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Assessment of Gladiolus Varieties for Growth and Floral Yield in Open Field Cultivation

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ABSTRACT

Gladiolus (*Gladiolus grandiflorus* L.) a widely cultivated ornamental bulbous crop, valued for its vibrant flower spikes, diverse color range and extended vase life. This study evaluated the growth and floral performance of eight gladiolus cultivars under open-field conditions in Karnataka, India. The experiment was conducted at the College of Horticulture, Bagalkot by following a Randomized Complete Block Design (RCBD) with three replications, assessing 8 cultivars including Arka Ayush, Arka Amar, Arka Tilak, Arka Darshna, Punjab Pink Elegance, Manhattan, S. Lady and Dhanvantari. Significant variations were observed in growth traits such as plant height, leaf number, leaf length and leaf area. Arka Amar recorded the tallest plants (111 cm) and the highest leaf number (12), while Dhanvantari exhibited the largest leaf area (114.72 cm²). In terms of floral traits, Arka Darshna produced the highest number of spikes per plant (2.54) and Arka Amar demonstrated superior spike length (75 cm), rachis length (42.3 cm) and floret count (13). The largest floret diameter (9.1 cm) was observed in Arka Tilak, whereas Dhanvantari and Manhattan consistently displayed lower growth and floral metrics. The findings highlighted the diverse performance of gladiolus cultivars under local conditions, with Arka Amar and Arka Darshna emerging as promising options for enhanced productivity and ornamental value. This study provides valuable insights for selecting cultivars suited to open-field cultivation in Karnataka.

Keywords: Evaluation, Field Conditions, Flower , Gladiolus, Growth, Performance.

INTRODUCTION

Gladiolus (*Gladiolus grandiflorus* L.) is renowned for its attractive flower spikes, broad color range and long vase life, making it an ideal choice for cut flowers (Kumar and Singh, 2022). Gladiolus belongs to the family Iridaceae and is cultivated in many parts of the world, including India, where it thrives in regions with moderate climatic conditions (Sharma *et al.,* 2015). There are over 180 known species of the gladiolus today but only a few of them are found in most gardens. The orchids like flowers of the Butterfly gladiolus and recently a strain of miniatures have also been introduced (Bharti *et al.,* 2021). In India, gladiolus cultivation is prominent in states like Karnataka, Himachal Pradesh, Maharashtra and Uttarakhand. Karnataka, with its favorable climate and well-drained soils, provides an optimal environment for growing gladiolus under open-field conditions (Singh *et al.,* 2017). Gladiolus cultivation in open fields in Karnataka has gained significant popularity, as it allows for the crop's optimum growth and flower production, contributing to the state's floriculture industry (Reddy *et al.,* 2014). The performance of gladiolus depends on several factors, including cultivar choice, soil type and climatic conditions. Different gladiolus cultivars exhibit variations in key traits such as flower size, spike length, blooming duration and overall flower quality, making cultivar evaluation critical for commercial success (Kumar *et al.,* 2018). The current study was conducted to evaluate various gladiolus cultivars under open-field conditions in Karnataka. The primary goal was to identify high-performing cultivars with superior growth, flowering and spike quality traits, with a focus on improving the overall commercial potential of gladiolus cultivation in the region.

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Table 1: Growth performance of Gladiolus varieties evaluated under open field conditions.

Variety	Plant height (cm)	Number of leaf/plant	Leaf length (cm)	Leaf area (cm^2)
Arka Ayush	95	9	38.5	91.63
Punjab Pink Elegance	87	10	44	83.78
Arka Amar	111	12	50.6	89.46
Arka Tilak	103	9	47	79.90
S. Lady	79	10	38.6	60.37
Arka Darshna	93	11	47.6	90.63
Manhattan	96	8	52	102.54
Dhanvantari	89	9	48.2	114.72
S.Em ±	1.57	0.105	0.80	1.43
CD at 5%	4.78	0.319	2.43	4.343

Table 2: Floral traits of Gladiolus varieties assessed under open field conditions.

Variety	Number of spikes/plant	Spike length (cm)	Rachis length (cm)	Number of floret/spike	Floret diameter (cm)
Arka Ayush	1.82	59.6	26.6	12	8.7
Punjab Pink Elegance	1.39	53.3	39.7	11	7.8
Arka Amar	2.18	75	42.3	13	8.5
Arka Tilak	1.23	63.3	38.2	12	9.1
S. Lady	1.08	52.6	33.3	10	6.6
Arka Darshna	2.54	53.6	27.8	11	7.1
Manhattan	1.82	53.4	24	9	5.4
Dhanvantari	1.29	42.6	21	12	5.2
S.Em ±	0.028	0.96	0.42	0.197	0.12
CD at 5%	0.085	2.76	1.26	0.598	0.38

MATERIALS AND METHODS

The present investigation was conducted at the Department of Floriculture and Landscape Architecture, College of Horticulture, Bagalkot, Karnataka, located in the Northern Dry Zone of Karnataka at a latitude of 16.18° N, a longitude of 75.7° E and an elevation of 533 meters above mean sea level. The region experiences semi-arid climatic conditions with moderate rainfall and distinct summer and winter seasons, which are suitable for gladiolus cultivation. The experiment was laid out in a Randomized Complete Block Design (RCBD) with eight gladiolus varieties as treatments, replicated thrice. The varieties evaluated included Arka Ayush, Punjab Pink Elegance, Arka Amar, Arka Tilak, S. Lady, Arka Darshna, Manhattan and Dhanvantari. Uniform and healthy corms, free from pests and diseases, were selected for planting. The plots were prepared with a spacing of 30 cm between rows and 20 cm between plants, accommodating 20 plants per plot. The soil was thoroughly ploughed, leveled and raised beds were prepared to ensure proper drainage. A basal dose of 30:20:30 kg NPK/ha was applied at planting, with nitrogen applied in two splits at 30 and 60 days after planting. Regular irrigation was provided at intervals of 7-10 days, depending on soil moisture levels. Manual weeding was carried out as required to maintain weed-free plots and recommended practices were followed to manage pests and diseases, ensuring healthy crop growth. Observations were recorded from five randomly selected plants in each treatment to ensure unbiased data collection. Growth parameters such as plant height, number of leaves per plant, leaf length and leaf width were measured using a measuring tape. Floral parameters, including the number of spikes per plant, spike length and rachis length, were measured using a measuring scale. Floret diameter was recorded using a vernier caliper. All data were collected systematically and averaged to assess the overall performance of each variety.

RESULTS AND DISCUSSION

Growth characteristics of Gladiolus cultivars

The analysis of growth parameters across gladiolus cultivars revealed significant variation among them influenced by both genetic and environmental factors (Table 1). The tallest plants were recorded in the cultivar Arka Amar (111 cm) followed by Arka Tilak (103 cm) and Manhattan (96 cm), which showed similar heights. In contrast, the shortest plants were observed in S. Lady (79 cm), with slightly taller plants in Punjab Pink Elegance (87 cm) and Dhanvantari (89 cm). This variation in plant height can be attributed to the genetic potential of each cultivar, in line with the findings of Reshma *et al.* (2017). Similarly, the number of leaves per plant varied significantly across the cultivars. Arka Amar exhibited the highest number of leaves per plant (12), followed by Arka Darshna (11). Conversely, Manhattan had the lowest number of leaves (8), which was statistically similar to Dhanvantari (9), Arka Ayush (9) and Arka Tilak (9). These differences reflect the genetic variability among cultivars, influencing their growth patterns, as also noted by Reshma *et al*. (2017). Leaf length showed a significant range among the cultivars, with Manhattan having the longest leaves (52 cm), followed by Arka Amar (50.6 cm) and Dhanvantari (48.2 cm). On the other hand, Arka Ayush and S. Lady had the shortest leaves, measuring 38.5 cm and 38.6 cm, respectively. These differences in leaf length highlight the genetic influence on growth potential, consistent with earlier studies that reported similar variations in gladiolus cultivars (Kumar*,* 2009). Regarding leaf area, significant differences were also observed among the cultivars. The largest leaf area was found in Dhanvantari (114.72 cm^2), followed by Manhattan (102.54 cm^2) and Arka Darshna (90.63 cm^2). S. Lady exhibited the smallest leaf area (60.37 cm^2), with Arka Tilak (79.90 cm^2) and Punjab Pink Elegance (83.78 cm^2) showing lower values. These differences in leaf area are crucial, as they are indicative of the plant's photosynthetic efficiency and nutrient utilization, directly impacting growth and yield. The findings align with previous research that emphasized the role of genetic factors in determining leaf area and plant productivity (Kumar *et al,* 2009).

Floral characteristics of Gladiolus cultivars

The number of spikes per plant showed significant variation among the gladiolus cultivars. The highest number of spikes per plant was observed in Arka Darshna (2.54) followed by Arka Amar (2.18), while the lowest number of spikes per plant was recorded in Dhanvantari (1.29). This variation in spike numbers can be attributed to the genetic differences among the cultivars, as noted by Rani *et al.* (2007), who highlighted the genetic potential's role in determining spike production. Spike length also varied significantly among the gladiolus cultivars. The highest spike length was recorded in Arka Amar (75 cm), followed by Arka Tilak (63.3 cm) and the lowest spike length was recorded in Dhanvantari (42.6 cm). This variation in spike length can be attributed to the genetic differences between cultivars, as supported by Islam *et al.* (2017) and Chourasia *et al* (2015) who observed similar results emphasizing the role of genetic potential in determining spike length in gladiolus. The rachis length of gladiolus cultivars exhibited significant variation, with the maximum rachis length recorded in Arka Amar (42.3 cm), followed by Punjab Pink Elegance (39.7 cm) and Arka Tilak (38.2 cm). The shortest rachis length was observed in Dhanvantari (21 cm). This variation in rachis length can be attributed to the genetic traits of the cultivars and their interaction with environmental conditions. Swaroop (2010) and Pandey *et al.* (2012) also reported significant differences in rachis length among gladiolus cultivars due to both genetic and environmental factors. Regarding the number of florets per spike, significant differences were observed among gladiolus cultivars. The maximum number of florets per spike was recorded in Arka Amar (13), followed by Arka Ayush (12) and Arka Tilak (12), while the minimum number of florets per spike was recorded in Manhattan (9). The variation in the number of florets per spike can be attributed to the genetic potential of the cultivars. Similar findings were reported by Sindhu *et al.* (2016) and Meena *et al.* (2016), who noted the significant role of genetic variability in determining the number of florets per spike in gladiolus. The floret diameter also showed significant variation among gladiolus cultivars. The maximum floret diameter (9.1 cm) was observed in Arka Tilak, while the minimum floret diameter (5.2 cm) was recorded in Dhanvantari. Other cultivars had floret diameters ranging from 5.4 cm (Manhattan) to 8.7 cm (Arka Ayush). The variation in floret diameter can be attributed to the inherent genetic differences of the cultivars, which influence their flower morphology. These findings are consistent with earlier reports indicating that genetic factors play a crucial role in determining the flower size in gladiolus (Chopade, 2011; Singh *et al.,* 2017).

CONCLUSION

This study evaluated the growth and floral traits of various gladiolus cultivars under open-field

conditions, revealing significant variability driven by genetic and environmental factors.These variations reflect the genetic potential and adaptability of the cultivars to different conditions, offering insights into their ornamental and commercial value. The study highlights significant differences in growth and floral traits among gladiolus cultivars, emphasizing the role of genetic variability and environmental interaction. Cultivars such as Arka Amar and Arka Darshna demonstrated superior traits, making them ideal for enhancing productivity and ornamental appeal. These findings provided valuable insights for breeders and growers in selecting cultivars for specific commercial and aesthetic applications.

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