



RESEARCH ARTICLE

Performance and adaptability of *Gladiolus* cultivars under the agro-climatic conditions of Tripura

Justin Debbarma¹, Kunal Debbarma^{1*}, Heera Lal Atal², Kalkame Ch Momin³, Tridip Bhattacharjee¹,
Th Irenaeus K S¹, Ezekiel Reang¹ & Ranjana Prasad⁴

¹Department of Horticulture, College of Agriculture, Lembucherra, West Tripura 799 210, Tripura, India

²Department of Horticulture, Guru Kashi University, Bathinda 151 302, Punjab, India

³Department of Horticulture, North-Eastern Hill University, Tura Campus, Tura 794 002, Meghalaya, India

⁴Department of Basic Sciences and Plant Molecular Biology, College of Agriculture, Lembucherra, West Tripura 799 210, Tripura, India

*Correspondence email - floriculturistkunal@gmail.com

Received: 24 November 2025; Accepted: 30 May 2026; Available online: Version 1.0: 05 August 2026

Cite this article: Justin D, Kunal D, Heera LA, Kalkame CM, Tridip B, Th Irenaeus KS, Ezekiel R, Ranjana P. Performance and adaptability of *Gladiolus* cultivars under the agro-climatic conditions of Tripura. Plant Science Today. 2026;13(sp5):01–06. <https://doi.org/10.14719/pst.12893>

Abstract

This study aimed to evaluate the adaptability and flowering performance of eight *Gladiolus* cultivars under the agro-climatic conditions of Tripura. The objective of this study was to identify cultivars suitable for commercial cut-flower production in this region. Field experiments were conducted during the rabi season (2023–24) at the College of Agriculture, Tripura. Key flowering parameters, including days to spike initiation, rachis length, number of florets per spike and vase life were recorded and statistically analysed. Significant variations were observed among the eight cultivars for all recorded traits. 'Candyman' and 'DFR Glad-2' performed the best, showing early spike initiation, longer rachis, higher floret count and extended vase life. These results suggest that 'Candyman' and 'DFR Glad-2' are highly suitable for commercial cultivation in Tripura. These cultivars can enhance floriculture profitability and guide future breeding programs in similar agro-climatic zones.

Keywords: adaptability; floral traits; *Gladiolus*; North-East; North-East Plains; varietal evolution

Introduction

Gladiolus (*Gladiolus* spp.), commonly known as the "Queen of bulbous flowers," holds a significant place in the global floriculture sector. Admired for its tall, striking flower spikes, a broad spectrum of vivid colours and prolonged vase life, gladiolus is highly valued by gardeners, landscape designers and the cut flower industry. Its visual appeal and symbolic association with strength and integrity have further enhanced its popularity in both domestic and international markets (1).

India has become a major hub for gladiolus cultivation, benefiting from the wide range of climatic conditions that extend from the northern mountainous regions to the southern plains. However, owing to varying environmental factors across regions, it is essential to assess specific cultivars to determine their suitability for different agro-climatic zones. In this regard, the north-eastern state of Tripura offers a favourable environment for gladiolus production, characterised by moderate temperatures, high humidity and well distributed rainfall (2). Despite these advantageous conditions, there is a lack of systematic research on the adaptability and flowering performance of gladiolus cultivars in Tripura.

Key flowering attributes, including spike initiation, rachis length, floret count and vase life, are essential for determining the ornamental and commercial value of a cultivar. These traits not only contribute to the flower's aesthetic appeal but also influence

its profitability for large-scale cultivation (3). Previous researchers found considerable variation among cultivars in terms of spike initiation time, rachis length and floret opening, emphasising the need to select region-specific cultivars to enhance productivity and market potential (4). Similar findings were reported in earlier studies which observed significant variation in floral characteristics among 42 *Gladiolus* cultivars (5).

This study presents a comparative evaluation of eight gladiolus cultivars under specific agro-climatic conditions of Tripura. By analysing key flowering parameters, this study aimed to identify the most suitable cultivars for enhancing both profitability and sustainability of gladiolus cultivation in the region. Furthermore, these findings are expected to contribute to the broader understanding of gladiolus cultivation practices, supporting their adoption to other regions with similar agro-climatic conditions (6).

Materials and Methods

The experiment was conducted during the rabi season (2023–24) at the Instructional Farm of the College of Agriculture, Tripura, located at 23.9138° N, 91.3203° E. The region experiences a tropical climate with distinct wet and dry periods and the soil type is sandy loam with a pH of 5.5, which provides favourable conditions for *Gladiolus* cultivation. Climatological data from the experimental site

significantly influenced growth and development of the gladiolus. Maximum temperatures ranged from 25.1 to 35.5 °C, while minimum temperatures varied between 9.1 °C and 20 °C. Rainfall was primarily concentrated in October (251.7 mm) and no rainfall was recorded in November, January, or February. Relative humidity peaked at 58–98 % in December and decreased from 51 to 90 % in March. Sunshine duration fluctuated, with the lowest being recorded at 4.8 hr per day in March and the highest at 7.6 hr per day in November. These climatic conditions collectively create an optimal environment for the growth and flowering of gladiolus.

Details of experiment

Genotype	<i>Gladiolus</i> spp.
Experimental design	Randomised block design
Treatments	8
Replications	3
Total number of plots	24
Bed type	Raised bed
Size of the plot	4.5 × 3 m ²
Planting material	Corms
Depth of sowing	5 cm
Date of planting	5 th October

Treatment details

Treatment	Symbol
Candyman	T ₁
DFR Glad-2	T ₂
Pusa Manmohak	T ₃
White Prosperity	T ₄
Pusa Sinduri	T ₅
Inter Paid	T ₆
Punjab Glad-3	T ₇
Arka Ranjini	T ₈

Planting and maintenance

Corms were used as planting material. They were treated with carbendazim 25 % + mancozeb 50 % WS to prevent the fungal infection. The recommended doses of nitrogen, phosphorus and potassium, at 40, 20 and 20 g/m², respectively, were applied (7). During the growing season, protective measures were undertaken to safeguard the crop from fungal infections, particularly *Botrytis* and downy mildew. Mancozeb and carbendazim (0.1 %) were sprayed to prevent fungal diseases, including instances of root rot. Additionally, a fungicide combination of tebuconazole 50 % + trifloxystrobin 25 % WG (75 WG) was applied to protect the plants from disease outbreaks.

Observations were recorded for the following key flowering parameters for the eight cultivars.

Days to spike initiation

Days to spike initiation were recorded as the number of days from planting (corm sowing) to the emergence of the flower spike from the foliage. Regular observations were made on every alternate day

and the date on which the spike first became visible was recorded. The time required for spike emergence was calculated by subtracting the planting date from the recorded spike emergence date. This parameter is crucial for assessing the early flowering potential of different gladiolus cultivars (5).

Rachis length

Rachis length was measured once the flower spike was fully developed. Measurements were taken from the base of the first floret to the tip of the last floret using a measuring tape. The data were recorded in centimeters (cm) and average of multiple readings were taken to ensure accuracy. Rachis length is a critical indicator of floral axis development and the overall spike quality in the gladiolus (6).

Days to show colour

Days to show colour were determined by recording the date on which the first visible colouration appeared on any part of the floret. Regular monitoring was conducted and the number of days from planting to the first sign of pigmentation on the florets was calculated. This parameter indicates the transition from vegetative to reproductive growth and is an essential trait for assessing early blooming potential (2).

Days to first floret opening

Days to the first floret opening were recorded as the time taken from planting until the first floret was fully opened with completely expanded petals. Daily observations were made to ensure precise data collection. The recorded date of the first floret opening was subtracted from the planting date to calculate the duration of blooming. This parameter reliably indicates the flowering response of different gladiolus cultivars under specific agro-climatic conditions (3).

Days to last floret opening

The number of days to the last floret opening was calculated by recording the interval between the opening of the first floret and the opening of the last floret on the spike. Observations were made daily and the number of days required for complete blooming was determined. This parameter provides insight into the flowering duration and uniformity of floret opening (1).

Number of florets per spike

To record the number of florets per spike, 10 spikes were randomly selected from different plants of the same cultivar or treatment group to ensure representative sampling. The florets on each spike, including both open and unopened buds, were carefully counted. The data for each sample were recorded and the average number of florets per spike was calculated (7,8).

Vase life

To assess vase life, flowers were harvested at the recommended stage of maturity for a specific species (when 1–2 florets were open for spikes). The stems were trimmed diagonally in water to prevent air embolism and immediately placed in a preservative solution (2 % sucrose + 200 ppm 8-HQC). The flowers were maintained in a controlled environment at a temperature of 20–22 °C, relative humidity of 60–70 % and light intensity of 10–12 μmol/m²/sec for 12 hr per day. The flowers were observed daily for signs of wilting, petal discolouration, or stem bending and the number of days was recorded until the flowers are no longer marketable (9–11) (Fig. 1).

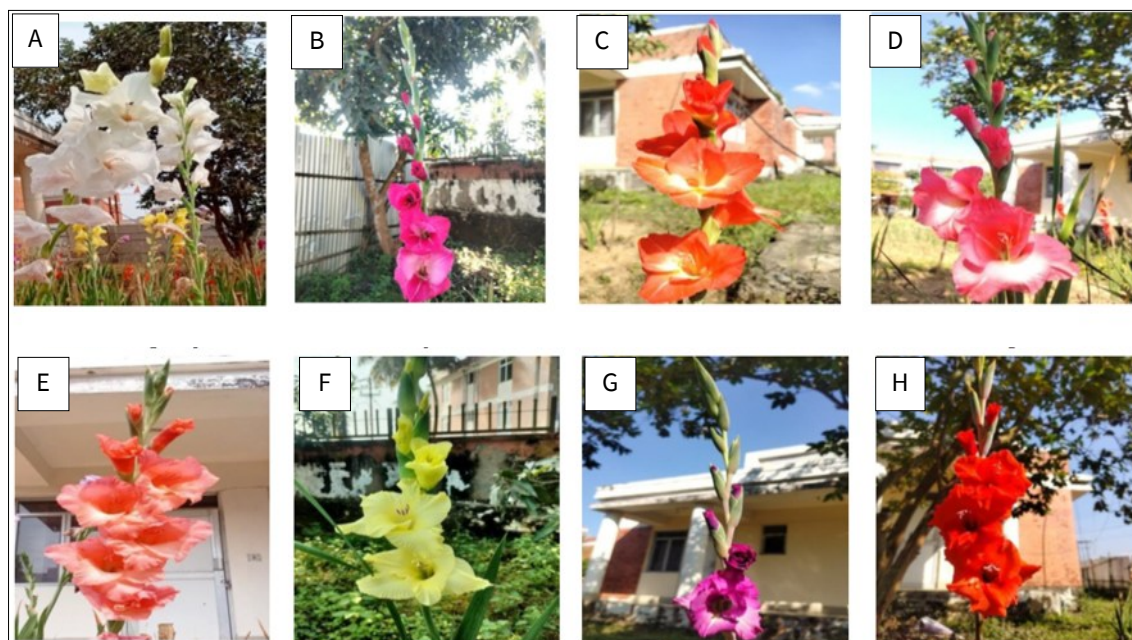


Fig. 1. Blooming stage of *Gladiolus* cultivars evaluated under the agro-climatic conditions of Tripura during the rabi season (2023–24). A: White Prosperity; B: Candyman; C: Pusa Sinduri; D: Interpid; E: Punjab Glad 3; F: DFR Glad-2; G: Arka Ranjini; H: Pusa Manmohak.

Results and Discussion

Days to spike initiation and flowering behaviour

Variations in days to spike initiation among gladiolus cultivars are governed primarily by genetic differences and environmental interactions. Early spike initiation, as observed in Candyman (T_1) (62.83 days), followed by White Prosperity (T_4) (64.12 days) and DFR Glad-2 (T_2) (65.34 days) (Table 1), indicates a genetic tendency for early flowering, which is a commercially desirable trait (4). The early spike initiation observed in these cultivars can be attributed to their efficient nutrient utilisation, which enables the faster accumulation of the requisite carbohydrates for spike growth (12). Delayed spike initiation in Pusa Manmohak (T_3) (70.45 days) suggests a longer vegetative phase, possibly influenced by genetic makeup and temperature sensitivity (13). Early flowering cultivars are advantageous because they ensure timely market availability, thereby improving economic returns (14, 15). Statistically significant differences ($CD = 1.25, p = 0.05$) reinforced the importance of genetic selection in optimising flowering time.

Rachis length and spike quality

Rachis length significantly influenced the spike quality, floral arrangement and commercial acceptance of gladiolus. In this study, Candyman (T_1) recorded the longest rachis (80.33 cm), followed by DFR Glad-2 (T_2) (78.12 cm) and Arka Ranjini (T_8) (76.45 cm), while Pusa Manmohak (T_3) exhibited the shortest rachis

(70.78 cm) (Table 1). This superior performance in rachis length can be attributed to their efficient phosphorus uptake because phosphorus is known to play a crucial role in cell elongation (16). According to previous studies, rachis length is a genotype-dependent trait influenced by environmental conditions, such as light intensity, soil nutrition and growth regulators (3). Longer rachises enhance the aesthetic appeal and structural integrity of gladiolus spikes, making Candyman (T_1) and DFR Glad-2 (T_2) highly marketable. The significant variation observed ($CD = 2.85$ cm, $p = 0.05$) emphasised the role of cultivar selection in improving gladiolus quality for commercial cultivation.

Days to show colour and floret opening

The transition from spike initiation to visible colouration in florets is controlled by genetic factors and environmental influences such as temperature and photoperiod. Candyman (T_1) exhibited the earliest colouration (67.00 days), while Pusa Manmohak (T_3) was the last (73.50 days), compared with other cultivars like DFR Glad-2 (T_2) (68.12 days) and White Prosperity (T_4) (68.45 days) falling in between (Table 1). This may be due to genetic factors that allow the superior variety to absorb phosphorus more efficiently than other varieties, thereby promoting earlier pigment production and flower colour initiation (17). These early colour developments are in line with the findings of previous researchers, who also observed that early colour enhances the marketability of flowers by allowing for earlier harvest (18). Similarly, cultivars such as DFR Glad-2

Table 1. Flowering parameters of *Gladiolus* spp. under the agro-climatic conditions of Tripura during 2023–24

Treatment	Variety	Days to spike initiation	Rachis length (cm)	Days to show colour	Days to first floret opening	Days to last floret opening	Number of florets per spike	Vase life (days)
T_1	Candyman	62.83	80.33	67.00	71.44	8.69	14.87	7.35
T_2	DFR Glad-2	65.34	78.12	68.12	73.21	7.98	15.33	7.12
T_3	Pusa Manmohak	70.45	70.78	73.50	75.12	6.32	13.78	5.90
T_4	White Prosperity	64.12	75.45	68.45	70.89	7.45	14.23	6.89
T_5	Pusa Sinduri	66.45	72.89	69.34	71.23	6.78	13.78	5.80
T_6	Inter Paid	68.23	74.56	70.23	72.11	6.12	13.45	6.12
T_7	Punjab Glad-3	67.78	73.34	69.78	71.67	7.01	14.00	6.34
T_8	Arka Ranjini	66.12	76.45	69.45	71.89	7.32	14.56	6.78
SEm $\pm$	-	0.42	0.95	0.46	0.55	0.38	0.28	0.14
CV (%)	-	3.85	4.21	3.12	3.56	3.21	4.56	3.78
CD ($p = 0.05$)		1.25	2.85	1.38	1.67	1.12	0.85	0.42

(73.33 days) took longer to show colour, indicating that they might be better suited to markets that favour longer display times or slower flowering cycles, as observed in other studies (13). The first floret opening followed a parallel trend, indicating genetic control over flowering duration. The significant differences ($CD = 1.38$ – 1.67 days, $p = 0.05$) suggest that selecting early-colouring cultivars can enhance market acceptability and economic gains.

Number of florets per spike and floral density

Floral density is a vital trait that determines the visual appeal and marketability of the gladiolus spikes. Candyman (T_1) recorded the highest number of florets per spike (14.87), followed closely by DFR Glad-2 (T_2) (15.33), while Pusa Sinduri (T_5) and Pusa Manmohak (T_3) exhibited lower floret counts (13.78 florets each) (Table 1). A higher floret count enhances the commercial value of gladiolus, making cultivars such as DFR Glad-2 (T_2) and Candyman (T_1) more desirable for floriculture businesses. Statistically significant differences ($CD = 0.85$, $p = 0.05$) highlighted the importance of genetic selection for optimising floral traits. These findings are consistent with those of earlier reports (3, 4, 19).

Vase life and postharvest longevity

Vase life is a key parameter that influences consumer preference and market demand for cut flowers. Candyman (T_1) exhibited the longest vase life (7.35 days), followed by DFR Glad-2 (T_2) (7.12 days), while Pusa Sinduri (T_5) and Pusa Manmohak (T_3) had the shortest vase life (5.80 and 5.90 days, respectively) (Table 1). According to previous researchers, vase life is influenced by factors, such as water uptake efficiency, transpiration rate and ethylene accumulation, which accelerate petal senescence (5). The prolonged vase life of Candyman is likely due to its longer spike length, higher number of florets and better carbohydrate accumulation, which enhances the ability of the flower to maintain freshness in a vase (20). In contrast, the shorter vase life of cultivars such as Interpid (3.79 days) may be due to their lower carbohydrate reserves and reduced tolerance to ethylene, which can accelerate wilting (16). Cultivars with extended vase life, such as candyman (T_1) and DFR Glad-2 (T_2), are preferred by the floral industry, particularly for long-distance transportation. The observed significant differences ($CD = 0.42$ days, $p = 0.05$) (Table 1) reinforce the need for postharvest management practices to enhance cut flower longevity.

Pearson correlation of floral parameters

The negative correlation between early spike initiation and rachis length ($r = -0.854$) (Table 2) suggests that earlier initiation leads to a longer rachis, which supports flower longevity, as longer stems are known to improve vase life (21). This is supported by previous studies, which found that early spike initiation increased plant vigour and resulted in longer stems (22).

The positive correlation between floret count and vase life ($r = 0.871$) conforms to the findings of previous researchers, who demonstrated that a higher number of florets leads to longer vase life due to increased robustness (23).

The strong negative correlation between delayed colour development and flowering duration ($r = -0.818$) is consistent with earlier findings, noted that delayed colour development has been associated with delayed market readiness, and less desirable in the market (24). However, the impact of early spike initiation on floret count ($r = 0.804$) is not always direct, as floret count can be more influenced by genetic and environmental factors than by spike timing, as observed by previous researchers (25, 26).

Likewise, the effect of late spike initiation on floret count ($r = -0.668$) should be reconsidered, as it was found that late initiation does not always reduce floret count, especially under optimal conditions (27).

The positive correlation between longer rachises and extended blooming ($r = 0.883$) (Table 2) may not apply universally, previous reports indicated that longer rachises do not always result in a longer blooming period, with other factors, such as nutrient allocation, playing a more significant role (10). Finally, the correlation between delayed colour development and reduced vase life ($r = -0.771$) may not always be true, earlier studies reported that delayed colour development does not always negatively impact vase life, depending on other post-harvest conditions (28).

Overall performance and cultivar suitability

Considering the comprehensive evaluation of flowering traits, Candyman (T_1) emerged as the most promising cultivar due to its early spike initiation, longer rachis length, higher floret count and extended vase life. DFR Glad-2 (T_2) and Arka Ranjini (T_8) also showed favourable performance, making them suitable for commercial gladiolus cultivation in Tripura. In contrast, Pusa Manmohak (T_3) and Pusa Sinduri (T_5) were less suitable because of their delayed flowering, shorter rachis length and reduced vase life. These findings highlight the importance of cultivar selection for optimising gladiolus production and meeting the market demand.

The significant variation among gladiolus cultivars revealed the importance of site-specific cultivar selection for enhancing production efficiency in Tripura. Early flowering cultivars, such as Candyman (T_1) and DFR Glad-2 (T_2), offer greater economic benefits because of their superior floral characteristics and extended post-harvest longevity. The biochemical mechanisms underlying flowering behaviour could contribute to the development of superior gladiolus cultivars with improved commercial traits.

Table 2. Pearson correlation of floral parameters

	Days to spike initiation	Rachis length (cm)	Days to show colour	Days to first floret opening	Days to last floret opening	Number of florets per spike	Vase life (days)
Days to spike initiation							
Rachis length (cm)	-0.854						
days to show colour	0.994	-0.863					
Days to first floret opening	0.673	-0.385	0.732				
Days to last floret opening	-0.875	0.883	-0.818	-0.327			
Number of florets per spike	-0.668	0.804	-0.646	-0.026	0.883		
Vase life (days)	-0.822	0.923	-0.771	-0.282	0.911	0.871	

Conclusion

The present study evaluated the adaptability and flowering performance of eight gladiolus cultivars under the agro-climatic conditions of Tripura, with an emphasis on key floral parameters, including spike initiation, rachis length, floret count and vase life. The findings revealed significant variation among the tested cultivars, highlighting the importance of genotype selection for optimising gladiolus production. Among the cultivars, Candyman (T₁) and DFR Glad-2 (T₂) emerged as the most promising because of their early spike initiation, superior rachis length, higher floret count and extended vase life, making them highly suitable for commercial cultivation. Conversely, Pusa Manmohak (T₃) and Pusa Sinduri (T₅) exhibited relatively inferior flowering traits, indicating their limited suitability for large-scale production in Tripura.

Overall, these findings demonstrate the necessity of region-specific cultivar evaluations to enhance gladiolus productivity in tropical and subtropical environments. The superior performance of Candyman (T₁) and DFR Glad-2 (T₂) suggests their potential for commercial floriculture in Tripura and other similar agroecological regions. Future research should focus on refining agronomic practices, post-harvest management and breeding programs to further improve gladiolus cultivation and ensure sustainable production in the cut-flower industry. Additionally, studies on the biochemical and physiological mechanisms governing flowering behaviour could provide deeper insights into trait enhancement strategies.

Future scope

1. More popular gladiolus varieties that perform well in different regions can also be evaluated under Tripura's specific environmental conditions. This evaluation would help identify the varieties best suited to the region's unique climate and soil, enabling more accurate recommendations for farmers in the future.
2. Additionally, an experiment focused on the off-season cultivation of gladiolus flowers could be conducted.
3. Furthermore, similar experiments could be carried out in various regions within Tripura to identify the most suitable gladiolus varieties for the diverse climatic conditions across the state.
4. Breeding plays a crucial role in the future of gladiolus cultivation. Developing disease-resistant, climate-adaptable and high-yielding cultivars is essential for sustainability. Breeding for improved flower quality, such as larger blooms and longer vase life, will also benefit the industry. These advancements could make gladiolus farming more environmentally sustainable and economically viable in the long term.

Acknowledgements

The authors are grateful to the Department of Horticulture, College of Agriculture, Tripura, India, for providing the necessary infrastructural support for this study. The authors also sincerely acknowledge Prof. Debashish Sen and Prof. T. K. Maity for their valuable support, guidance and encouragement throughout the course of the research.

Authors' contributions

JD conducted the research and performed the data analysis. KD designed the technical programme and HLA reviewed and edited the manuscript. KCM, TB, TIKS, ER and RP wrote the main manuscript text. All authors have read and approved the final version of the manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interest to declare.

Ethical issues: None

References

1. Bhattacharjee SK, De LC. Advanced commercial floriculture. Vol. 2. Jaipur: Aavishkar Publishers; 2010.
2. Singh AK, Kumar P, Kumar S. Performance of gladiolus (*Gladiolus grandiflorus* L.) cultivars for growth, flowering and corm production under Jharkhand conditions. *Int J Agric Environ Biotechnol*. 2016;9(5):861–5.
3. Baruah P, Bora P. Evaluation of gladiolus (*Gladiolus grandiflorus*) cultivars for performance and correlation in vegetative, floral and multiplication characters under paired-row system. *Curr Hortic*. 2022;10(1):45–7. <https://doi.org/10.5958/2455-7560.2022.000097>
4. Ahmad I, Saeed T, Khan SA, Wahid A, Ahmad T, Akhtar G, et al. Assessment of four gladiolus cultivars for the best production under Multan's agro-climatic conditions. *J Pure Appl Agric*. 2023;8(3):1–9.
5. Sankari A, Anand M, Arulmozhiyan R. Evaluation of gladiolus cultivars in Eastern Ghats of Tamil Nadu. *J Hortic Sci*. 2012;7(2):206–8. <https://doi.org/10.24154/jhs.v7i2.377>
6. Kumar R, Singh AK, Singh DK. Evaluation of gladiolus (*Gladiolus grandiflorus* L.) cultivars for growth, flowering and corm production under Chhattisgarh plains. *J Pharmacogn Phytochem*. 2018;7(2):390–3.
7. Bhattacharjee SK, De LC. Dried flowers and plant parts. In: Advanced commercial floriculture. Jaipur: Avishkar Publishers; 2003. p. 162–73.
8. Datta D. Indian fodder management towards 2030: A case of vision or myopia. *Int J Manag Soc Sci Res*. 2013;2(2):33–41.
9. Nowak J, Rudnicki RM. Postharvest handling and storage of cut flowers, florist greens and potted plants. Portland: Timber Press; 1990. <https://doi.org/10.1007/978-94-009-0425-5>
10. Reid MS, Jiang CZ. Postharvest biology and technology of cut flowers and potted plants. *Hortic Rev*. 2012;40:1–54. <https://doi.org/10.1002/9781118351871.ch1>
11. Kumar S, Srivastava SK. Effect of postharvest treatments on vase life and quality of gladiolus cut spikes. *Int J Adv Res*. 2014;2(3):188–99.
12. Swaroop K, Singh KP, Kumar P, Sindhu SS. Improvement and performance of gladiolus hybrids for flower traits, novel colour and higher corm multiplication. *Int J Agric Innov Res*. 2017;6(4):4–7.
13. Pandey RK, Bhat DJI, Dogra S, Singh A, Laishram N, Jamwal S. Evaluation of gladiolus cultivars under subtropical conditions of Jammu. *Int J Agric Sci*. 2012;8(2):518–22.
14. Bhatt ST, Chawla SL, Desai JR, Patel GD, Bhatt D. Varietal assessment and variability studies on gladiolus under South Gujarat conditions. *Indian J Hortic*. 2015;72(3):382–7. <https://doi.org/10.5958/0974-0112.2015.00074.2>
15. Negi R, Kumar S, Dhiman SR. Evaluation of different cultivars of gladiolus (*Gladiolus grandiflorus* L.) suitable for low hills of Himachal Pradesh. *Indian J Sci Res Technol*. 2014;2(6):6–11. <https://doi.org/10.5958/2230-7338.2015.00029.4>
16. Mishra P. Post-harvest flowering behaviour of some gladiolus

- varieties grown under Faizabad climatic condition. HortFlora Res Spectr. 2015;4(1):64–6.
17. Bhattacharjee SK. Influence of nitrogen, phosphorus and potash fertilization on flowering and corm production in gladiolus. Singapore J Prime Ind. 1981;9(1):23–7.
 18. Hemanta L, Rahman MA, Devi MP. Evaluation of gladiolus (*Gladiolus grandiflorus* L.) cultivars under natural farming. J Agric Technol. 2024;11(1–2):89–98.
 19. Kashyap HBA, Panwar AS, Shulka YR. Response of gladiolus to nitrogen and phosphorus under mid hill conditions of HP Himalayas. Indian J Hill Farming. 2001;14(2):88–91.
 20. Chouhan P, Vidhya SM, Vijay R. Effect of NPK on physico-chemical parameters of gladiolus (*Gladiolus hybridus* Hort.) cv. White Prosperity. Int J Sci Res. 2014;4(1):50–3.
 21. van Doorn WG, Woltering EJ. Physiology and molecular biology of petal senescence. J Exp Bot. 2008;59(3):453–80. <https://doi.org/10.1093/jxb/erm356>
 22. Kulkarni MG, Street RA, Van Staden J. Effects of foliar sprays of a commercial seaweed extract on the growth and development of marigold plants. J Hortic Sci Biotechnol. 2010;85(2):85–9.
 23. Ichimura K, Kohata K, Goto R. Soluble carbohydrates in *Delphinium* and their influence on sepal abscission in cut flowers. Physiol Plant. 2000;108(3):307–13. <https://doi.org/10.1034/j.1399-3054.2000.108003307.x>
 24. van der Meulen-Muisers JJM, van Oeveren JC, van der Plas LHW. Postharvest flower development in Asiatic hybrid lilies as related to tepal carbohydrate status. Postharvest Biol Technol. 1999;17(2):93–102. <https://doi.org/10.1023/A:1026493902668>
 25. Shillo R, Ding M, Pasternak D, Zaccai M. Cultivation of cut flower and bulb species with saline water. Sci Hortic. 2002;92(1):41–54. [https://doi.org/10.1016/S0304-4238\(01\)00276-X](https://doi.org/10.1016/S0304-4238(01)00276-X)
 26. Dole JM, Wilkins HF. Floriculture: principles and species. Upper Saddle River: Pearson Prentice Hall; 2005.
 27. Heins RD, Liu J, Cameron AC. Influence of light intensity on plant growth and flowering. HortScience. 1997;32(6):1017–21.
 28. Jones RB, Hill M. The effect of germicides on the longevity of cut flowers. J Am Soc Hortic Sci. 1993;118(3):350–4. <https://doi.org/10.21273/JASHS.118.3.350>

Additional information

Peer review: Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

Reprints & permissions information is available at https://horizonepublishing.com/journals/index.php/PST/open_access_policy

Publisher's Note: Horizon e-Publishing Group remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Indexing: Plant Science Today, published by Horizon e-Publishing Group, is covered by Scopus, Web of Science, BIOSIS Previews, Clarivate Analytics, NAAS, UGC Care, etc
See https://horizonepublishing.com/journals/index.php/PST/indexing_abstracting

Copyright: © The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited (<https://creativecommons.org/licenses/by/4.0/>)

Publisher information: Plant Science Today is published by HORIZON e-Publishing Group with support from Empirion Publishers Private Limited, Thiruvananthapuram, India.