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Performance of standard carnation varieties for flowering and flower quality parameters under naturally ventilated polyhouse

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Abstract : The experiment was carried out under naturally ventilated polyhouse for investigation on evaluation of ten varieties of carnation (*Dianthus caryophyllus* L.) with respect to flowering and flower quality parameters. Varieties Diana, Yellow Firato and Aicardi were found early to initiate flower buds and opening of flower buds. Varieties Diana, Yellow Firato and Aicardi recorded longer duration of flowering as compared to rest of varieties. Firato, Gaudina, Buemonde and Dali required comparatively less period for development of flower buds. In general Diana, Firato, Aicardi and Gaudina were early varieties. In case of flower qualities, flower stalk length was highest in variety Yellow Firato, followed by Diana, Firato and Pink Shiva, whereas the girth of flower stalks was highest in variety Pink Shiva, followed by Guadiana and Viking. Varieties Gaudina, Aicardi, Alibaba and Diana recorded higher diameter of flowers. Number of petals was highest in variety Pink Shiva, followed by Guadiana and Viking. Pink Shiva, Aicardi, Guadiana and Viking recorded higher vase life. The weight of flower was highest in variety Pink Shiva, followed by Gaudina, Viking and Firato. In general high quality flowers were obtained in Diana, Yellow Firato, Firato, Aicardi and Pink Shiva.

Key words : Carnation, Polyhouse, Flowering characters, Quality.

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India has been identified as one of the major forces in the world floriculture scenario. In Karnataka apart from Bangalore, the entire part of transitional belt seems to be very ideal for cultivation of flowers on account of favourable climate, soil and other factors. In Pune and Bangalore, carnation is grown under controlled condition. Standard carnation performs well under cool climate, whereas spread type grow better at higher temperature. Though there are different types of greenhouses, naturally ventilated polyhouses are preferred in mild climate in which temperature is reduced by ventilation (Ryagi *et al.*, 2007).

The performance of carnation varieties varies with region, season, genotypes and growing environment. In India, depending upon region there is a wide difference 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. It is necessary to grow carnation under polyhouse condition for obtaining good quality flowers. Testing of the available varieties

for suitability and adaptability with respect to flowering and flower quality parameters are of prime importance.

RESEARCH METHODS

The investigation was carried out at the Hi-Tech Horticulture Unit, Saidapur farm, Main Agricultural Research Station, University of Agricultural Sciences, Dharwad under naturally ventilated polyhouse during February, 2008 to August, 2008 for second flush. The experiment was laid out in Randomized Block Design (RBD) with three replications. Experiment included ten standard carnation varieties of which five varieties *viz.*, Gaudina, Viking, Buemonde, Firato and Yellow Firato were from KF Bio plant Pune, while remaining five varieties *viz.*, Diana, Pink Shiva, Aicardi, Alibaba and Dali were from SPA Flora, Bangalore.

The support was provided by iron rods at 3 m distance to both side of the bed and wire of 15 cm x

15cm mesh supported by stacks at the corner of beds. The three layers of mesh were laid together on the soil surface. The data were collected on of flowering and flower quality parameters. Five plants were selected at random and tagged in each treatment and replication. The mean value of the data observed was taken to represent a particular genotype with respect to character. The data pertaining to biometric parameters *viz.*, flowering and flower quality parameters recorded during the experimental period were tabulated treatment and replication wise and statistically analysed.

RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarised under following heads:

Flowering characters:

Data presented in Table 1 showed significant differences in different carnation varieties with respect to flowering characters. The number of days for flower bud initiation was recorded minimum in variety Diana (67.58 days) and significantly differed over rest of varieties, whereas variety Firato (96.72 days) was last to initiate variable buds, followed by Gaudina (91.47 days) and Buemonde (89.59 days). Similar variations due to varieties were also observed by Mahesh (1996), Sathisha (1997), Patil (2001) and Shiragur (2002). These variations for flower bud initiation may be attributed to genetical make up of varieties as reported by Reddy *et al.* (2004).

The variety Diana (88.54 days) was the earliest to open its buds, followed by Yellow Firato (94.55 days) and Viking (99.52 days), whereas varieties Firato (114.6 days) and Gaudina (113.6 days) were very late for flower bud

opening. Varieties Buemonde (109.6 days), Alibaba (108.5 days) and Aicardi (105.5 days) were medium duration types with respect to days taken for bud opening. In varieties Diana and Yellow Firato, flower bud initiation was early hence, flower bud opening was also early, whereas in variety Firato and Gaudina flower bud initiation was late hence, there was delay in flower bud opening. Similar variation was also observed previously by Patil (2001) and Shiragur *et al.* (2002).

Flower bud development was early in the variety Viking (14.24 days), followed by Yellow Firato (15.06 days). Varieties Aicardi (25.09 days) and Dali (24.05 days) took maximum time for flower bud development. Flower bud development was moderately late in varieties Gaudina (22.06 days), Diana (21.24 days) and Buemonde (20.27 days). Variations among varieties were also observed in carnation previously by Mahesh, (1996), Sathisha, (1997), Shiragur *et al.* (2002) and Krishnappa *et al.* (2000).

Among the ten varieties evaluated variety Diana (180 days) exhibited free-flowering nature (flowers throughout the season), followed by Aicardi (166.5 days) and Viking (162.6 days), whereas varieties Firato (151.8 days), Gaudina (156.2 days) and Dali (159.1 days) recorded minimum duration of flowering. These variations in flower duration due to varieties was also observed by Patil (2001), Shiragur (2002) and Dwivedi and Kareem (2004). The varieties Diana and Yellow Firato were early to reach their peak growth and as a result they initiate flowering earlier when compared to other varieties. Whereas, varieties Firato Gaudina and Buemonde initially exhibited slow growth and were late in their flowering. These variations were also observed by Kallihal (2005), Shiragur (2002) and Gopinath (2001).

Table 1 : Number of days required for different reproductive growth in different varieties of carnation grown under greenhouse

Treatments	Days to flower bud initiation	Days to bud opening	Days to bud development	Duration of flowering (days)
T ₁ : Gaudina	91.47	113.56	22.06	156.17
T ₂ : Viking	85.43	99.52	14.24	162.59
T ₃ : Buemonde	89.59	109.58	20.27	158.85
T ₄ : Yellow Firato	79.42	94.55	15.06	166.65
T ₅ : Firato	96.72	114.63	18.07	151.84
T ₆ : Diana	67.58	88.54	21.24	180.12
T ₇ : Pink Shiva	87.38	105.12	18.08	159.54
T ₈ : Aicardi	80.51	105.51	25.09	166.50
T ₉ : Alibaba	85.42	108.46	23.07	161.72
T ₁₀ : Dali	88.21	112.22	24.05	159.08
Mean	85.17	105.17	20.12	162.31
S. E. ±	0.76	0.69	2.26	0.63
C.D. (P=0.05)	2.27	2.05	6.72	1.88

Flower quality parameters:

Flower quality parameters decide the significance of suitability of the particular variety for commercial cultivation. The important biometric characters deciding the size and nature of flowers are stalk length, stalk girth, flower diameter, number of petals per flower, flower length, flower weight, calyx slitting and shelf life (Table 2).

Stalk length was maximum in variety Yellow Firato (97.94 cm) and which was superior over other varieties. The next superior variety was Diana (89.84 cm) followed by Firato (89.38 cm), Pink Shiva (86.84 cm) and Gaudina (86.52 cm) and were found at par. Variety Viking recorded minimum stalk length (76.70 cm) and was at par with Alibaba (79.64 cm). Increased number of internodes with increased internodal length resulted in increased stalk length. Variety Viking had shorter Stalk length due to less number of shorter internodes. This is in accordance with the report of Mahesh (1996), Sathisha (1997) and Patil (2001). Variation in stalk length among the carnation varieties was observed previously by Naveenkumar *et al.* (1999) and Singh *et al.* (2001).

Varieties Pink Shiva and Gaudina had strong flower stalks and Yellow Firato and Aicardi had weak flower stalks. It was in the range of 3.66 mm to 5.07 mm. Stalk girth was maximum in variety Pink Shiva (5.07 mm) which was superior over rest of the varieties. Flower stalk girth was minimum in variety Yellow Firato (3.66 mm). Similar influence of flower girth among varieties was also observed previously in carnation by Mahesh (1996), Shiragur (2002), Ryagi *et al.* (2007) and Patil (2001).

Flower diameter was maximum in variety Gaudina

(7.55 cm) which was closely followed by Aicardi (7.46 cm), Alibaba (7.25 cm) and were found at par. It was minimum in variety Yellow Firato (6.27 cm). Similar variations in bud and diameter among the varieties were also observed previously by Naveenkumar *et al.* (1999), Singh and Sangama (2003) and Reddy *et al.* (2004).

Maximum number of petals per flower was recorded in variety Gaudina (74.18). The varieties Aicardi (70.53) and Alibaba (70.19) were at par. It was minimum in variety Yellow Firato (46.36). Varieties Diana (66.39) and Viking (64.23) produced medium number of petals per flower and were at par. It is being genetically controlled character. The number of petals per flower varied among the varieties. It is one of the quality parameters which greatly influence the quality of cut flower density. Similar variation in number of petals per flower was noticed by Patil (2001) and Mahesh (1996).

One of the components of the flower that contributes for the increase in diameter is the flower length. Increase in flower length directly contributed for the higher flower diameter and varied among the different varieties evaluated. Length of flower was maximum in variety Gaudina (5.81) which was at par with varieties Aicardi (5.77 cm), Alibaba (5.74 cm), Diana (5.47 cm), Dali (5.37 cm), Viking (5.32 cm) and Pink Shiva (5.27 cm). The length of flower was found minimum in variety Yellow Firato (5.07 cm), followed by Firato (5.12 cm) and Buemonde (5.21 cm). These results are in accordance with the results of Gurav *et al.* (2004).

Significantly superior variety over others for maximum flower weight was noticed in Pink Shiva (35.08 g). Next superior ones were Gaudina (30.57 g) and Viking

Table 2 : Flower quality characters in different varieties of carnation grown under greenhouse

Treatments	Flower stalk length (cm)	Girth of Flower stalk (mm)	Flower dia. (cm)	No. of petals/ flower	Flower length (cm)	Flower weight (g)	Calyx splitting (%)	Shelf life (Days)
T ₁ : Gaudina	86.52	4.78	7.55	74.18	5.81	30.57	7.18 (2.77)	11.85
T ₂ : Viking	76.70	4.67	6.64	64.23	5.32	29.34	23.09 (4.81)	11.67
T ₃ : Buemonde	83.08	4.62	6.42	56.32	5.21	21.81	4.76 (2.29)	5.15
T ₄ : Yellow Firato	97.94	3.66	6.27	46.36	5.07	28.14	0.51 (1.00)	4.85
T ₅ : Firato	89.38	4.52	6.36	50.36	5.12	27.53	0.94 (1.20)	4.96
T ₆ : Diana	89.84	4.45	6.74	66.39	5.47	25.85	8.51 (3.00)	9.48
T ₇ : Pink Shiva	86.84	5.07	6.54	60.10	5.27	35.08	4.18 (2.16)	15.18
T ₈ : Aicardi	84.61	4.14	7.46	70.53	5.77	23.83	10.34 (3.29)	14.83
T ₉ : Alibaba	79.64	4.34	7.25	70.19	5.74	25.52	0.09 (0.77)	11.06
T ₁₀ : Dali	81.86	4.25	6.67	62.16	5.37	23.36	5.73 (2.50)	6.35
Mean	85.64	4.45	6.79	62.08	5.41	27.10	6.53	9.54
S. E.±	1.52	0.09	0.17	1.13	0.16	0.71	0.21	0.54
C.D. (P=0.05)	4.53	0.28	0.51	3.35	0.48	2.12	0.63	1.61

Figures in the parenthesis indicate square transformed values

(29.34 g) and were found at par. On the other hand minimum flower weight was noticed in Buemonde (21.81 g), followed by Dali (23.36 g) and Aicardi (23.83 g). Variety Viking, Yellow Firato and Firato were at par. Such variations in weight of flower among the varieties were also observed by earlier workers in carnation by Singh *et al.* (2001), Shiragur (2002) and Singh and Sangama (2003). This variation in flower weight among varieties might be attributed to the higher water and carbohydrates level in the flower. Water plays a very important role to maintain flower turgidity, freshness and petal orientation. The ultimate effect of all these factors resulted into strong and long flower stalks, large sized buds or flower and finally increases in flower weight. Similar variations were also recorded previously in carnation (Singh *et al.*, 2001, Singh and Sangama, 2003).

The vase life is one of the important traits which decide its economic value. Shelf-life was maximum in variety Pink Shiva (15.18 days) which was at par with Aicardi (14.83 days). The variety Yellow Firato (4.85 days) had recorded minimum shelf life, followed by Firato (4.96 days), Buemonde (5.15 days) and Dali (6.35 days). The variety Alibaba and Diana (9.48 days) were at par to each other. This variation in vase life among the varieties might be attributed to the variations in accumulation of carbohydrates since, these varieties could produce more number of leaves and indicated positive and significant correlation between these characters. Variation in vase life could also be attributed to fact that, the variation in ability to produce ethylene and sensitivity to it among the different varieties. Similar variation for vase life in varieties was also reported previously in carnation by Mahesh (1996), Sathisha (1997), Krishnappa *et al.* (2000), Singh *et al.* (2007), Shahakar *et al.* (2004) and Patil (2001).

The carnation flowers are badly affected by a serious physiological disorder named calyx splitting. The per cent calyx splitting was low in variety Alibaba (0.09%), followed by Yellow Firato (0.51%) and Firato (0.94%). Calyx splitting percentage was maximum in variety Viking (23.09%). There was significant difference among the varieties Aicardi (10.34%), Diana (8.51%), Gaudina (7.18%) and Dali (5.73) with respect to calyx splitting. There is a negative correlation between the calyx splitting and number of petals. The results are in accordance with the findings of Sathisha (1997), Singh *et al.* (2006) and Shiragur (2002).

Based on present findings, it can be concluded that varieties *viz.*, Yellow Firato, Diana, Firato, Aicardi, and Pink Shiva had emerged as promising varieties with respect to earliness in flowering, and quality during the

second flush of the crop. These varieties are suitable for commercial cultivation under naturally ventilated polyhouse in Northern transitional tract of Karnataka.

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