International Journal of Bio-resource and Stress Management https://pphouse.org/ijbsm.php

Crossref

IJBSM January 2023, 14(1):039-044 Print ISSN 0976-3988 Online ISSN 0976-4038 **Article** AR3258a

Research Article *Natural Resource Management*

DOI: HTTPS://DOI.ORG/10.23910/1.2023.3258a

Evaluation of Gladiolus Cultivars for Growth, Flowering and Corm Multiplication under Jhansi Conditions of Bundelkhand Region

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ABSTRACT

An experiment was conducted to evaluate different Gladiolus (*Gladiolus grandiflorus* L.) cultivars for growth, flowering and corm multiplication at Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, India during the year 2019–20. Ten cultivars of gladiolus namely 'Australian Fair', 'African Star', 'Creamy Green', 'Pusa Srijana', 'Gunjan', 'Urvashi', 'Pusa Mohini', 'Urvashi', 'Suryakiran' and 'Chandni' were selected for this study. Healthy and uniform sized corms of different cultivars of gladiolus were planted at a spacing of 30×10 cm^2 in the month of November, 2019. Maximum plant height, spike length and rachis length was recorded in cv. 'Australian Fair'. Significant results were also observed in case of leaf growth and maximum leaf length was recorded in cv. 'Gunjan' and number of leaves $plant^{-1}$ were recorded maximum in cv. 'Surya Kiran'. However, number of florets $spike^{-1}$ was observed to be maximum in cv. 'Urvashi'. Results were found to be significant for floret size and it was recorded maximum in cv. 'Creamy Green'. Number of corms $plant^{-1}$ was recorded maximum in cvs. 'African Star' and 'Gunjan' and corm size and corm weight were recorded maximum in cv. 'Gunjan'. However, number of cormels $plant^{-1}$ were found to be maximum in cv. 'Pusa Srijana'. Significant results related to cormel development were also recorded and cormel diameter and cormel weight were found to be maximum in cv. 'Australian Fair'.

KEYWORDS: Bundelkhand, corm multiplication, cultivars, flowering, gladiolus, growth

***Citation* (VANCOUVER):** Sharma et al., Evaluation of Gladiolus Cultivars for Growth, Flowering and Corm Multiplication under Jhansi Conditions of Bundelkhand Region. *International Journal of Bio-resource and Stress Management,* 2023; 14(1), 039-044. HTTPS://DOI.ORG/10.23910/1.2023.3258a.

Data Availability Statement: Legal restrictions are imposed on the public sharing of raw data. However, authors have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

Conflict of interests: The authors have declared that no conflict of interest exists.

RECEIVED on 13th September 2022 RECEIVED in revised form on 24th December 2022 ACCEPTED in final form on 07th January 2023 PUBLISHED on 18th January 2023

1. INTRODUCTION

Gladiolus (*Gladiolus grandiflorus* L.) is called as the queen of bulbous flowers, belonging to the family Iridaceae and is amongst the most popular ornamental bulbous plants grown in many parts of the world and in India for its fascinating flowers. In the year 2020–21, Gladiolus was cultivated in an area of about 11.77 tha in India (Anonymous, 2022). The genus *Gladiolus* having approximately 300 species and most of them have their centre of origin in South Africa. The generic name *Gladiolus* is derived from the Latin word '*gladius*' meaning 'sword' relating to the sword like leaves and commonly it is called as Sword lily. It is a herbaceous bulbous perennial plant used for landscaping and for cut flower production (Alam et al., 2013). This crop is having commercial value due to its majestic flower spikes that bears florets of varying shapes, sizes, colours, patterns and have excellent keeping quality (Gul et al., 2020, Dhiman et al., 2022). Gladiolus is a very popular cut flower crop grown during summers in temperate to sub temperate areas and during winters in tropical to sub-tropical areas in India under open field conditions (Kleynhans and Spies, 2011, Sarkar et al., 2014b, Proietti et al., 2022). This makes Gladiolus a versatile crop being grown throughout India for cut flower production. Gladiolus is amongst the seven genera dominating the global trade in ornamental bulbous flowers (Kamenetsky and Miller, 2010).

As at present there are large number of cultivars of exotic and indigenous origin in gladiolus, however, scope to improve different traits of cultivars using breeding techniques requires knowledge about performance of particular cultivars. Therefore, for the development of new varieties, use of interbreeding of individuals related closely or distantly having desirable properties can be utilized (Cantor and Tolety, 2011).

It has been observed that gladiolus cultivation can be exploited in low hills of Nagaland during summer and for commercial purpose the variety Oscar can be utilized (Singh et al., 1998). For commercial cut-flower production in the Eastern Ghats, different genotypes have been recommended (Sankari et al., 2012). In one of the study, genotypes have also been recommended for the hilly region of North Eastern India (Sarkar et al., 2014a). Variation in morphological characters of different genotypes under climatic conditions of Uttar Pradesh have also been reported earlier (Kumar, 2015). Rao and Sushma (2015) recommended various gladiolus cultivars for commercial cultivation in Andhra Pradesh. Genetic variability have been noticed in different gladiolus cultivars when grown under Delhi conditions in India (Kadam et al., 2014, Sindhu et al., 2016). Messar et al. (2016) concluded that variety American Beauty can be used as female parent whereas the variety Nathan White as a male parent in crossing programme. Vast morphological genetic diversity in all genotypes under study of gladiolus have also been reported earlier (Islam et al., 2017, Nagar et al., 2017, Singh et al., 2017, Safeena and Thangam, 2019, Swaroop et al., 2019, Gurung et al., 2021) There are reports that among gladiolus cultivars there was higher genotypic correlation than phenotypic correlation in most of the cases (Rashmi and Kumar, 2014, Pattanaik et al., 2015, Ruati et al., 2013). Under the climatic conditions of Bundelkhand, this crop is one of the best option for production of cut flowers during winter season. At present, reports of research work under agro-climatic conditions of Jhansi region is not available on performance of gladiolus cultivars for growth, flowering and corm multiplication. Keeping all these factors in view, the present study was undertaken under Jhansi area of Bundelkhand region for identifying the best suitable cultivar.

2. MATERIALS AND METHODS

The study on Gladiolus (*Gladiolus grandiflorus* L.) was carried out in the Research Farm of Department of Floriculture and Landscaping of Rani Lakshmi Bai Central Agricultural University, Jhansi, Uttar Pradesh, India from November, 2019 to March, 2020. For this study, ten cultivars of gladiolus were selected viz. 'Australian Fair', 'African Star', 'Creamy Green', 'Pusa Srijana', 'Gunjan', 'Urvashi', 'Pusa Mohini', 'Urvashi', 'Suryakiran' and 'Chandni'. Healthy and uniform sized corms of different cultivars of gladiolus were treated with fungicide solution for 30 min and dried in shade before planting in field. Planting of corms was done in the month of November, 2019 and corms were planted at a spacing of 30 cm×10 cm accommodating 30 corms m^{-2} area. Experiment was conducted in Randomized Complete Block Design (RCBD) with three replications. Standard cultural practices like weeding, hoeing, earthing up and irrigation were adopted for all the cultivars throughout growth and corm development. About 20 days before lifting of corms irrigation was withheld. Data pertaining to the parameters like vegetative growth (plant height, number of leaves and leaf length), flowering (spike length, rachis length, number of florets $sipke^{-1}$, floret size) and corm growth and multiplication (number of corms $plant^{-1}$, corm size, corm weight, number of cormels $plant^{-1}$, cormel size and cormel weight) was subjected to analysis using SPSS software (USA). Data pertaining to growth and flowering characters were taken at the time of peak flowering when about 50% florets were fully open in spike, and corm parameters were taken at the time of lifting of corms.

3. RESULTS AND DISCUSSION

3.1. Growth parameters

Findings pertaining to various growth and flowering

parameters are presented in Table 1 and Figure 1. It was observed that significant difference was there in growth and flowering characters of gladiolus cultivars under study. Earliest sprouting of corms (18 days) was observed in cv. 'African Star', with at par results recorded in cv. 'Australian Fair'. It is evident from findings that minimum number of days for flower spike emergence (56.17 days) was observed in cv. 'Creamy Green' which however, was found to be at par with cvs. 'Surya Kiran', 'Urvashi' and 'Pusa Mohini'. Similarly earliest flowering (86.17 days) was also recorded in cv. 'Creamy Green' with at par results recorded in cv. 'Surya Kiran'. Identification of characters like flower emergence would be useful in scheduling the flower production of gladiolus according to market demand. Through judicious planning and planting of early and late cultivars producing flowers for sustainable marketing for a longer period can be obtained. Similar variations in gladiolus cultivars have also been reported earlier (Kumar, 2009, Ranjan et al., 2010, Islam et al., 2017, Nagar et al., 2017, Singh et al., 2017, Safeena and Thangam, 2019, Swaroop et al., 2019, Gurung et al., 2021).

Data shows that maximum plant height (94.83 cm) was recorded in cv. 'Australian Fair' which was however found to be at par with plant height of cvs. 'African Star', 'Creamy Green', 'Surya Kiran', 'Gunjan' and 'Shubham'. Similarly, spike length was also recorded maximum (84.17 cm) in cv. 'Australian Fair' with at par values with spike length of cv. 'Creamy Green' and 'Surya Kiran'. Significant results were also observed in case of leaf length and maximum leaf length (39.00 cm) was recorded in cv. 'Gunjan'. As regards, number of leaves plant^{-1} was recorded maximum (18.17) in cv. 'Surya Kiran'. Similar results have also been reported earlier

Table 1: Growth and flowering of different cultivars of gladiolus under Bundelkhand region

Cultivars	Corm sprouting (days)	Spike emergence (days)	Flowering (days)	Plant height (cm)	Spike length (cm)	Leaf length (cm)	No. of leaves plant^{-1}	Rachis length (cm)	No. of florets spike^{-1}	Floret size (cm)
African star	18.00	66.40	96.51	89.17	72.00	32.67	10.00	28.00	10.33	10.33
Australian fair	19.67	61.11	91.78	94.83	84.17	30.83	7.94	47.67	11.33	7.32
Creamy green	21.67	56.17	86.17	91.67	79.83	31.17	12.28	34.33	12.17	10.83
Surya kiran	20.33	56.83	86.83	94.00	82.45	31.33	18.17	28.33	10.17	9.24
Gunjan	21.67	64.89	95.50	89.67	69.00	39.00	7.83	24.40	10.90	10.50
Urvashi	23.33	58.50	88.50	82.83	68.83	33.67	9.00	34.33	12.33	9.77
Shubham	23.33	62.38	89.78	92.00	83.67	27.50	6.83	25.83	10.67	9.00
Chandni	22.33	59.33	88.83	83.50	76.33	29.17	8.00	35.67	9.33	9.62
Pusa srijana	23.67	59.46	89.46	79.00	61.00	30.83	11.33	35.00	9.00	9.20
Pusa mohini	23.33	58.11	88.00	83.83	73.67	27.67	11.33	24.50	9.83	9.45
SEm±	0.65	0.94	0.42	2.45	2.55	1.77	1.04	1.55	0.69	0.37
CD (p=0.05)	1.96	2.82	1.25	7.35	7.63	5.30	3.10	4.66	2.06	1.10

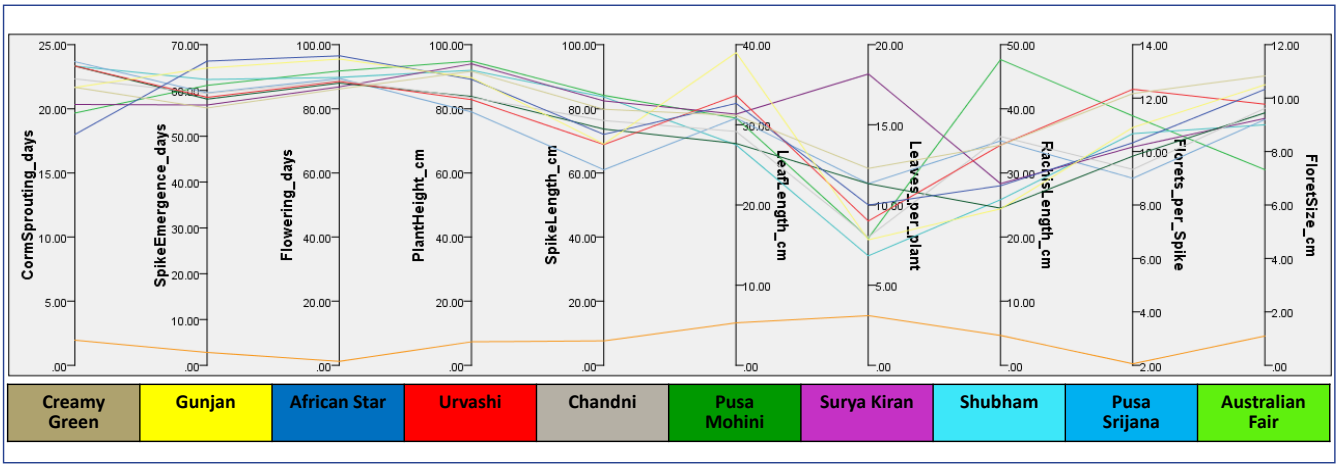

Figure 1: Graphical representation for the growth and flowering trends of cultivars of gladiolus under Bundelkhand region

wherein it was observed that different cultivars of gladiolus showed variable responses for vegetative characteristics (Singh et al., 2017, Islam et al., 2017). Dhatt and Jhanji (2021) evaluated the gladiolus varieties for off-season flower production and found that cvs. Punjab Glance and Punjab Lemon Delight planted early performed at par to their respective normal plantings.

3.2. Flowering parameters

It is evident from the findings that rachis length was maximum (47.67 cm) in cv. Australian Fair' (Table 1 and Figure 1). However, number of florets spike^{-1} was observed to be maximum (12.33) in cv. 'Urvashi' which was found to be at par with number of florets spike^{-1} in cvs. 'Creamy Green' and 'Australian Fair'. Results were found to be significant for floret size and it was recorded maximum (10.83 cm) in cv. 'Creamy Green' which was however found to be at par with floret size in cv. 'Gunjan'. Significant difference in growth and flowering of gladiolus cultivars under varied agro-climatic zones of India have been reported earlier. The results showing significant effect of different cultivars of gladiolus to particular agroclimatic zone have been reported earlier (Kumar, 2009). In a similar study, Safeena and Thangam (2019) reported significant differences for vegetative, floral, corm and cormel characters of gladiolus when evaluated under the agroclimatic conditions of Goa. They found that Arka Amar and Darshan were promising in respect of growth, yield and quality cut flower production under agroclimatic conditions of Goa.

3.3. Corm parameters

Results pertaining to corm and cormel multiplication are presented in Table 2. It has been observed that corm development and corm multiplication characters are varietal and varied with cultivar. However, effect of particular climatic conditions also influences the corm development. It was observed that corm development was optimum under these climatic conditions. Increase in corm growth can be attributed to the light conditions prevailing during the vegetative growth and flowering resulting in development of more number of photosynthates which were directed towards corm development after harvesting of flower spikes. Findings show that number of corms plant^{-1} (2.17) was recorded maximum in cvs. 'African Star' and 'Gunjan'.

Table 2: Corm and cormel multiplication of different gladiolus cultivars under Bundelkhund region

Cultivars	No. of corms plant^{-1}	Corm diameter (cm)	Corm weight (g)	No. of cormels plant^{-1}	Cormel diameter (cm)	Cormel weight (g)
African star	2.17	4.48	27.03	6.33	0.86	0.42
Australian fair	1.00	4.31	28.59	2.33	1.50	2.05
Creamy green	1.83	4.72	28.72	17.83	1.05	0.48
Surya kiran	1.83	4.04	13.20	3.33	0.94	0.29
Gunjan	2.17	5.97	59.66	5.78	1.13	0.85
Urvashi	1.33	3.77	30.79	1.33	1.33	0.60
Shubham	1.50	4.49	29.87	6.33	1.06	0.50
Chandni	1.67	4.31	27.17	2.33	1.47	0.43
Pusa srijana	1.83	4.06	29.12	19.17	0.80	0.71
Pusa mohini	1.33	4.43	26.13	13.00	1.03	0.48
SEm±	0.14	0.09	1.22	0.89	0.06	0.06
CD (p=0.05)	0.41	0.28	3.65	2.65	0.18	0.18

Whereas, minimum number of corms plant^{-1} (1.00) was recorded in cv. 'Australian Fair'. It is also evident from the data that corm size and corm weight were recorded maximum (5.97 cm and 59.66 g, respectively) in cv. 'Gunjan'. However, number of cormels plant^{-1} (19.17) were found to be maximum in cv. 'Pusa Srijana' which was found to be at par with cv. 'Creamy Green'. Wide variation in corm and cormel production of gladiolus cultivars have also been reported earlier by Sankari *et al.* (2012). Significant results related to cormel development were also recorded and cormel diameter and cormel weight were found to be maximum (1.50 cm and 2.05 g respectively) in cv. 'Australian Fair'. Wide variation in corm multiplication parameters like weight and size of corm, number of corms, cormel weight and number of cormels have also been reported while working on different gladiolus cultivars (Safeena and Thangam, 2019).

4. CONCLUSION

Based upon this study on selected cultivars of gladiolus cvs. 'Australian Fair', 'Creamy Green', 'Surya Kiran' and

'Urvashi' are recommended for cultivation in Bundelkhund region for cut flower production. For propagule production viz. corms and cormels in gladiolus, climatic conditions in Bundelkhund region is congenial during winters for obtaining economic yield. For corm multiplication among the cultivars selected for the study, best results were found in cvs. 'Gunjan' and 'African Star'. In case of cormel multiplication, cvs. 'Pusa Srijana' and 'Creamy Green' are recommended.

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