on 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. These results are in conformity with Dubois and Devries [16] in rose cv. Minima and Borreli [17] in rose cv. Superstar and with Grawal et al. [18] 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 [7] in rose cv. Superstar.

The data (Table 4) 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 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 [11] in rose cv. Raktagandha that pruning at 60 cm length resulted in production of maximum number of flowers. Prasanna et al. [19] 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 [20].

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 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.

| 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 <sup>a</sup>                                 | 71.86 <sup>b</sup> | 73.43 <sup>b</sup>  | 74.87 <sup>d</sup> | 2.61   | 2.32              | 2.48                | 2.47 <sup>d</sup> | 6.00 <sup>a</sup>                           | 5.26 <sup>b</sup>  | 5.86 <sup>a</sup>   | 5.70 <sup>d</sup>  | 11.20                          | 10.06              | 8.71                | 9.99 <sup>c</sup>  |
| 10 cm      | 98.30 <sup>a</sup>                                 | 80.33 <sup>b</sup> | 84.36 <sup>b</sup>  | 87.66 <sup>a</sup> | 3.26   | 2.82              | 3.09                | 3.05 <sup>a</sup> | 8.77 <sup>a</sup>                           | 8.33 <sup>c</sup>  | 8.53 <sup>b</sup>   | 8.54 <sup>c</sup>  | 14.00                          | 11.50              | 10.00               | 11.83 <sup>a</sup> |
| 15 cm      | 92.29 <sup>a</sup>                                 | 79.53 <sup>b</sup> | 81.30 <sup>b</sup>  | 84.37 <sup>b</sup> | 3.15   | 2.71              | 2.89                | 2.91 <sup>b</sup> | 10.01 <sup>a</sup>                          | 9.72 <sup>b</sup>  | 9.89 <sup>b</sup>   | 9.87 <sup>b</sup>  | 12.00                          | 10.84              | 10.16               | 11.00 <sup>b</sup> |
| 20cm       | 84.80 <sup>a</sup>                                 | 76.70 <sup>b</sup> | 77.83 <sup>b</sup>  | 79.77 <sup>c</sup> | 3.03   | 2.60              | 2.88                | 2.83 <sup>c</sup> | 11.98 <sup>a</sup>                          | 11.63 <sup>c</sup> | 11.80 <sup>b</sup>  | 11.80 <sup>a</sup> | 11.80                          | 10.76              | 9.00                | 10.52 <sup>b</sup> |
| Mean       | 88.68 <sup>a</sup>                                 | 77.10 <sup>b</sup> | 79.23 <sup>b</sup>  | 81.67              | 3.01 <sup>a</sup>                              | 2.61 <sup>c</sup> | 2.83 <sup>b</sup>   | 2.81              | 9.19 <sup>a</sup>                           | 8.73 <sup>c</sup>  | 9.02 <sup>b</sup>   | 8.97               | 12.25 <sup>a</sup>             | 10.79 <sup>b</sup> | 9.46 <sup>c</sup>   | 10.88              |
|            | Cultivars  | Heights            | Cultivars x Heights |                    | Cultivars                                      | Heights           | Cultivars x Heights |                   | Cultivar                                    | Heights            | Cultivars x Heights |                    | Cultivars                      | Heights            | Cultivars x Heights |                    |
| SEm ±      | 0.58   | 0.67               | 1.16                |                    | 0.01   | 0.01              | 0.02                |                   | 0.02  | 0.03               | 0.05                |                    | 0.24                           | 0.28               | 0.48                |                    |
| CD(5%)     | 1.71   | 1.98               | 3.43                |                    | 0.04   | 0.04              | --                  |                   | 0.08  | 0.09               | 0.16                |                    | 0.71                           | 0.82               | --                  |                    |

**Table 4:** 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.

## Conclusion

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

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