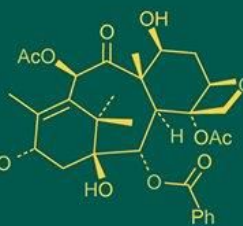
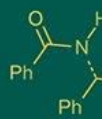


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Sourabh Sherawat
M.Sc. Research Scholar,
Department of Floriculture
and Landscaping, K.N.K.
College of Horticulture,
Rajmata Vijayaraje Scindia
Krishi Vishwa Vidyalaya,
Gwalior, Madhya Pradesh,
India

Anuj Kumar
Assistant Professor,
Department of Floriculture
and Landscaping, K.N.K.
College of Horticulture,
Rajmata Vijayaraje Scindia
Krishi Vishwa Vidyalaya,
Gwalior, Madhya Pradesh,
India

Nitin Soni
Scientist (Horticulture),
K.N.K. College of
Horticulture, Rajmata
Vijayaraje Scindia Krishi
Vishwa Vidyalaya, Gwalior,
Madhya Pradesh, India

Ramesh Chand Choudhary
Assistant Professor,
Department of Agriculture,
Vivekananda Global
University, Jaipur, Rajasthan,
India

Babu Lal Yadav
M.Sc. Horticulture,
Department of Fruit Science,
K. N. K. College of
Horticulture, University of
RVSKVV, Gwalior, Madhya
Pradesh, India

Corresponding Author:
Sourabh Sherawat
M.Sc. Research Scholar,
Department of Floriculture
and Landscaping, K.N.K.
College of Horticulture,
Rajmata Vijayaraje Scindia
Krishi Vishwa Vidyalaya,
Gwalior, Madhya Pradesh,
India

Studies on growth and flowering parameters of standard chrysanthemum (*Chrysanthemum morifolium* Ramat.) varieties under Malwa plateau conditions of Madhya Pradesh

Sourabh Sherawat, Anuj Kumar, Nitin Soni, Ramesh Chand Choudhary and Babu Lal Yadav

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Abstract

During the *Rabi* season of 2024-2025, research was conducted at the Department of Floriculture and Landscaping, KNK College of Horticulture, Mandsaur (M.P.) to evaluate the growth and flowering parameters of standard chrysanthemum (*Chrysanthemum morifolium* Ramat.) varieties in Madhya Pradesh's Malwa Plateau. Three replications of the experiment were set up using a Completely Randomized Design (CRD). Under Malwa conditions, the chrysanthemum variety Raja showed maximum plant height at all stages (30, 60, and 90 DAT), while Bidhan Mallika recorded the minimum. Plant spread was highest in Raja at 30 DAT and in Jambala at 60 DAT, whereas Bidhan Mallika showed the least spread. Raja had the highest number of leaves and stem diameter at 30 DAT, while Jaya performed best at 60 DAT. In flowering traits, Jambala was the earliest (minimum days to bud and flowering), whereas Jubilee was the latest.

Keywords: Standard chrysanthemum, varietal performance, Malwa region, flowering parameters

Introduction

Chrysanthemum (*Chrysanthemum morifolium* Ramat.), belonging to the Asteraceae family, is one of the most popular ornamental flowering plants, valued for its wide range of colors, shapes, and sizes. Commonly referred to as the "Queen of the East" and the "Autumn Flower," it holds deep cultural significance, particularly in Japan where it symbolizes longevity and is celebrated during traditional festivals. In India, it is widely known as "Guldaudi" and is extensively cultivated for loose flowers, garlands, and landscape decoration.

Botanically, chrysanthemum exhibits complex genetic behavior, with a basic chromosome number of $x = 9$ and multiple ploidy levels such as $2n = 36, 45, 47, 51$, and 75 , reflecting its high variability and adaptability (Datta & Bhattacharjee, 2001) [4].

In addition to its ornamental value, chrysanthemum is also used in cut flower arrangements, potted plant production, and even in traditional medicine and tea in some countries. Its versatility, ease of cultivation, and diverse forms-such as decorative, pompon, spider, and anemone types-make it a key crop in the floriculture industry worldwide.

Chrysanthemum is one of the world's most popular commercial flowers, valued for cut flowers, loose flowers, and potted plants. According to the National Horticulture Board (NHB), India's floriculture production in 2023-24 was over 285 thousand hectares, generating roughly 2,284 thousand metric tons of loose flowers and 947 thousand metric tons of cut flowers (Anonymous, 2024) [1].

In Madhya Pradesh, the area dedicated to flower cultivation has seen a steady increase. In 2023, the state reported a cultivation area of 39,494 thousand hectares, which expanded to 41,050 thousand hectares in 2024 (Anonymous, 2024) [2]. This growth underscores the region's rising prominence in floriculture.

The effective production of chrysanthemums is strongly dependent on selecting acceptable types for specific area conditions. With the introduction of various new cultivars with a diverse variety of colors and forms, it is critical to assess their performance under local agro-

climatic conditions. Such evaluations help to identify cultivars with higher growth, yield, and quality, informing breeding initiatives targeted at producing improved variety (Swaroop *et al.*, 2008) ^[11].

In the Malwa region of Madhya Pradesh, there exists a considerable gap in comprehensive and systematic information regarding the growth performance, adaptability, and productivity of various chrysanthemum cultivars.

Identifying the most appropriate cultivars is critical not only for improving flower productivity and quality, but also for increasing profitability for floriculture growers. Given the growing demand for high-quality chrysanthemum flowers in both domestic and international markets, selecting cultivars that thrive in the Malwa Plateau's environmental conditions is critical. This study seeks to fill a knowledge gap by systematically analyzing numerous common chrysanthemum cultivars based on their vegetative development, flowering features, and post-harvest performance. A detailed grasp of these criteria will assist in recommending the best cultivars for commercial production in the region.

Materials and Methods

The present study was conducted during the winter season of 2024-25 at the Department of Floriculture and Landscaping, K.N.K. College of Horticulture, Mandsaur (M.P.), located on the Malwa Plateau at an altitude of about 435 m above mean sea level. The region falls under Agro-climatic Zone 10 and experiences a sub-tropical climate, with temperatures ranging from about 3.5 °C in winter to 44 °C in summer. The area receives an average annual rainfall of around 744.8 mm, mainly from the southwest monsoon between mid-June and early October. The experiment was laid out in a Completely Randomized Design (CRD) with three replications to evaluate the performance of seven standard chrysanthemum varieties, namely Bidhan Mallika, Gitanjali, Jambala, Jaya, Jubilee, Raja, and Silk Brocade, under Malwa conditions. Observations were recorded on growth, flowering, post-harvest, and biochemical parameters. The collected data were statistically analyzed using analysis of variance (ANOVA) as per the method described by Panse and Sukhatme (1985) ^[7] to assess the significance of variation among treatments.

Result and Discussion

Growth Parameters

1. Plant height (cm) at 30, 60 and 90 DAT

The finding results shown in Figure 1 has significant variations in plant height among the different chrysanthemum varieties evaluated at 30, 60 and 90 DAT. The highest plant height was recorded in variety Raja (V₆) with a mean height of 22.46 cm, 36.36 m and 46.50 cm at 30, 60 and 90 DAT respectively, which was significantly superior over all other varieties. The minimum plant height was observed in Bidhan Mallika (V₁), with a mean of only 5.63 cm, 10.93 cm and 20.71 cm at 30, 60 and 90 DAT respectively.

Among the varieties, Raja (V₆) consistently exhibited the tallest plants at all stages (30, 60, and 90 DAT), followed by Jambala (V₃) and Silk Brocade (V₇). The superior performance of Raja in plant height may be attributed to its inherent genetic potential for vigorous growth. Similar findings were reported by Swaroop *et al.* (2008) ^[11] and Vasuniya *et al.* (2020) ^[13], who observed significant varietal

differences in chrysanthemum plant height, with certain cultivars exhibiting enhanced vegetative growth under favorable conditions.

2. Plant spread at 30 and 60 DAT

The data on plant spread of chrysanthemum varieties at 30 & 60 DAT are presented in Figure 1. The results showed significant differences among the varieties. The maximum plant spread at 30 DAT was recorded in Raja (V₆) with 2.50 cm, but at 60 days after transplanting maximum plant spread shown in Jambala variety (20.00 cm). The minimum plant spreading (0.63 cm and 7.51 cm) was shown by Bidhan Mallika variety at 30 and 60 days after transplanting respectively.

The highest plant spread at 60 DAT was recorded in Jambala (V₃), suggesting a spreading growth habit beneficial for light interception. Silk Brocade (V₇) and Gitanjali (V₂) also showed moderate plant spread. The variations in spread may reflect genotypic differences and adaptability to the given environmental conditions. This aligns with Choudhary *et al.* (2014) ^[3], who noted significant differences in canopy architecture among chrysanthemum varieties.

3. Number of leaves per plant at 30 and 60 days:

The data presented in Figure 1 show the significant differences among the chrysanthemum varieties with respect to the number of leaves per plant at 30, 60 and 90 DAT. The maximum number of leaves per plant was recorded in Raja (V₆) with 7.49 leaves at 30 DAT, but at 60 DAT Jaya (V₄) with 50.80 leaves per plant, which was significantly higher than all other varieties. The lowest leaf counts were observed in Bidhan Mallika (V₁) with 1.88 leaves per plant at 30 DAT and Jambala (V₃) with 24.27 leaves per plant at 60 DAT.

Leaf production is crucial for photosynthesis and overall plant vigor, and these differences indicate varietal adaptability and photosynthetic efficiency. The results are in agreement with Singh *et al.* (2017) ^[10] and Uddin *et al.* (2015) ^[12], who highlighted leaf number as a key indicator of vegetative performance in chrysanthemum genotypes.

4. Stem diameter (mm) at 30 and 60 DAT

The stem diameter data presented in Figure 1 significant differences among the evaluated chrysanthemum varieties at 30 & 60 DAT. The maximum stem diameter was recorded in Raja (V₆) with 3.36 mm at 30 DAT but at 60 DAT it was recorded in Jaya (V₄) with 5.10 mm. The minimum stem thickness was observed in Jubilee (V₅) (2.34 mm & 3.65 mm at 30 & 60 DAT respectively).

Thicker stems were observed in Jaya (V₄) and Jambala (V₃) at 60 DAT, which may enhance flower support and post-harvest life. The robust stem development in these varieties may be attributed to stronger vascular tissues and structural growth, consistent with previous reports by Rani *et al.* (2020) ^[8].

Flowering Parameters

1. Number of days taken to flower bud appearance and days taken to flowering

The data presented in Figure 2 show significant variations in the number of days taken for flower bud appearance and days taken to flowering among the different chrysanthemum varieties. The earliest flower bud appearance and flowering

were recorded in Jambala (V_3) with a mean of 33.33 days and 58.13 days respectively. The latest bud appearance and flowering were observed in Jubilee (V_5), with a mean of 66.96 and 124.64 days.

Jambala (V_3) recorded the earliest flower bud initiation and flowering, indicating its early maturity. Early flowering is desirable in commercial floriculture, ensuring timely market availability. Similar observations were made by Deshmukh *et al.* (2016) [5], who reported early flowering in certain standard chrysanthemum genotypes under central Indian conditions.

2. Length of Flower Stalk and Flower Diameter

According to data shown in Figure 2 has significant variations in the length of flower stalk and flower diameter among the different chrysanthemum varieties. The maximum flower stalk length and flower diameter were recorded in Raja (V_6) with a mean of 40.85 cm and 8.55 cm respectively, which was significantly longer than all other varieties. The shortest flower stalk length and minimum flower diameter were observed in Bidhan Mallika (V_1), with a mean of 16.51 cm and 5.23 cm respectively.

Raja (V_6) had the longest stalks and largest flower diameter,

indicating superior floral quality and market appeal. Flower stalk length influences vase life and arrangement suitability, while flower diameter enhances aesthetic value. These results are in line with Joshi and Bhatnagar (2015) [6], who observed varietal impacts on flower morphology in chrysanthemum.

3. Flowering duration

The data presented in Figure 2 show significant differences in the flowering duration among the chrysanthemum varieties evaluated. The longest flowering duration was recorded in Raja (V_6) with a mean of 36.67 days, which was significantly superior to all other varieties. The shortest duration of flowering was observed in Bidhan Mallika (V_1) at 20.67 days.

The longest flowering duration was recorded in Raja (V_6), followed by Jubilee (V_5) and Silk Brocade (V_7), suggesting their prolonged blooming potential. This trait is economically important for both cut and pot chrysanthemums. The extended flowering period may be linked to improved physiological resilience, as noted by Sharma *et al.* (2018) [9].

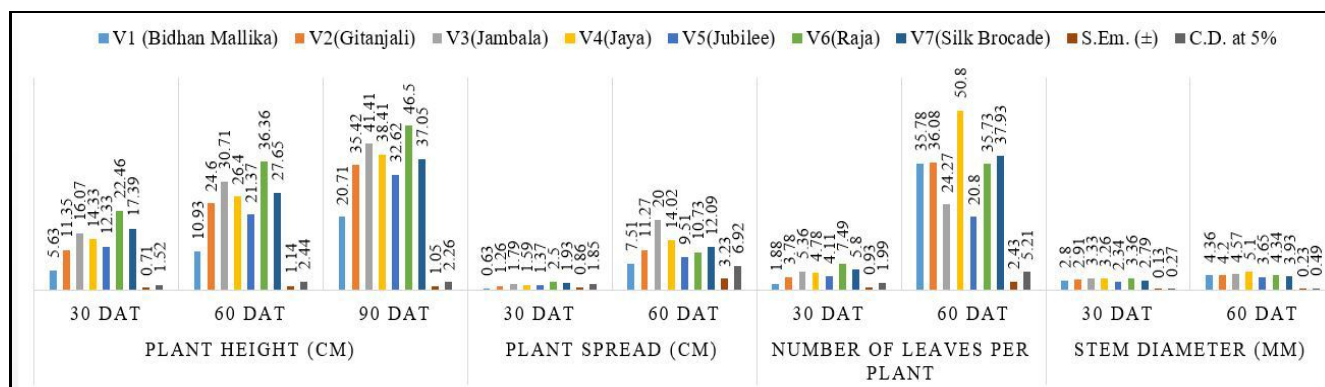


Fig 1: Different Growth Parameters of Chrysanthemum

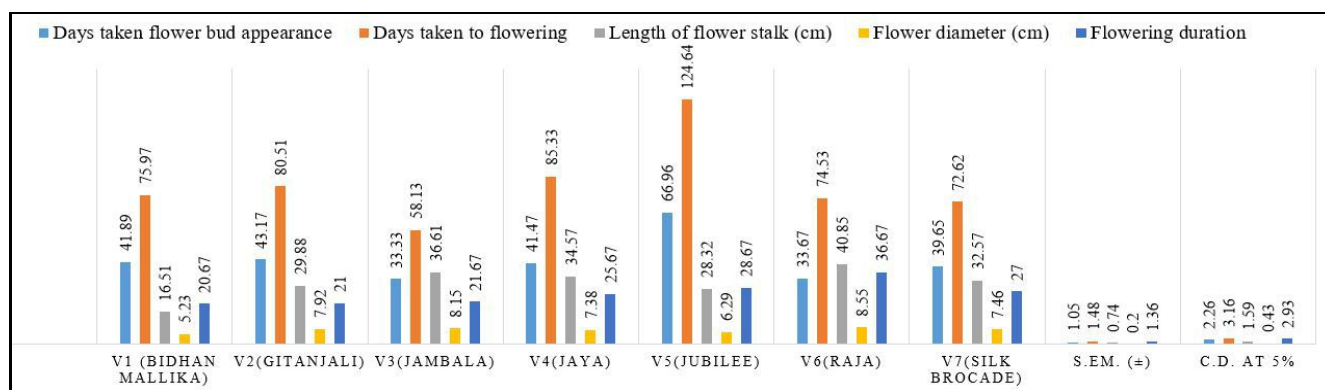


Fig 2: Different Flowering Parameters of Chrysanthemum

Conclusion

Under the agro-climatic conditions of the Malwa Plateau, clear differences were observed among the chrysanthemum varieties. Raja performed the best overall, producing taller plants, larger flowers, longer stalks, and extended flowering duration, making it ideal for both ornamental use and cut flower production. Jambala was the earliest to initiate buds and flowering, making it suitable for early market supply. Silk Brocade showed vigorous vegetative growth with a higher number of leaves. In contrast, Bidhan Mallika

recorded the lowest values for most traits, indicating its poor suitability under these conditions.

References

- Anonymous. Department of Horticulture and Food Processing, Government of Madhya Pradesh. Statistics. 2024. Available from: www.mphorticulture.gov.in/en/related-to-department/statistics
- Anonymous. Indian Horticulture Database. National Horticulture Board. 2024. Available from:

<http://www.nhb.gov.in>

3. Choudhary ML, Singh DB, Sharma VK. Canopy architecture and light interception in chrysanthemum varieties. Horticultural Journal. 2014;27(1):25-28.
4. Datta SK, Bhattacharjee SK. Chrysanthemum. All India Coordinated Research Project on Floriculture. Indian Council of Agricultural Research; 2001.
5. Deshmukh AN, Kale SD, Pawar VS. Performance of chrysanthemum genotypes under central Indian conditions. Advances in Horticultural Science. 2016;30(1):12-15.
6. Joshi AR, Bhatnagar M. Influence of varieties on flower morphology in chrysanthemum. Journal of Applied and Natural Science. 2015;7(1):156-158.
7. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. Indian Council of Agricultural Research; 1985. p.87-89.
8. Rani A, Mehta P, Kaur J. Stem quality attributes in standard chrysanthemum varieties. Journal of Floriculture and Landscaping. 2020;28(2):97-100.
9. Sharma SK, Verma LN, Choudhary P. Prolonged blooming and flowering duration in chrysanthemum varieties. Indian Journal of Horticultural Research. 2018;35(4):343-346.
10. Singh A, Mahawer LN, Bairwa HL. Evaluation of perennial chrysanthemum cultivars under sub-humid southern plains and Aravali hills of Rajasthan. Indian Journal of Horticulture. 2017;74(3):423-428.
11. Swaroop KV, Prasad, Raju DVS. Evaluation of standard chrysanthemum (*Dendranthema grandiflora* Tzvelev) cultivars under low cost polyhouse and open field conditions. Journal of Ornamental Horticulture. 2006;9(1):69-70.
12. Uddin AFMJ, Ahmed R, Hossain MA. Evaluation of chrysanthemum varieties for growth and flowering. Bangladesh Journal of Agricultural Research. 2015;40(3):421-427.
13. Vasuniya P, Patel BK, Thakur RK. Evaluation of chrysanthemum cultivars for growth and yield parameters. Indian Journal of Horticulture. 2020;77(3):439-442.