



EVALUATION OF CARNATION (*DIANTHUS CARYOPHYLLUS* L.) VARIETIES UNDER NATURALLY VENTILATED POLYHOUSE

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Abstract

Nine varieties of carnations were evaluated for vegetative, quality and yield parameters under naturally ventilated poly house condition in Allahabad agro-climatic condition. The results revealed that variety Irene was recorded with maximum plant height (109.49 cm), internodal length (8.12 cm). No. of shoots (8.46), flower length (5.91) flower stalk length (98.07cm), highest no. of cut flower stalks (8.06) number of cut flower stalk per square meter (193.44), vase life (13.93), highest benefit to cost ratio (4.91). The days taken for bud initiation (79.53), days to bud opening (93.53) was recorded minimum in Irene. Maximum no. of leaves (169.46), maximum days to bud opening (123.33) was recorded in Eskimo. Leaf length (22.07 cm), No. of internodes (16.13), Flower stalk girth (8.49 mm) was recorded maximum in Farida. Maximum bud length (4.10 cm), flower diameter was recorded in Manuela (8.22 cm). Based on the findings of the experiment it is concluded that the variety Irene is found to be the promising variety with respect to growth, quality, earliness to flowering maximum no. of flowers per plant, maximum no. of flowers per meter square, and benefit cost ratio.

Key words: Carnation, varieties, poly house.

Introduction

Carnation is one of the most important cut flower of the world. Carnation (*Dianthus caryophyllus* L.) belongs to the family *Caryophyllaceae* having diploid chromosome number $2n=30$. It is grown in several parts of the world and is believed to be the native of Mediterranean region. There are 280 species of carnation and are found from Siberia to Arctic America, Japan, and in Himalayas, where blooms spring when long days and congenial temperature is found. The centre of origin of carnation is considered to be Spain. Some species are native to Hungary and Alps region. Carnation is a flowering annual but in reality it is treated as biennial and succeeds well as such. According to Theophrastus it was in cultivation in Greece as early as in 300 B.C. it is being cultivated for more than 2000 years. There are several distinct type of carnations and each of these can be grown successfully in cooler parts of the plains and at medium-to- high elevations. It is popular as cut flower on account of its exquisite shape, wide range of colours, good vase

life and light in weight which makes it ideal for distant market. Its common name carnation was taken from Latin word carnation-carnis which means flesh colour on account of similarity of original colour of carnation and it is also derived from coronation as the carnation flower which were being used in decorating the crown of athletes. The generic word Dianthus is from Greek word Dios which means divine and Anthos means flower. The species name caryophyllus has been given after generic name of the clove tree- *Caryophyllus aromaticus* which means caryon- nuts; phyllon-leaf, due to resemblance of fragrance of carnation flowers to clove. It is popular as cut flower on account of its exquisite shape, wide range of colours, good vase life and light in weight which makes it ideal for distant market.

Carnation plants are half hardy herbaceous perennial. The flowers are solitary, terminally formed; the petals are broad with frilled margins and the calyx cylindrical with bracts at the base. The hybrids involving many *Dianthus* species are of perpetual flowering types. The florist's Carnations are grouped into two major classes

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such as 'Standard' and 'Spray'. The standard type produces larger blooms on longer flower stalks. On the other hand the spray type produces many flowers of smaller size with weaker stem. Carnations are generally classified as border carnation and picotees which is sub divided into self, bizzares and flakes, picotees, fancies next category is perpetual flowering and maguerite carnations,. The commercial Carnation plant is capable of producing 10-20 flowers per year. Each flowering stem originates from a 'break' or shoot that emerges from one side of flower stem node

It is commercially grown in many countries like Columbia, Kenya, Canary island, Italy, Spain, Holland, U.S.A etc. In India, sim carnations are being cultivated in many cities like Nasik, Pune, Bengaluru, Ludhiana, Solan and Shimla etc.

Carnation does not likes extreme of temperature and has been classified as cool crop. The ideal range of temperature for carnation is considered to be 10-20°C and exposure of plant to 7°C favours development of branches. Sunlight for 12 hours and humidity in the range of 50-60% is considered very favourable for growth of plants as well as flower development. Carnations require sufficient amount of light and proper ventilation to produce high quality flowers and therefore design and orientation of greenhouse are of greater importance. Ventilation plays an important part at all times of the year and especially during warm summer weather in order to reduce temperature; it is necessary to fit the greenhouses with adequate number of ventilators. It should be equipped with heating and cooling systems that will maintain the required interior temperature. Evaporative cooling is now a standard method of lowering greenhouse temperatures during spring, summer and fall.

Yield and quality of cut flowers are influenced by many pre-harvest and postharvest treatments. The factors influencing pre-harvest yield and quality may include environmental conditions such as light, temperature, season, relative humidity and growing media as well as cultural practices such as irrigation, fertilization, cultivar, supporting, reduction of the buds, and disease and pest management. The crop grown in open field is exposed to aberration of environmental conditions and attack by different pest and diseases, resulting in poor quality flowers.

The performance of carnation varieties varies with region, season, genotypes and growing environment. In India, there is a wide fluctuation in temperature, light intensity and humidity which not only affect the yield and quality of flowers but also limit their availability for a

particular period of a year Gharge *et al.* (2012). Hence it is necessary evaluate carnation genotypes under different geographical area or regions of the country.

Materials and Methods

Nine standard carnation varieties *viz.*, Liberty, Manuela, Farida, Irene, Gwenn, Amado, White liberty, Gaudina, Eskimo were evaluated for their growth, flowering, quality and yield attributes. Flat beds of 1m width and 10 m length with a walking path of 40cm in between beds were made under naturally ventilated polyhouse. The experiment was conducted under naturally ventilated polyhouse in the Department of Horticulture, Sam Higginbottom University of agriculture technology and sciences, Allahabad, during 2016-2017. Experiment was designed in randomized block design with nine varieties as treatments and three replications. The rooted cuttings of nine varieties were planted in two rows on a bed with spacing of 15 × 15 cm. Support with five layers of net was provided and the nets were shifted according to the growth. Single pinching was done in all the varieties when they attained a six node stage. The data were recorded for growth, flowering, quality, yield attributes after 30, 60, 90 and 120 DAT. The data collected from five randomly selected tagged plants were subjected to statistical analysis.

Results and Discussion

Significant variations were observed among the varieties with growth, flowering, quality and yield parameters. Plant height is an important factor for carnation cutflowers since they influence the stalk length of the cutflowers. Variety Irene (109.49cm) was recorded with superior plant height followed by variety Manuela (106.84cm) and minimum plant height was recorded in variety Gwenn (84.09 cm) differences in plant height was similar to the findings of Kumar and Singh (2003), Ramesh Kumar and Kartar Singh (2003), Shahakar and Sable (2003), Dwivedi and Kareem (2004). Maximum number of leaves was recorded in variety Eskimo (169.46) followed by White liberty (165.33) which is at par with variety Gwenn (162.93). And the minimum number of leaves was recorded in variety Farida (129.66). This may be influenced by the height of the plant and no. of internodes. These findings with respect to number of leaves were in conformity with the findings of Kumar and Singh (2003b), Patil *et al.* (2001) Shiragur *et al.* (2004a), Sarkar and Sharma (2016). Maximum no. of shoots was recorded in variety Irene (8.46) which is at par with variety Liberty (8.33) and variety Gwenn (8.26). And the minimum was recorded in variety Farida (6.33) which is at par with variety Amado (6.46) and variety

Manuela (6.53). This may be due to the effect of pinching. Single pinching was done in all the varieties when they attained six leaf stage. Similar findings were recorded by Tarannum and Hemla (2014). No. of internodes was recorded maximum in variety Farida (16.13) followed by variety Gaudina (15.46). Minimum no. of internodes was recorded in variety Liberty (12.06) is followed by variety Gwenn (12.73) and variety Eskimo (12.73) which were at par with each other. Maximum intermodal length was recorded in variety Irene (8.12 cm) followed by variety Manuela (7.93 cm) which is at par with variety Farida (7.93 cm). Shortest intermodal length was recorded in variety White liberty (4.86 cm) which is at par with variety Gwenn (5.00 cm). Vegetative parameters *viz.*, plant height (109.49 cm), no. of shoots per plant (8.46), intermodal length (8.12 cm) were recorded maximum in variety Irene. Irene was significantly superior over other varieties with respect to vegetative parameters except no. of leaves and no. of internodes.

The days taken for bud initiation was recorded minimum in variety Irene (79.53) followed by variety Gwenn (85.06) and variety Manuela (85.86). Maximum days to bud initiation was recorded in variety Eskimo (107.13) followed by variety Gaudina (97.56). Days to bud opening was recorded minimum in variety Irene (14.85), followed by variety Manuela (15.38) which is at par with variety Gwenn (15.69). The long duration variety was Liberty (21.10). Variety Irene was superior with respect to flowering parameters. Similar differences in days to bud initiation and bud opening was observed by Patil (2001), Ramesh Kumar and Kartar Singh (2003), Sahakar *et al.* (2003), Gurav *et al.* (2004), Reddy *et al.* (2004).

Quality parameters were recorded with significant variations among the varieties. Maximum bud length was recorded in variety Manuela (4.10 cm), followed by variety Irene (4.01 cm) and the shortest bud length was recorded in variety White liberty (2.25cm) followed by variety Liberty (2.56cm). Bud diameter was observed maximum in variety Gaudina (3.15) followed by variety Eskimo (2.92) which is at par with variety Irene (2.91). Minimum bud diameter was recorded in variety Gwenn (2.14) which is at par with variety White liberty (2.16). The differences in bud diameter among varieties grown in naturally ventilated polyhouse was recorded by Maitra and Roychowdhury (2013), Tarannum and Hemla (2012). Maximum flower length was recorded in variety Irene (5.91), followed by variety Gaudina (5.84). And the minimum was recorded in variety Amado (4.24) followed by variety Gwenn (4.30). This may be attributed to the varietal characters. Maximum flower diameter was recorded

in variety Manuela (8.22), which is at par with variety Farida (8.16). Minimum flower diameter was recorded in variety Gaudina (5.78). Differences in flower diameter may be due to the growing environment and the genetic characters of the variety, which is in close proximity with the findings of Reddy *et al.* (2004), Gurav *et al.* (2004). Flower stalk length is very important quality trait which decides the quality of Carnation as a cut flower. Maximum stalk length was recorded in variety Manuela (98.07 cm) followed by variety Farida (91.02) which is statistically superior to other varieties. And the minimum was recorded in variety Liberty (74.13) followed by variety Gwenn (78.18). The difference in stalk length among the different varieties may be attributed to the inherent genetic

Table 1: Vegetative parameters of carnation varieties grown under naturally ventilated polyhouse.

Varieties	Plant height	No. of leaves per plant	No. of shoots per plant	No. of internodes	Inter-nodal length
Liberty	85.22	158.93	8.33	12.06	6.44
Manuela	106.84	155.06	6.53	15.06	7.93
Farida	94.01	129.46	6.33	16.13	7.63
Irene	109.49	154.43	8.46	14.26	8.12
Gwenn	84.09	162.93	8.26	12.73	5.00
Amado	88.04	159.06	6.46	14.86	7.51
White liberty	85.96	165.33	6.73	14.73	4.86
Gaudina	89.82	159.86	6.86	15.46	5.48
Eskimo	96.62	169.46	6.8	12.73	7.41
F-test	S	S	S	S	S
S. Ed. (±)	0.23	1.25	0.19	0.16	0.08
C. D. at 5 %	0.48	2.65	0.41	0.34	0.17

Table 2: Flowering and yield parameters of carnation varieties grown under naturally ventilated polyhouse.

Varieties	Days to flower bud initiation	Days to flower bud opening	No. of cut flower stalks per plant	No. of cut flower stalks per square meter
Liberty	87.66	21.10	5.93	142.26
Manuela	85.86	15.38	6.73	160.79
Farida	93.33	19.52	5.26	126.24
Irene	79.53	14.85	8.06	193.36
Gwenn	85.06	16.66	7.93	190.38
Amado	88.73	15.69	6.26	150.26
White liberty	90.06	18.38	6.53	154.74
Gaudina	97.56	20.13	6.33	151.90
Eskimo	107.13	19.96	6.26	150.24
F-test	S	S	S	S
S. Ed. (±)	0.36	0.26	0.17	0.94
C. D. at 5 %	0.77	0.55	0.35	1.99

Table 3: Quality parameters of carnation varieties grown under naturally ventilated polyhouse.

Varieties	Bud length (cm)	Bud diameter (cm)	Flower length (cm)	Flower diameter (cm)	Flower stalk length (cm)	Flower stalk girth(mm)	Vase life (days)
Liberty	2.56	2.49	5.39	6.61	78.18	19.08	12.73
Manuela	4.10	2.79	5.56	8.22	91.02	22.15	13.06
Farida	3.25	2.37	5.14	8.16	88.07	26.49	11.06
Irene	4.01	2.91	5.91	7.84	98.07	22.91	13.93
Gwenn	2.79	2.14	4.30	6.39	74.13	12.61	10.13
Amado	3.16	2.51	4.24	7.22	84.01	18.49	11.33
White liberty	2.25	2.16	5.73	6.26	80.13	17.91	10.53
Gaudina	2.57	3.15	5.84	5.78	81.42	16.11	12.46
Eskimo	3.58	2.92	4.84	6.59	84.64	15.07	10.33
F-test	S	S	S	S	S	S	S
S. Ed. (±)	0.01	0.05	0.02	0.03	0.11	0.08	0.20
C. D. at 5 %	0.03	0.12	0.04	0.06	0.23	0.18	0.43

characters associated with the genotypes and also due to the growing environmental conditions as reported by Singh and Sangama (2003), Shahakar *et al.* (2004), Dalal *et al.* (2009). Maximum stalk girth was recorded in variety Farida (26.49mm) followed by variety Irene (22.91mm). Minimum stalk girth was observed in variety Gwenn (12.61mm) followed by variety Eskimo (15.07mm). This may be attributed to genetic characters or physiological differences among the genotypes. Similar findings were recorded by Patil (2001), Ryagi *et al.* (2007), Shiragur *et al.* (2004). Vase life is an important factor which decides the demand of cut flowers for commercial cultivation. Maximum vase life was recorded in variety Irene (13.93), followed by variety Manuela (13.06). Minimum vase life was observed in variety Gwenn (10.13) which is statistically at par with variety Eskimo (10.33) and variety White liberty (10.53). Variations in vase life among different varieties may be attributed to the variations in rate of production of ethylene and sensitivity of the varieties to ethylene which results in senescence. Differences in vase life among different varieties were reported by Krishnappa *et al.* (2000), Chikkasubbanna and Sharada (2002), Sumanbhatia *et al.* (2002).

Yield parameters decide the suitability of a variety for commercial cultivation. Highest no. of cut flower stalk per plant was obtained in variety Irene (8.06) which is at par with variety Gwenn (7.93). Minimum no. of flower stalks were obtained from variety Farida (5.26), followed by variety Liberty (5.93). This may be due to the no. of productive shoots produced and the growing environment. Similar differences in number of cut flowers were noted by Gurav *et al.* (2004), Dalal *et al.* (2009), Tarannum and Hemla (2012), Singh *et al.* (2013). Number of cut flower stalk per square meter was obtained maximum in variety Irene (193.44) followed by variety Gwenn

(190.32). And the lowest no. of flower stalks was recorded in variety Farida (126.24) followed by variety Liberty (142.32).

Conclusion

Based on the findings of the experiment it is concluded that the variety Irene is found to be the promising variety with respect to vegetative parameters *viz.*, plant height (109.49 cm), no. of shoots per plant (8.46), intermodal length (8.12 cm). Flowering parameters *viz.*, days to bud initiation (79.53 days), days to bud opening (14.85 days). Quality parameters *viz.*, flower length (5.91cm) and vase life (13.93 days). Yield parameters such as no. of cutflower stalk per plant (8.06) and no. of cut flower stalks per meter square (193.44), was also recorded superior in variety Irene. This variety is suitable for commercial cultivation under naturally ventilated polyhouse in Allahabad agro climatic condition.

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