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Evaluation of Chrysanthemum Cultivars for Cut Flower Production Under Polyhouse Conditions

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ABSTRACT

Chrysanthemum (*Dendranthema grandiflora Tzvelev*) is an economically significant ornamental crop with diverse applications including cut flowers, loose flowers and potted plants. This study evaluated the growth and flowering performance of ten chrysanthemum cultivars under polyhouse conditions at the College of Horticulture, Bagalkot. The experiment followed a Randomized Complete Block Design (RCBD) with three replications and data on key parameters such as plant height, spread, primary branches, stem girth, internodal length, flower count, flower diameter and ray floret dimensions were recorded and statistically analyzed. The results demonstrated significant variability among the cultivars. Bontempi excelled in vegetative growth, recording the highest plant height (122.42 cm), plant spread (N-S: 21.84 cm, E-W: 22.83 cm) and flower production (16.42 flowers per plant). Big White stood out for its flower diameter (7.94 cm) and ray floret length (2.82 cm), while Hamilton showed excellent overall growth and floral traits, including plant height (120.78 cm) and ray floret width (1.8 cm). Cultivars such as Arctic Queen and Champagne Yellow also displayed favorable characteristics, including floral quality and adaptability to polyhouse conditions. The findings underscore the influence of genetic potential and controlled environmental conditions on chrysanthemum performance. Cultivars like Bontempi, Hamilton, Arctic Queen, and Champagne Yellow emerged as highly suitable for commercial polyhouse cultivation due to their superior vegetative growth, flower quality and adaptability. This study provided valuable insights for optimizing chrysanthemum production under controlled environments to meet market demands.

Keywords: Chrysanthemum, Commercial, Floral trait, Morphology, Performance, Polyhouse.

INTRODUCTION

Chrysanthemum (*Dendranthema grandiflora Tzvelev*) is one of the most important ornamental crops, valued for its aesthetic appeal, diverse floral forms and wide applications in floriculture, including cut flowers, loose flowers and potted plants (Thakur *et al*, 2018; Tomar *et al*, 2022). It belongs to the family Asteraceae and is native to the Northern Hemisphere, particularly Europe and Asia, with China credited for its domestication and early hybridization efforts (Thakur *et al*, 2018). Globally, chrysanthemum ranks as the second most significant cut flower after rose, with the Netherlands, Italy, Colombia and the USA leading in its cultivation, largely under greenhouse conditions (Mandal *et al*, 2024).

In India, chrysanthemum is one of the five most commercially important flower crops identified by the All India Coordinated Floriculture Improvement Project (ICAR). The crop covers an area of approximately 11.05 Mha, with Himachal Pradesh leading in cut flower production at 4.65 MT, followed by Assam and Haryana. Its commercial cultivation is widespread, primarily in Maharashtra, Rajasthan and Karnataka, as well as urban centers like Bangalore and Pune, where it is grown for decoration, floral arrangements and exhibitions (Mishra *et al,* 2003).

The adoption of polyhouse cultivation has gained traction in recent years, as this method provides a controlled environment that optimizes key growth factors such as light, temperature and humidity. Polyhouses allow year-round production of high-quality blooms, meeting the growing demand in domestic and export markets (Mandal *et al*, 2024). However, the performance of chrysanthemum cultivars under polyhouse conditions can vary significantly based on genetic potential, environmental conditions and management practices. Therefore, evaluating different chrysanthemum cultivars is essential to identify those with superior traits, such as higher yield, better quality and adaptability for polyhouse production.

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Table 1. Growth Parameters of Cut Chrysanthemum Varieties Under Open Polyhouse Condition.

Variety	Plant height (cm)	Plant Spread (cm)		Primary branches (no.)	Stem girth (cm)	Internodal length (cm)
		NS	EW			
Bontempi	122.42	21.84	22.83	14.16	0.45	4.94
Bright Orange	114.71	20.63	20.75	8.11	0.88	4.64
Champagne Yellow	117.63	19.53	19.71	9.31	0.74	4.55
Feeling Green Dark	110.84	19.61	20.96	10.47	0.8	4.28
Artic Queen	120.07	19.81	20.87	9.57	0.69	4.54
Pink Frost	111.82	18.98	19.65	7.94	0.78	4.15
Hamilton	120.78	20.48	21.49	12.69	0.48	4.89
Lollipop Purple	113.94	20.18	19.53	9.29	0.81	4.52
Big White	116.52	20.58	20.76	8.85	0.93	5.16
Lollipop Pink	112.78	19.93	20.69	9.11	0.79	4.6
S.Em ±	1.85	0.278	0.32	0.18	0.01	0.061
CD at 5%	5.51	0.825	0.94	0.522	0.03	0.180

MATERIALS AND METHODS

An experiment was carried out to assess the growth and flowering characteristics of different chrysanthemum cultivars under polyhouse conditions. The trial was conducted in a polyhouse located at the experimental plot of the Floriculture Department, College of Horticulture, Bagalkot, during the 2024–25 period. The site lies at a latitude of 16.18° N, a longitude of 75.7° E and an elevation of 533 meters above mean sea level. The controlled environment of the polyhouse provided favorable conditions for chrysanthemum cultivation, including regulated light, temperature and humidity, which are crucial for flower development.

The cultivars evaluated included Bontempi, Bright Orange, Champagne Yellow, Feeling Green Dark, Arctic Queen, Pink Frost, Hamilton, Lollipop Purple, Big White and Lollipop Pink. The experiment followed a Randomized Complete Block Design (RCBD) with three replications and 36 plants per plot were selected for observation.

Rooted chrysanthemum cuttings were planted inside the polyhouse, with spacing tailored to suit each cultivar's growth habit. Well-decomposed farmyard manure (FYM) was incorporated at a rate of 2 tons per 560 m² of polyhouse area to improve soil fertility and structure. Nutrient management was adjusted according to the specific requirements of each cultivar to support optimal vegetative and reproductive development. A single pinching was performed 45 days after planting to encourage lateral branching and enhance flowering. Artificial lighting was provided for up to eight weeks during periods of insufficient natural light, ensuring consistent growth and flower production throughout the trial period.

Data were recorded on various growth and floral attributes, including plant height (cm), plant spread in both North–South and East–West directions (cm), number of primary branches, number of flowers per plant, flower diameter (cm), stem girth (cm) and internodal length (cm). Plant height, plant spread and internodal length were measured using a measuring scale, while stem girth and flower diameter were measured with a vernier caliper. The collected data were subjected to statistical analysis to assess the significance of variation among the treatments.

RESULTS AND DISCUSSION

The data pertaining to plant height, plant spread (North–South and East–West directions), number of primary branches, stem girth and internodal length at the grand growth stage (90 d after planting) of different cut chrysanthemum cultivars are presented in Table 1. At this stage, the cultivar Bontempi recorded the significantly highest plant height (122.42 cm), followed by Hamilton (120.78 cm) and Arctic Queen (120.07 cm). Bontempi also exhibited the maximum plant spread, with 21.84 cm in the North–South direction and 22.83 cm in the East–West direction. This was followed by Hamilton with 21.49 cm (E–W) and 20.48 cm (N–S) and Bright Orange with 20.63 cm (N–S) and 20.75 cm (E–W).

In terms of the number of primary branches per plant, Big White recorded the highest (14.16), followed by Hamilton (12.69) and Feeling Green Dark (10.47). Big White also had the greatest stem girth

Table 2. Floral traits of cut chrysanthemum varieties under polyhouse condition.

Variety	Number of flower/plant (no.)	Flower diameter (cm)	Disc Diameter (cm)	Ray floret (cm)	
				Length	Width
Bontempi	16.42	4.4	1.8	2.6	1.82
Bright Orange	9.58	5.7	0	1.97	1.27
Champagne Yellow	8.97	6.23	0	2.38	1.23
Feeling Green Dark	11.42	4.5	0	0.92	0.73
Artic Queen	10.62	7.22	0	2.21	1.63
Pink Frost	9.97	5.32	1.9	1.92	1.56
Hamilton	14.76	4.5	1.68	2.4	1.8
Lollipop Purple	11.31	4.97	0	1.91	1.31
Big White	8.31	7.94	0.53	2.82	1.53
Lollipop Pink	10.14	6.1	0	2.08	1.6
S.Em ±	0.140	0.091	0.015	0.030	0.018
CD at 5%	0.42	0.27	0.046	0.090	0.054

(0.93 cm), followed by Bright Orange (0.88 cm). The maximum internodal length was observed in Big White (5.16 cm), followed by Bontempi (4.94 cm).

The data related to flowering parameters, including the number of flowers per plant, flower diameter, disc diameter and the length and width of ray florets at the grand growth stage (90 d after planting) of different cut chrysanthemum cultivars are presented in Table 2. The cultivar Bontempi recorded the maximum number of flowers per plant (16.42), followed by Bontemp (14.76). The largest flower diameter was observed in Big White (7.94 cm), followed by Arctic Queen (7.22 cm). The maximum disc diameter was noted in Bontempi (1.8 cm), followed by Hamilton (1.68 cm).

With respect to ray floret length, Big White recorded the highest value (2.82 cm), followed by Bontempi (2.6 cm). The maximum ray floret width was also recorded in Bontempi (1.82 cm), followed closely by Hamilton (1.8 cm).

Shankar and Tiwari (1993) suggested that plant height is an important criterion for selecting chrysanthemum cultivars. The performance of both standard and spray chrysanthemums was found to be satisfactory with the use of artificial illumination during the Rovan cyclone period for a duration of one month. Suvija *et al* (2016) stated that improved vegetative growth significantly contributes to increased flower yield in chrysanthemum. The differences in the number of branches among cultivars could be attributed to the genetic makeup of the cultivars and the prevailing environmental conditions, as reported by Bennurmath (2020). Similar variations in branch number were also observed in chrysanthemum by Baskaran *et al* (2004) and Dahiya *et al* (2007).

Joshi *et al* (2009) stated that a higher number of branches may be attributed to the vigorous growth habit of the plant. Variation in internodal length among different varieties was also reported by Kumar *et al* (2014) in chrysanthemum. Differences among standard-type cultivars with respect to the number of flowers produced per plant were observed by Behera *et al* (2002) and Dilta *et al* (2005). The number of flowers per plant ranged from 39.89 to 109.67. Among the ten cultivars studied, the variation observed could be due to inherent genetic factors, as noted by Hemalatha *et al* (1992) in chrysanthemum. These findings are consistent with those reported by Dilta *et al* (2005) and Negi *et al* (2015) in chrysanthemum. Similar variability in the number of flowers per plant among cultivars was also documented by Dahiya *et al* (2007) and Punetha *et al* (2011) in chrysanthemum.

CONCLUSION

Among the chrysanthemum cultivars evaluated, the cultivars Bontempi, Hamilton, Arctic Queen and Champagne Yellow were found to be highly suitable for commercial cultivation under polyhouse conditions due to their superior vegetative growth,

floral traits and flower quality.

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