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Morphological studies on growth and flowering of gladiolus (*Gladiolus hybridus*) cultivars

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Abstract

An experiment entitled “Morphological studies on Growth and Flowering of Gladiolus (*Gladiolus hybridus*) cultivars” was carried out in Botanical Garden, Department of Floriculture and Landscape Architecture, Horticulture College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during 2022-2023. The experiment was laid out in Completely Randomized Design with 12 treatments (cultivars) and three replications. With respect to growth parameters, the cultivar Dhanvantari showed maximum plant height (32.77 cm), maximum number of leaves (8.00), maximum leaf width (5.11 cm), more leaf area (101.62 cm²). In case of flowering and quality parameters, Arka Gold and Arka Pratham recorded the minimum number of days (63.00) to spike emergence. The cultivar Dhanvantari had more number of spikes per plant (2.00), length of spike (95.44 cm), diameter of first floret (9.00 cm). The cultivar Arka Amar had the longest period of vase life (11.00 days).

Keywords: Gladiolus, cultivars, spike, rachis, vase life

Introduction

Gladiolus hybridus L. (2n = 30) belonging to the Iridaceae family. Gladiolus is popularly regarded as “Queen of Bulbous flowers”. Gladiolus is one of the most popular ornamental bulbous plants grown in many parts of the world for its bewitching flowers. South Africa was the country of origin for Gladiolus. Its cultivation began in India in the 19th century. Gladiolus are found in western Asia, Europe, Africa, and Madagascar. The Cape of Good Hope is regarded as the genus core of variety because it is home to the bulk of approximately 260 species of Gladiolus (Goldblatt 1996) [5]. Pliny the Elder was the first to use the name “Gladiolus” (A.D.23-79) derived from the Latin word “gladius”, meaning “sword”, for the shape of its foliage and is commonly referred to as “Sword Lily” or “Corn flag”.

Gladiolus is a herbaceous perennial plant which develops from axillary buds on the corm that are covered in numerous layers of brownish, fibrous tunics. Their stems are unbranched and produce 1 to 9 slender sword-shaped, longitudinally grooved leaves that are sheathed. The intriguing spikes have several florets that are different in size and shape, with smooth, ruffled, deeply crinkled or lacinated tepals that are blotched or have distinct patches or markings of different hues and colour combinations. Gladiolus are propagated by means of corms and cormels. Any crop's or cultivar's performance is greatly influenced by its genotypic makeup and its interaction with the environment. In order to evaluate which gladiolus cultivars were best for growth, quality flower production and corm production, the current experiment was carried out.

Materials and Methods

The present investigations were carried out at the Botanical Garden, Horticulture College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, during 2022-23. The experiment was laid out in Completely Randomized Design with 3 replications and 15 corms of each genotype per replication was taken for observation. The healthy corms of 12 varieties (Dhanvantari, Pricilla, Yellow Stone, Arka Gold, Arka Amar, Arka Naveen, Arka Kesar, Arka KumKum, Arka Tilak, Arka Dharshan, Arka Pratham, Arka Aayush) were taken and cleaned by removing the dried husk present on them. Then they were dipped in Carbendazim (0.2%) solution for 20 minutes as preventive measure for Fusarium wilt disease. These corms were planted in a pot at a depth of 5-6 cm. Light irrigation was given immediately after planting. All cultural operations were uniformly done for all the cultivars. Observations were recorded on various plant growth, flowering, corm and cormel attributes and data were analyzed statistically.

Results and Discussion

i) Vegetative characters

The data presented in table 1 showed that the days taken to sprout were found to differ significantly. The time it took for sprouting varied from 8.33 days for Arka Gold to 18.66 days for Arka KumKum. Early sprouting may be a result of genetic variability, temperature needs, dormancy, and stored food reserves, which led to different sprouting timeframes under the current agro-climatic conditions. This is in conformity with the findings of Rajiv and Yadav (2005) ^[6] in gladiolus. At 30DAP, Dhanvantari had the maximum plant height (61.16 cm), which was on par with Arka KumKum (60.33 cm) followed by Arka Dharshan (59.33 cm) and Pricilla (42.66 cm) had the minimum plant height. At 45DAP, Dhanvantari had the maximum plant height (79.10 cm), which was on par with Arka Gold (75.83 cm) and minimum plant height was observed in Pricilla (59.26 cm). At 60DAP, Dhanvantari recorded the highest plant height (101.13 cm) followed by Arka Gold (96.10 cm) and the minimum plant height was seen in Pricilla (80.26 cm). Plant height is a fundamental characteristic that is determined by the genetic make-up. These findings are in agreement with Syed atif *et al.* (2013) ^[11] in gladiolus. Significant differences were also found for number of leaves per plant. Number of leaves at 60DAP were maximum in Dhanvantari (6.50), whereas minimum number of leaves were observed in Pricilla (4.73). Due to genetic heterogeneity and varying degrees of adaptation to the agro-climatic conditions, there were considerable differences in the number of leaves per plant between different cultivars. With more leaves, photosynthesis normally increases, allowing the plant to create more food that affects its ability to grow and develop. Therefore, genotypes with more leaf production have greater plant development, which results in higher yield. These outcomes support the earlier findings of Ankit Chourasia *et al.*, (2015) ^[1] in gladiolus.

ii) Flowering characters

The data in table 2 revealed, that Arka Gold (63.00 days) and Arka Pratham (63.33 days) had the earliest spike emergence whereas Pricilla took the maximum days (75.00 days). One significant varietal characteristic in gladiolus is the length of time it takes for spikes to appear, this may be predominantly controlled by the genotypes' genetic makeup. The primary factor in the formation of spikes may have been the plant food reserves, which may be related to plant growth rate, that controls the accumulation of the necessary amount of carbohydrates for slipping stage (Bhat *et al.*, 2009) ^[2]. Similar findings regarding variances in spike emergence across various genotypes have been observed by Ganesh Kadam *et al.*, (2014) ^[4] in gladiolus. Dhanvantari had the highest number of spikes per plant (2.00), followed by Arka Gold (1.66) and Yellow stone recorded the minimum (1.00). The supply of food stored in the corms may vary, which could account for differences in spike length. Longer spikes are

produced by cultivars with corms that contain more food material. Our reports are confirmed with the findings of Mahawer *et al.* (2013) ^[7] in gladiolus. The longest spike was recorded in Dhanvantari (95.44 cm) and Pricilla had the shortest spike (67.43 cm). Likewise, Dhanvantari had the highest diameter of first floret (9.00 cm) followed by Arka KumKum (8.60 cm) and the least diameter was recorded in Arka Pratham (5.90 cm) (Figure.1). The genetic variation among the several gladiolus cultivars and the field trial's climatic conditions may be a reason for the differences in the floret diameter. Vase life is another crucial consideration for a good cut flower. Along with other desirable characteristics of spikes including floret colour, spike length, and number of florets per spike, the vase life of the cut spikes affects consumer preference. For vase life, the current investigations have found a considerable variation between genotypes. Vase life period ranged between 11.00 days in Arka Amar to 5.00 days in Pricilla. This was confirmed by Singh *et al.*, (2000) ^[10] in gladiolus.

The cultivar Dhanvantari recorded the highest yield of (1, 80,000 flower spikes/ha), followed by Arka Gold (1, 49,400 flower spikes/ha). The lowest yield was recorded by Pricilla (90,000 flower spikes/ha). The diversity in attributes between varieties may result from genetic variability and the impact of current environmental conditions. These are in conformity with the research findings of Pandey *et al.*, (2012) ^[8] in gladiolus

iii) Corm characters

The current investigation showed significant variance in corm and cormel characteristics (Table 3). Number of daughter corms ranged between 2.32 in Dhanvantari and 1.10 in Pricilla. Dhanvantari had the highest weight of daughter corm (40.50g) and the least weight of daughter corm was recorded by Arka Naveen (21.16g). The highest diameter of daughter corm was recorded in Dhanvantari (18.66cm) and Arka Gold had the least (8.33 cm). Dhanvantari had the highest number of cormels (29.33) and Pricilla had the least number of cormels (8.10). After reaching full bloom, corms and cormels begin to form and show the formation of flower spikes. As the flowers start to fade, the food supply decreases and the size of the corms and cormels increases. The development of corms with greater weight may be linked to the healthy vegetative growth of the plants during the early phases, which provides a sufficient amount of photosynthates for store in the corms, which are also storage organs (Chopde *et al.*, 2012) ^[3]. The size of the corms has a significant impact on the growth and development of the gladiolus, including the production of flowers and corms. It is abundantly clear from the results that Dhanvantari had more plant height and leaves in the early growth stages. Soil, climate, and genetic composition may play a role in the difference in cormel output per plant. Similar findings with respect to daughter corms and cormels have been reported by Sankari *et al.*, (2012) ^[9] in gladiolus.

Table 1: Performance of gladiolus cultivars for vegetative characters

S. No	Cultivars	Days taken for sprouting	Plant height (cm)			Number of leaves		
			30 th DAP	45 th DAP	60 th DAP	30 th DAP	45 th DAP	60 th DAP
1	Dhanvantari	9.33	61.16	79.10	101.13	3.96	5.51	6.50
2	Pricilla	12.66	42.66	59.26	80.26	2.45	3.80	4.73
3	Yellow Stone	10.00	49.06	72.03	90.40	3.16	5.06	6.06
4	Arka Gold	8.33	51.00	75.83	96.10	2.30	4.86	5.36
5	Arka Amar	13.33	53.40	66.80	94.06	3.78	5.28	5.76
6	Arka Naveen	17.66	56.36	71.16	91.66	3.96	5.14	5.90
7	Arka Kesar	10.66	48.26	71.30	89.23	3.89	5.38	5.80
8	Arka KumKum	18.66	60.33	72.20	93.86	3.56	5.46	6.26
9	Arka Tilak	9.33	55.10	73.60	91.10	3.20	5.18	5.79
10	Arka Dharshan	16.66	59.33	73.06	92.03	3.06	4.96	5.86
11	Arka Pratham	12.33	52.20	62.16	84.40	2.66	4.55	4.73
12	Arka Aayush	17.00	58.20	68.73	89.06	3.20	5.16	6.16
	Mean	13.00	53.92	70.14	91.10	3.30	5.03	5.74
	S.Ed	2.50	2.68	3.14	3.49	0.21	0.13	0.14
	C.D. 5%	5.17	5.53	6.49	7.20	0.45	0.27	0.30

Table 2: Performance of gladiolus cultivars for flowering characters

S. No	Cultivars	Spike emergence(days)	Spike length (cm)	Vase life (days)	No. of spikes per plant	Marketable spikes per m ²	Estimated Yield per ha (in 000's)
1	Dhanvantari	66.33	95.44	8.00	2.00	18.00	180.00
2	Pricilla	75.00	67.43	5.00	1.00	9.00	90.00
3	Yellow Stone	71.33	93.00	10.00	1.33	11.97	119.70
4	Arka Gold	63.00	88.33	7.33	1.66	14.94	149.40
5	Arka Amar	69.00	86.46	11.00	1.00	10.00	100.00
6	Arka Naveen	65.66	77.86	7.66	1.33	12.34	123.40
7	Arka Kesar	67.00	82.30	6.66	1.00	12.50	125.00
8	Arka KumKum	69.66	89.60	7.00	1.33	11.00	110.00
9	Arka Tilak	71.66	80.50	8.33	1.33	14.32	143.20
10	Arka Dharshan	74.00	86.15	9.33	1.00	13.69	136.90
11	Arka Pratham	63.33	95.29	8.33	1.00	15.00	150.00
12	Arka Aayush	70.66	75.28	6.66	1.00	15.80	158.00
	Mean	68.88	84.80	7.94	1.54	11.22	112.35
	S.Ed	2.09	2.73	0.63	0.09	0.50	12.34
	C.D. 5%	4.33	5.65	1.31	0.20	1.03	20.79

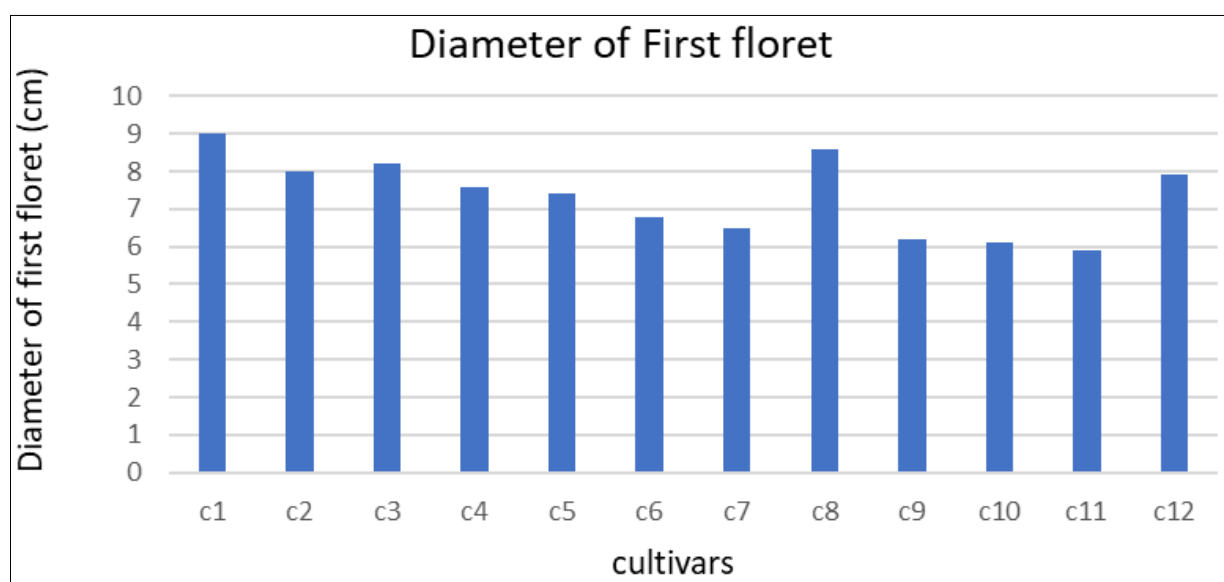
**Fig 1:** Diameter of First floret

Table 3: Performance of gladiolus cultivars for corm characters

SI. No	Cultivars	Number of daughter corms per plant	Weight of daughter corms (g)	Diameter of daughter corms (cm)	Number of cormels per plant
1	Dhanvantari	2.32	40.50	18.66	29.33
2	Pricilla	1.10	35.33	12.66	8.10
3	Yellow Stone	1.20	21.66	10.00	17.33
4	Arka Gold	1.18	35.00	8.33	21.66
5	Arka Amar	1.35	30.50	13.33	15.66
6	Arka Naveen	1.28	21.16	17.66	20.33
7	Arka Kesar	1.50	25.66	10.66	20.66
8	Arka KumKum	1.90	25.33	9.33	16.66
9	Arka Tilak	1.20	28.16	9.33	24.30
10	Arka Dharshan	1.88	29.00	16.66	25.33
11	Arka Pratham	1.97	37.00	12.33	16.00
12	Arka Aayush	1.86	26.00	17.00	23.33
	Mean	1.56	29.61	3.81	19.89
	S.Ed	0.05	3.20	0.37	4.27
	C.D. 5%	0.10	6.62	0.76	8.82

Conclusion

In the present investigation it is observed that the minimum days required for spike emergence was seen in Arka Gold. Spike length, number of spikes per plant, diameter of floret, number of daughter corms, weight of daughter corms, diameter of daughter corms were recorded maximum in Dhanvantari, while the longest vase life was recorded in Arka Amar. It is concluded that the cultivar Dhanvantari and Arka Gold is suitable for cultivation under Coimbatore conditions.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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