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Performance Evaluation of Elite Gladiolus Cultivars under Agro Climatic Conditions of Rawalpindi

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Authors' contributions

This work was carried out in collaboration between all authors. Author SM envisioned the project and conducted the experiment. Author IAH provided guideline and supervised the project. Author MA assisted in growth and yield analysis. Author AA analyzed the data. All authors read and approved the final manuscript.

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ABSTRACT

Cut flower production is a fast growing sub-sector of horticultural industry in Pakistan. Among the numerous flowering crops available for exploitation on commercial scale, gladiolus (G*ladiolus alatus* L.) is one of the premier bulbous ornamental crops. Performance of seven exotic cultivars of gladiolus namely; Jack gold, Nova, Invi, Porterdale, Eiaia, Fado and Madriver were evaluated for their growth and floral characteristics under agro-climatic conditions of Rawalpindi. The experiment was laid out according to randomized complete block design (RCBD) with three replications. Among the cultivars, Porterdale recorded the best result for plant height (139.33 cm), number of leaves per plant (9), leaf length (56.67 cm), leaf area (139 cm^2) and floret length (10 cm). Cultivar Fado showed superiority in spike length (73.19 cm), floret width (11.33 cm) and number of florets per plant (16.41). Early flowering (105.33) was observed in Invi, while longevity of open floret (4.33 days) was best for cultivars Invi and Nova. Keeping in view the performance the most adapted gladiolus cultivars for cut flower production were Porterdale and Fado.

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Keywords: Cultivars; Gladiolus alatus; floret size; spikes per plant.

1. INTRODUCTION

Gladiolus (*Gladiolus alatus*) is an ornamental bulbous plant, a flower of perfection also known as "Queen of bulbous flowers" native to South Africa. The 'Sword Lilly' is its common name because of its sword shaped foliage [1]. It was introduced into cultivation towards the end of the 16th century. In Indo-Pak, its cultivation was started at the nineteenth century [2]. Its cultivation is gaining popularity for its attractive flowering spikes having a longer life of cut flower. Its attractive inflorescence with diversity of colours and number of appealing florets has made it attractive for diversified use in the garden [3]. The luxuriance unique multicolored spikes of some high demanding gladiolus cultivars have great economic value for cut flower trade and much valued by the aesthetic world for beauty and loving people because its prettiness and unparallel elegance [4]. They are widely used as artistic garlands, floral ornaments, bouquets and religious ceremonies [5]. The long flower spikes are excellent as cut flower for table decoration when arranged in vases [6].

Gladiolus is very amusing in varietal properties and every year there is an accretion of new cultivars. Development of cultivars having higher yield and improved quality have been main objectives for most of the breeding programmes. New cultivars of important flower crops are being developed by breeders every year to meet the ever-changing consumer demands [7]. The modern gladiolus cultivars offer a diversity of colours, shapes, and sizes available in few other flowering plants. Moreover, new cultivars also come from other countries and the performance of these cultivars depends upon climatic conditions of the region under which they are grown. Gladiolus cultivars show narrow adaptations and fluctuating performance in terms of various traits over varying environments. As a result, cultivars which perform well in one region may not perform same in other regions of varying climatic conditions [8]. It is also important to study the performance of existing cultivars for their superior desirable characters [9]. Hence, it becomes very much necessary to study the morphological variation and evaluation of genotypes and also to identify the suitable germplasm for further improvement.

Considering these points, an investigation was undertaken to study the performance of elite gladiolus cultivars and to investigate the constraints associated with scope of Gladiolus production under agro climatic conditions of Rawalpindi.

2. MATERIALS AND METHODS

The present study on *Gladiolus alatus* was conducted at Department of Horticulture, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, under rain fed conditions with Latitude 33° N and Longitude 73° E. Seven exotic cultivars of gladiolus namely, Jack Gold, Nova, Invi, Porterdale, Eiaia, Fado and Madriver were used in the experiment. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. The plot was thoroughly prepared by repeated working with spade. The corms of seven varieties were cleaned by removing the dried scales or tunics present on them. These corms were planted at a spacing of 30 x 30 cm in each row along the sides of the ridges at a depth of 5-6 cm on 15th of October. Light irrigation was given immediately after planting. Well decomposed farm yard manure at the rate of 20 tons per hectare was applied at the time of land preparation. The corms of these plants were fertilized with Urea, TSP and MOP @ 150 kg, 225 kg and 130 kg per hectare respectively. Half the dose of nitrogen, full dose of phosphorus and potash was applied at final land preparation. The crop was top dressed with remaining half dose of nitrogen at 40 days after planting. Weeds were kept under control by hand weeding as and when needed. Regular irrigations were given as and when required, during crop growth period. All other agronomic practice was remaining same for all the cultivars.

Five plants were selected at random and tagged in each treatment and replication for the purpose of recording the observations. The mean value of the five selected plants in each treatment of three replications was taken to represent a particular variety with respect to a character. The observations were plant height (cm), number of leaves per plant, leaf length (cm), leaf area (cm^2), spike length (cm), days taken to start flower blooming (by calculating the number of days from bulb planting date to the start of first flower date), number of floret per plant, floret size (cm) and longevity of open floret (days from opening of flower to wilting). The experiment was completed after 150 days of sowing. All the data were analyzed statistically using the Fisher's analysis of variance technique on computer and

Duncan's multiple range test (DMRT) at 5% probability level was used to compare significance of treatment means [10].

3. RESULTS AND DISCUSSION

3.1 Plant Height (cm)

Plant height of a crop is changed due to both genetical and environment factor. Plant height (cm) was significantly affected by the different cultivars of gladiolus evaluated (Fig. 1). Fado produced the tallest plants (143.5 cm) which is statistically at par with Porterdale, Madriver, Eiaia and Invi. Jack Gold produced shortest plants (109.00 cm) which is statistically at par with Nova. The difference in plant height of the cultivars was attributed to difference in their genetic make-up [11]. These findings were in line with Reshma et al. [12] who found the variation in plant height for different cultivars of gladiolus.

3.2 Number of Leaves per Plant

Gladiolus cultivars showed significant differences with respect to number of leaves per plant (Fig. 4). The range obtained was 5 to 9 with mean of 6.47. The maximum number of leaves (9) was recorded for Porterdale and the least was found in Nova (5). The number of leaves per plant in different cultivars may be due to genetic features. Similarly Reshma et al. [12] found significant differences for number of leaves per plant with different cultivars.

3.3 Leaf Length (cm)

With attention to variance analysis table, the effect of cultivars on leaf length showed significant differences at 5% probability level (Fig. 2). Maximum leaf length (56.67 cm) was obtained from Porterdale while minimum leaf length (48.67 cm) was recorded from Eiaia. The difference in leaf length among the gladiolus cultivars was attributed to their variable inherent potential [9].

3.4 Leaf Area (cm^2)

Leaf area is a good indicator of the light capturing capacity of the growing crop. More leaf area index represents higher assimilate partitioning of the crop contributing towards better yields while, poor leaf area index represents inferior partitioning of assimilates thus resulting in scanty harvests of the crop. Different cultivars showed significant differences with respect to leaf area (Fig. 1). Maximum leaf area was observed in Porterdale (139.0 cm^2) while minimum (95.0 cm^2) was recorded in Eiaia. The difference in leaf area may be due to the genetic potential of gladiolus cultivar, which enables the plants to use nutrients efficiently and more adaptability of cultivar [12].

3.5 Spike Length (cm)

Genotypic variation in spike length under different gladiolus cultivars is presented in Fig. 2. Spike length (cm) was significantly affected by the gladiolus cultivars. Maximum spike length (73.19 cm) was recorded in Fado which was statistically at par with Portedale and Invi. Minimum spike length (49.67 cm) was recorded in Jack Gold. The variation in spike length of different cultivars may be due to genetic factors [5]. These results are in line with Islam et al. [8] and Chourasia et al. [9], who noted significant difference in spike length of gladiolus due to cultivars effect.

3.6 Days to First Flowering

The analysis of variance for gladiolus cultivars was significantly different for days to first flowering (Fig. 1). Maximum number of days required for initiation of first flower was 144.85 days in Fado followed by Eiaia (142.67 days) while minimum days required for initiation of first flower was observed in cultivar Invi (105.33). This may be due to genetic variability [3]. Similarly, Swaroop et al. [6] studied the genetic variability in gladiolus for characters like days to opening of first floret.

3.7 Florets per Spike

Gladiolus cultivars showed significant differences with respect to florets per spike (Fig. 3). Maximum number of florets per spike (16.41) were recorded in Fado which was at par with cultivars Porterdale. Whereas, minimum number (11.67) of florets was recorded in Nova. These significant differences among different gladiolus cultivars regarding florets per spike may be due to their genetic potential [6]. Similar results were observed by Sindhu et al. [11] and Meena et al. [13] who found that genetic variability affects number of florets per spike.

3.8 Floret Width

Data regarding floret width subjected to variance analysis and means of variation sources was

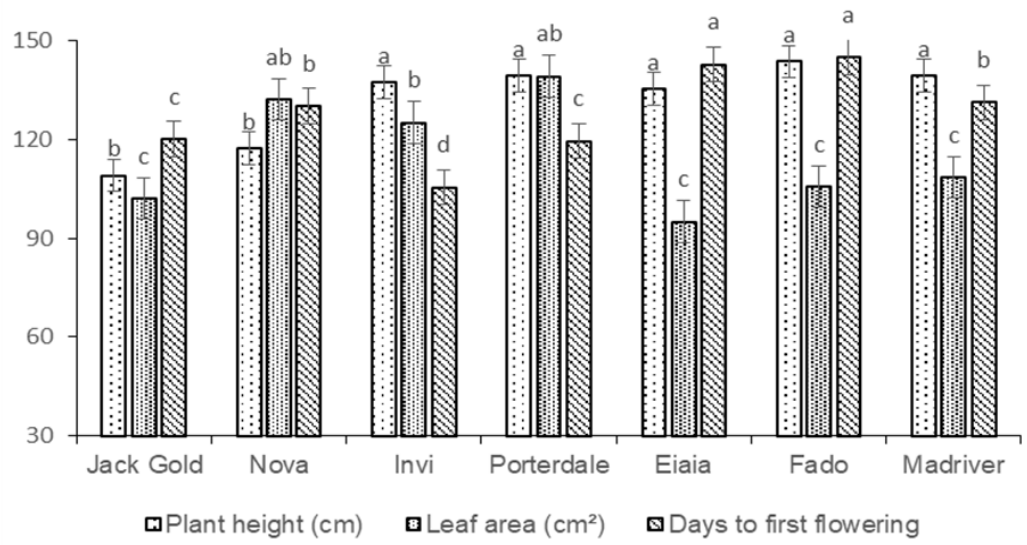

Fig. 1. Cultivars effects on a) plant height (cm) b) leaf area (cm^2) and c) days to first flowering. Vertical bars indicate ± SE of means. n = 3 replicate. Any two means not sharing same letter differ significantly at 5% level of probability

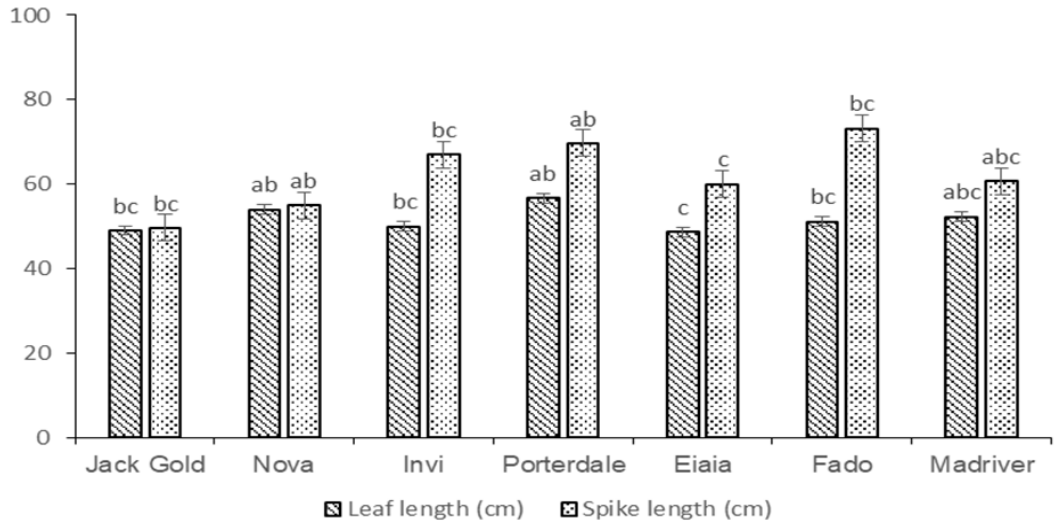

Fig. 2. Cultivars effects on a) leaf length (cm) and b) spike length (cm). Vertical bars indicate ± SE of means. n = 3 replicate. Any two means not sharing same letter differ significantly at 5% level of probability

found to be statistically significant (Fig. 3). Maximum floret width (11.33 cm) was noticed in Fado followed by Eiaia, whereas minimum floret width (8 cm) was observed in Invi. The differences among gladiolus cultivars tested might be due to their inherent genetic characteristics [3]. Ramzan et al. [14] found the variability in flower size existed among different cultivars in Iris cut flower.

3.9 Floret Length

Significant differences were found in floret length for different gladiolus cultivars (Fig. 3). Porterdale showed maximum floret length (10 cm), while minimum (7 cm) was observed in Jack Gold. This might be due to their genetic composition, which interacts differently to soil and climatic conditions [8]. Similarly, Meena et al. [13] studied the

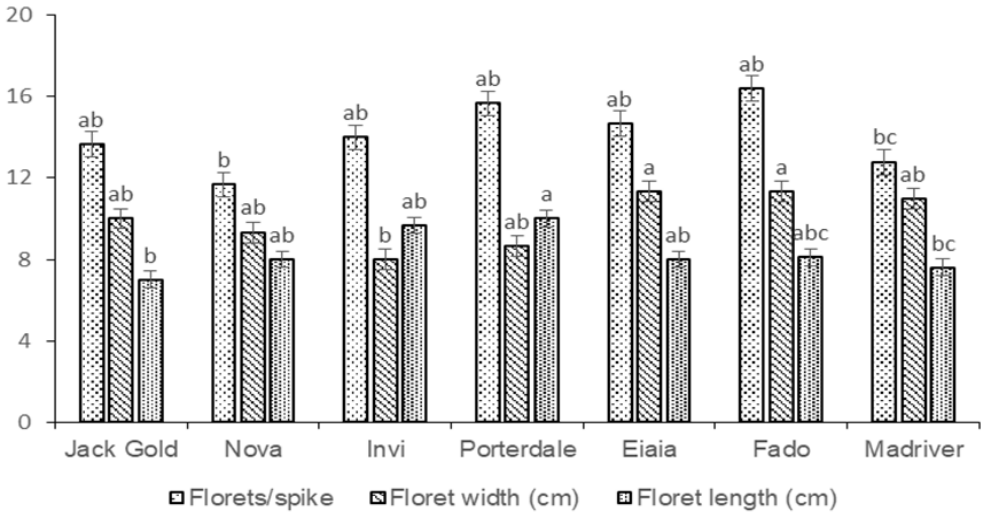

Fig. 3. Cultivars effects on a) florets/spike b) floret width (cm) and c) floret length (cm). Vertical bars indicate ± SE of means. n = 3 replicate. Any two means not sharing same letter differ significantly at 5% level of probability

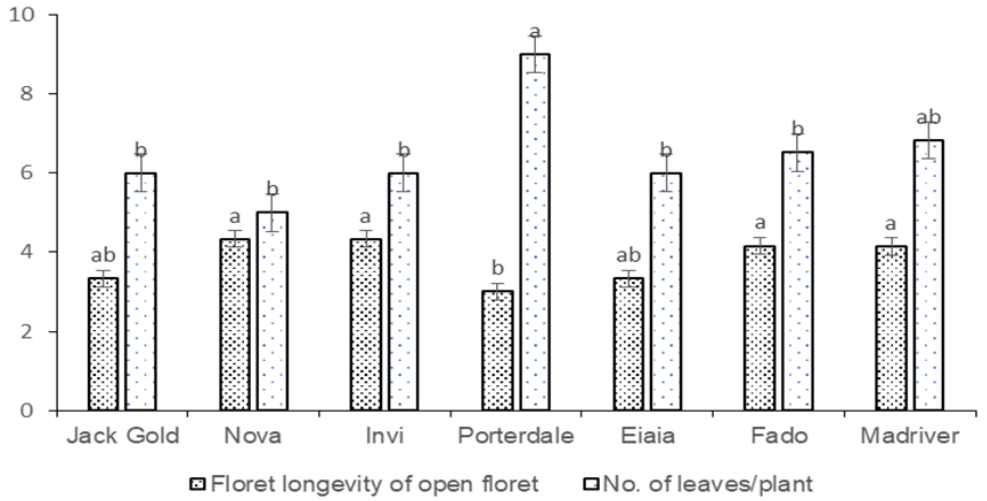

Fig. 4. Cultivars effects on a) floret longevity of open florets and b) number of leaves per plant. Vertical bars indicate ± SE of means. n = 3 replicate. Any two means not sharing same letter differ significantly at 5% level of probability

genetic variability in gladiolus for characters like floret size and floret length.

3.10 Longevity of Open Floret

Longevity of open floret is the function of both genetic and environmental factors. Longevity of open floret was significantly affected by the gladiolus cultivars (Fig. 4). Maximum longevity of open floret was 4.33 days in Nova and Invi, while minimum longevity of floret (3 days) was observed in Porterdale. The variation in floret longevity might be the cause of genetic make of cultivars evaluated [15].

4. CONCLUSION

Porterdale showed superiority in vegetative traits while floral traits were best in Fado. Although, Invi showed early flowering and longevity of open floret.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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