

Original Research Article

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## Gladiolus Hybrids for Commercial Traits and their Evaluation

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### ABSTRACT

The present experiments were conducted with twenty-eight gladiolus hybrids along with check at the research farm of the Division of Floriculture & Landscaping, ICAR-Indian Agricultural Research Institute, New Delhi during the year 2021-22 to study the gladiolus hybrids for commercial traits and their performance and suitability for commercialization and profitability. The mean performance of gladiolus hybrids data were highly significant for all the traits studied. The results indicated that early flowering was observed in hybrids such as Chandni x Snow Princess, P-16-1 x Eurovision, Melody Open Seedlings and High Hopes Open Seedlings and its range was from 76.00 – 88.33 days after planting, whereas, late flowering was observed in hybrids such as Rose Time Steam Boat x GreenWillow (114.66 day), Swarnima x Viola (111.00 day) and Candyman x Anjali (107.00 day) respectively. Maximum plant height 145.33 cm, 133.00 cm, 131.33 cm, 131.00 cm and 130.66 cm were recorded in Green Pasture x Regency, Smokey Lady x HeadyWine, Salmon Queen Open Seedlings, Canada x GreenWillow and American Beauty x GreenWillow respectively. Number of florets per spike more than 19 was received in hybrid AVE x Mayur, Vidushi Mutant, Mayur x Howard, Pearl Beauty x Lucky Shamrock, Mayur x GreenWillow and Green Lilac Open Seedlings respectively. Maximum number of corms per plant was seen in many hybrids such as Smokey Lady x Oscar, Chandni x Snow Princess, Vidushi Mutant, Canada x GreenWillow, Candyman x Anjali, Salmon Queen Open Seedlings and Melody Open Seedlings respectively as compare to remaining hybrids and check. Hybrids Smokey Lady x HeadyWine, Vidushi Mutant and Canada x GreenWillow had produced maximum number of cormels as 77.33, 74.66, and 72.00 respectively as compare to other hybrids.

#### Keywords

Gladiolus, Hybrids,  
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Evaluation,  
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## Introduction

Gladiolus (*Gladiolus hybridus* Rodigas), a member of the Iridaceae is native to South Africa. Modernization and urbanization have enhanced the traditional use of flowers by recognizing them as high value crops and value addition for higher profit

through processing. Among the most important floricultural crops grown in India, ornamental geophytes (Gladiolus) for the use of cut flowers and landscape are very popular. The availability of Indian cultivars has become an important objective in the national production of geophytes as cut flowers. It is one of the most important among the

bulbous ornamentals for cut flower trade in India. It is also ideal both for garden display, herbaceous border and floral arrangements for table and interior decoration as well as making high quality bouquet (Lepcha *et al.*, 2007). It is one of the most popular landscape plants as well as cut flower both in the domestic and international flower industry (Mehra *et al.*, 2016). There is big demand of gladiolus varieties with novel flower colour and patterns. It is also important to develop Indian hybrids and evaluate them with the existing cultivar for their superior desirable commercial traits (Archana *et al.*, 2008). The consumer acceptability keeps on changing for different colours and novelty. It has high demand in both domestic and international markets (Singh *et al.*, 2017). Development and evaluation are a basic tool for assessing the genetic variability present in any crop species, which could be exploited for its commercialization (Amit Nishant Kujur and Sharma, 2016). Therefore, the new coloured, higher multiplier having long spikes and more florets per spikes varieties will helpful in obtaining better flower quality, corm yield and market price. Hence, there is need to develop gladiolus hybrids/varieties in a spectrum of colours with long spike and more florets per spike. Gladiolus varieties are shy multiplier in general and there is need to develop hybrids with higher multiplication rate to fulfill the demand of growers/consumers.

## Materials and Methods

The present experiments were carried out at the Research Farm of the Division of Floriculture and Landscaping, ICAR-Indian Agricultural Research Institute, New Delhi for the year 2021-22 with twenty-eight gladiolus hybrids including best check, viz, Smokey Lady x Oscar, Green Pasture x Regency, Smokey Lady x Heady Wine, AVE x Mayur, Chandni x Snow Princess, Vidushi (Mutant), Cignet x Little Fawn, Howard x White Oak, (Green Willow x Cignet) x Little Fawn, Mayur x Howard, Pearl Beauty x Lucky Shamrock, Canada x Green Willow, P-16-1 x Eurovision, Mayur x Green Willow, American Beauty x Green Willow,

Candyman x Anjali, White Oak x Flirt, Canada x Miss America, Cignet x Rose Time Steam Boat, Swarnima x Viola, George Mazure x Melody, Urmil x Smokey Lady, Rose Time Steam Boat x Green Willow, Green Lilac Open Seedlings, Nauvalux x Candyman, Salmoon Queen Open Seedlings, Melody Open Seedlings, High Hopes Open Seedlings and White Prosperity(Check). Uniform size of each hybrid was planted during October 2021. The experiments were laid out in randomized block design with three replications, at a spacing of 50 cm x 10 cm at 6-8 cm depth in a plot size of 5.00 m x 3.00 m. Irrigation was given immediately after planting. Plots were kept weed free by hand weeding. Adequate soil moisture was maintained in the soil by giving regular irrigation from time to time. Disease control measures were taken up by spraying fungicides such as Bavistin, Captan or M-45 whenever necessary throughout the experiment to grow a healthy crop. Other agronomic practices were followed as and when required. Five plants were selected for taking observations in each hybrids and replication which were recorded on various growth and flowering characters viz., plant height, spike length, rachis length, number days taken to first floret open, number of florets per spike, florets remain open at a time, number of corms and cormels per plant, vase life and spike longevity in field etc. The collected data were subjected to statistical analysis as suggested by Panse and Sukhatme (1965).

## Results and Discussion

The results of the experiment showed in table 1, 2, and 3 indicate that all the growth, flowering and corms traits of hybrids were found significant except spike longevity and number of leaves per plant. Few hybrids shown as earliness in flowering and Melody Open Seedlings had taken minimum 76.00 days to first flowering after planting followed by Chandni x Snow Princess 84.00 days and P-16-1 x Eurovision 84.33 days, whereas, few hybrids such as Candyman x Anjali had taken more days (107.00) to first flowering, Swarnima x Viola (111.00 days) and Rose Time Steam Boat x Green Willow had taken

114.00 days as compared to check White Prosperity (103.00 days). The plant height, spike length and rachis length are the important commercial traits in gladiolus which decide the rate in the market and their acceptability. The hybrids such as Green Pasture x Regency had recorded longest plant height 145.33 cm followed by Smokey Lady x Heady Wine 133.00 cm, Salmon Queen Open Seedlings and Canada Green Willow each 131.00 cm, American Beauty x Green Willow 130.66 cm and Vidushi Mutant 130.00 cm; whereas minimum plant height 84.33 cm and 84.66 cm was observed in P-16-1 x Eurovision and George Mazure x Melody hybrids respectively. Kumari & Kumar (2015) reported that variation in plant height among all the hybrids may be due to the hereditary traits or prevailing environmental conditions of the growing location. Spike characters are important ones with regard to cut flower for preparation of bouquet in gladiolus. The maximum spike length 133.66 cm, 126.33 cm, and 120.00 cm were recorded in Green Pasture x Regency, American Beauty x Green Willow, Vidushi Mutant, Canada x Green Willow and Salmon Queen Open Seedlings hybrids respectively as compared to remaining hybrids and check variety (Table 1). Vidushi Mutant had recorded maximum rachis length 70.33 cm followed by Salmon Queen Open Seedlings hybrid 69.00 cm, (Green Willow x Cignet) x Little Fawn 67.33 cm, AVE x Mayur 66.66 cm and it was minimum 48.00 cm in Chandni x Snow Princess. The results on vegetative growth such as days to first flowering, plant height, rachis length, number of florets per spike, floret remains open at a time, number of corms and cormels per plant are presented in the Table 1 and 2 and clearly indicated that the genotypic difference existed with regard to all these characters amongst the different hybrids studied. The results are in accordance with Kishan and Singh (2005). As per North American Gladiolus Council, the standard for number of florets per spike should be more than 16.00, but our newly developed almost all hybrids had shown more than 16.00 florets per spike except three-four hybrids. Further, interestingly, it was observed that seven hybrids namely AVE x Mayur, Vidushi

Mutant, Mayur x Howard, Pearl Beauty x Luckey Shamrock, Mayur x Green Willow, Nauvalux x Candyman and Melody Open Seedlings had recorded 19.00 to 19.33 florets per spike respectively. The variation in number of florets per spike might be due to hereditary traits of the hybrids. Similar results on number of florets per spike were reported by Rani and Singh (2005) and Ram *et al.*, 2005 and Swaroop *et al.*, 2021). Floret diameter, length and width of tepals, stem thickness at the base, number of florets remain open at a time are also important qualitative characters. Table 2 showed that hybrid Salmon Queen Open Seedlings, recorded maximum floret diameter 13.33 cm followed by (Green Willow x Cignet) x Little Fawn 11.33 cm, and Canada x Green Willow 10.33 cm, whereas, it was minimum in hybrids such as Cignet x Rose Time Steam Boat and Green Lilac Open Seedlings each 7.00 cm. Stem thickness at the base was recorded maximum 3.16 cm in hybrid (Green Willow x Cignet) x Little Fawn and minimum 2.00 cm in Mayur x Green Willow hybrid. Florets remain open at a time were found maximum 10.33 cm in Smokey Lady x Oscar hybrid followed by Chandni x Snow Princess 8.66 cm and Mayur x Green Willow 8.33 cm, whereas, it was least 5.00 in Rose Time Steam Boat x Green Willow hybrid as compared to check and remaining hybrids. Length of tepals was also recorded maximum 7.33 cm in Smokey Lady x Oscar hybrid while hybrids namely Canada x Green Willow, American Beauty x Green Willow, Candyman x Anjali, White Oak x Flirt and Salmon Queen Open Seedlings each had recorded 7.00 cm length of tepals. The check variety and remaining hybrids had shown lesser length of tepals statistically. Two hybrids as Nauvalux x Candyman and Salmon Queen Open Seedlings each had recorded maximum 6.00 cm width of tepals as compared to other hybrids. These results are in conformity with findings of Shaukat *et al.*, 2012; Poonam 2012 and Dhiman *et al.*, 2020). Moreover, these results are in line with the results of Arora and Khanna (1985) and Rani *et al.*, (2007) who reported superiority of some genotypes over other genotypes due to variation of genotypes of hybrids.

**Table.1** Days to flowering, plant height, spike, rachis length and number of florets of gladiolus hybrids

| S. No. | Hybrids                               | Days to first flowering | Plant height (cm) | Spike Length (cm) | Rachis Length (cm) | Number of florets per spike |
|--------|---------------------------------------|-------------------------|-------------------|-------------------|--------------------|-----------------------------|
| 1      | Smokey Lady x Oscar                   | 97.66                   | 107.00            | 100.00            | 53.66              | 18.33                       |
| 2      | Green Pasture x Regency               | 95.00                   | 145.33            | 133.66            | 65.00              | 18.00                       |
| 3      | Smokey Lady x Heady Wine              | 104.00                  | 133.00            | 119.33            | 62.33              | 18.66                       |
| 4      | AVE x Mayur                           | 98.66                   | 107.33            | 100.33            | 66.66              | 19.33                       |
| 5      | Chandni x Snow Princess               | 84.00                   | 96.00             | 86.00             | 48.00              | 17.33                       |
| 6      | Vidushi (Mutant)                      | 96.00                   | 130.00            | 120.00            | 70.33              | 19.33                       |
| 7      | Cignet x Little Fawn                  | 101.66                  | 102.33            | 91.66             | 52.33              | 17.00                       |
| 8      | Howard x White Oak                    | 100.00                  | 106.33            | 97.00             | 52.66              | 17.66                       |
| 9      | (Green Willow x Cignet) x Little Fawn | 99.00                   | 106.00            | 95.66             | 67.33              | 16.33                       |
| 10     | Mayur x Howard                        | 96.00                   | 111.00            | 98.00             | 57.33              | 19.00                       |
| 11     | Pearl Beauty x Lucky Shamrock         | 103.00                  | 104.33            | 91.66             | 59.33              | 19.00                       |
| 12     | Canada x Green Willow                 | 101.66                  | 131.00            | 120.00            | 56.66              | 17.33                       |
| 13     | P-16-1 x Eurovision                   | 84.33                   | 84.33             | 97.00             | 60.00              | 16.00                       |
| 14     | Mayur x Green Willow                  | 95.00                   | 128.66            | 109.00            | 59.33              | 19.33                       |
| 15     | A B x Green Willow                    | 101.00                  | 130.66            | 126.33            | 61.00              | 17.33                       |
| 16     | Candyman x Anjali                     | 107.00                  | 121.00            | 110.33            | 56.33              | 18.33                       |
| 17     | White Oak x Flirt                     | 95.66                   | 109.00            | 96.00             | 55.33              | 18.33                       |
| 18     | Canada x Miss America                 | 103.66                  | 120.00            | 113.00            | 49.33              | 17.00                       |
| 19     | Cignet x Rose Time Steam Boat         | 101.00                  | 118.33            | 103.33            | 61.33              | 17.33                       |
| 20     | Swarnima x Viola                      | 111.00                  | 118.00            | 103.66            | 49.33              | 15.33                       |
| 21     | George Mazure x Melody                | 102.00                  | 84.66             | 73.66             | 39.66              | 14.00                       |
| 22     | Urmil x Smokey Lady                   | 91.66                   | 113.66            | 103.66            | 47.00              | 15.00                       |
| 23     | Rose Time Steam Boat x Green Willow   | 114.66                  | 101.33            | 76.33             | 49.33              | 17.33                       |
| 24     | Green Lilac Open Seedling             | 95.00                   | 90.66             | 80.00             | 36.00              | 14.00                       |
| 25     | Nauvalux x Candyman                   | 104.33                  | 127.66            | 110.00            | 62.66              | 19.33                       |
| 26     | Salmoon Queen Open Seedling           | 92.00                   | 131.33            | 120.00            | 69.00              | 18.66                       |
| 27     | Melody Open Seedling                  | 76.00                   | 124.00            | 115.33            | 65.00              | 19.33                       |
| 28     | High Hopes Open Seedling              | 88.33                   | 117.00            | 105.33            | 60.33              | 18.66                       |
| 29     | White Prosperity(Check)               | 103.00                  | 110.00            | 99.33             | 61.00              | 16.66                       |
|        | C. D.                                 | 0.959                   | 2.471             | 2.356             | 1.315              | 0.848                       |
|        | C.V.                                  | 0.597                   | 1.306             | 1.385             | 1.415              | 2.943                       |

**Table.2** Floral traits of gladiolus hybrids.

| S.No. | Hybrids                               | Floret diameter (cm) | Stem thickness at the base (cm) | Florets remain open at time | Length of tepals (cm) | Width of tepals (cm) | Spike longevity (field life) |
|-------|---------------------------------------|----------------------|---------------------------------|-----------------------------|-----------------------|----------------------|------------------------------|
| 1     | Smokey Lady x Oscar                   | 9.00                 | 2.83                            | 10.33                       | 7.33                  | 5.66                 | 24.33                        |
| 2     | Green Pasture x Regency               | 8.66                 | 2.63                            | 6.66                        | 6.66                  | 5.00                 | 23.33                        |
| 3     | Smokey Lady x Heady Wine              | 9.66                 | 2.50                            | 7.00                        | 6.66                  | 5.33                 | 25.66                        |
| 4     | AVE x Mayur                           | 8.33                 | 2.46                            | 7.00                        | 5.66                  | 4.33                 | 23.33                        |
| 5     | Chandni x Snow Princess               | 9.33                 | 2.56                            | 8.66                        | 6.33                  | 4.33                 | 24.00                        |
| 6     | Vidushi (Mutant)                      | 9.66                 | 2.26                            | 7.00                        | 6.66                  | 4.66                 | 22.00                        |
| 7     | Cignet x Little Fawn                  | 9.66                 | 2.50                            | 6.33                        | 6.66                  | 4.33                 | 18.33                        |
| 8     | Howard x White Oak                    | 9.33                 | 2.66                            | 7.66                        | 6.33                  | 4.00                 | 20.00                        |
| 9     | (Green Willow x Cignet) x Little Fawn | 11.33                | 3.16                            | 6.33                        | 6.33                  | 5.00                 | 23.00                        |
| 10    | Mayur x Howard                        | 10.00                | 2.26                            | 7.00                        | 6.66                  | 5.00                 | 25.33                        |
| 11    | Pearl Beauty x Lucky Shamrock         | 9.00                 | 2.13                            | 7.00                        | 6.33                  | 5.33                 | 23.66                        |
| 12    | Canada x Green Willow                 | 10.33                | 2.13                            | 6.66                        | 7.00                  | 5.66                 | 23.66                        |
| 13    | P-16-1 x Eurovision                   | 9.66                 | 2.13                            | 6.33                        | 5.66                  | 4.66                 | 19.00                        |
| 14    | Mayur x Green Willow                  | 8.33                 | 2.00                            | 8.33                        | 6.33                  | 4.00                 | 22.00                        |
| 15    | A B x Green Willow                    | 10.00                | 2.90                            | 7.00                        | 7.00                  | 4.33                 | 22.66                        |
| 16    | Candyman x Anjali                     | 9.66                 | 2.33                            | 6.00                        | 7.00                  | 4.66                 | 19.33                        |
| 17    | White Oak x Flirt                     | 9.66                 | 2.26                            | 7.33                        | 7.00                  | 5.00                 | 21.33                        |
| 18    | Canada x Miss America                 | 10.00                | 2.66                            | 5.33                        | 6.33                  | 4.33                 | 19.00                        |
| 19    | Cignet x Rose Time Steam Boat         | 7.00                 | 2.90                            | 6.66                        | 6.33                  | 3.00                 | 23.33                        |
| 20    | Swarnima x Viola                      | 9.66                 | 2.43                            | 5.33                        | 6.33                  | 5.00                 | 21.00                        |
| 21    | George Mazure x Melody                | 7.66                 | 2.33                            | 5.33                        | 6.33                  | 4.33                 | 25.00                        |
| 22    | Urmil x Smokey Lady                   | 8.00                 | 2.16                            | 6.66                        | 6.00                  | 4.00                 | 22.33                        |
| 23    | Rose Time Steam Boat x Green Willow   | 9.66                 | 2.70                            | 5.00                        | 6.00                  | 4.33                 | 20.00                        |
| 24    | Green Lilac Open Seedling             | 7.00                 | 2.50                            | 7.00                        | 6.00                  | 3.66                 | 19.66                        |
| 25    | Nauvalux x Candyman                   | 10.00                | 2.43                            | 6.66                        | 6.33                  | 6.00                 | 26.00                        |
| 26    | Salmoon Queen Open Seedling           | 13.33                | 3.13                            | 7.66                        | 7.00                  | 6.00                 | 16.33                        |
| 27    | Melody Open Seedling                  | 8.66                 | 2.30                            | 6.66                        | 6.33                  | 5.66                 | 21.00                        |
| 28    | High Hopes Open Seedling              | 8.66                 | 2.20                            | 6.66                        | 6.33                  | 5.00                 | 19.00                        |
| 29    | White Prosperity(Check)               | 8.66                 | 2.20                            | 5.66                        | 6.33                  | 5.33                 | 14.33                        |
|       | C. D.                                 | 0.797                | 0.271                           | 0.818                       | 0.817                 | 0.717                | NS                           |
|       | C.V.                                  | 5.210                | 6.674                           | 7.330                       | 7.660                 | 9.191                | 20.446                       |

**Table.3** Vase life, leaves, corms and cormels traits.

| S.N. | Hybrids                               | Vase life of spike (day) | Number of leaves per plant | Length of leaf (cm) | Width of leaf (cm) | No. of corms per plant | No. of cormels per plant |
|------|---------------------------------------|--------------------------|----------------------------|---------------------|--------------------|------------------------|--------------------------|
| 1    | Smokey Lady x Oscar                   | 16.00                    | 6.00                       | 45.66               | 4.00               | 3.33                   | 42.00                    |
| 2    | Green Pasture x Regency               | 13.66                    | 6.33                       | 48.00               | 4.66               | 3.00                   | 40.00                    |
| 3    | Smokey Lady x Heady Wine              | 13.66                    | 6.66                       | 43.66               | 3.00               | 2.66                   | 77.33                    |
| 4    | AVE x Mayur                           | 14.33                    | 6.33                       | 40.33               | 3.66               | 2.66                   | 29.00                    |
| 5    | Chandni x Snow Princess               | 15.66                    | 6.00                       | 35.66               | 3.33               | 3.00                   | 36.33                    |
| 6    | Vidushi (Mutant)                      | 14.00                    | 6.00                       | 42.33               | 3.66               | 3.00                   | 74.66                    |
| 7    | Cignet x Little Fawn                  | 12.66                    | 6.00                       | 34.00               | 3.66               | 2.66                   | 38.66                    |
| 8    | Howard x White Oak                    | 12.33                    | 6.33                       | 41.3                | 3.33               | 2.33                   | 37.66                    |
| 9    | (Green Willow x Cignet) x Little Fawn | 12.33                    | 7.00                       | 48.66               | 3.66               | 2.33                   | 26.33                    |
| 10   | Mayur x Howard                        | 13.00                    | 6.66                       | 41.66               | 3.33               | 2.66                   | 23.00                    |
| 11   | Pearl Beauty x Lucky Shamrock         | 15.33                    | 6.00                       | 36.33               | 3.66               | 2.66                   | 43.33                    |
| 12   | Canada x Green Willow                 | 15.00                    | 6.33                       | 55.33               | 4.33               | 3.00                   | 72.00                    |
| 13   | P-16-1 x Eurovision                   | 11.33                    | 6.33                       | 33.66               | 3.33               | 3.00                   | 14.33                    |
| 14   | Mayur x Green Willow                  | 11.33                    | 6.66                       | 42.00               | 3.00               | 2.00                   | 24.00                    |
| 15   | A B x Green Willow                    | 12.33                    | 6.00                       | 52.33               | 3.33               | 2.33                   | 23.00                    |
| 16   | Candyman x Anjali                     | 12.66                    | 7.00                       | 32.00               | 4.00               | 2.66                   | 26.00                    |
| 17   | White Oak x Flirt                     | 13.00                    | 6.66                       | 43.00               | 3.66               | 2.66                   | 23.00                    |
| 18   | Canada x Miss America                 | 13.00                    | 6.66                       | 44.00               | 4.33               | 2.00                   | 24.00                    |
| 19   | Cignet x Rose Time Steam Boat         | 15.00                    | 6.33                       | 33.00               | 3.33               | 2.33                   | 27.00                    |
| 20   | Swarnima x Viola                      | 13.00                    | 7.00                       | 55.66               | 6.66               | 2.33                   | 22.33                    |
| 21   | George Mazure x Melody                | 13.66                    | 6.00                       | 24.33               | 3.66               | 2.33                   | 15.66                    |
| 22   | Urmil x Smokey Lady                   | 13.00                    | 6.33                       | 41.66               | 3.66               | 2.66                   | 22.00                    |
| 23   | Rose Time Steam Boat x Green Willow   | 13.00                    | 6.33                       | 46.33               | 3.00               | 2.00                   | 25.00                    |
| 24   | Green Lilac Open Seedling             | 13.00                    | 6.33                       | 40.00               | 3.00               | 2.00                   | 24.33                    |
| 25   | Nauvalux x Candyman                   | 11.66                    | 6.66                       | 41.00               | 3.66               | 2.66                   | 21.00                    |
| 26   | Salmoon Queen Open Seedling           | 12.33                    | 6.66                       | 49.00               | 4.66               | 3.00                   | 47.00                    |
| 27   | Melody Open Seedling                  | 12.33                    | 6.66                       | 38.00               | 3.66               | 3.33                   | 20.66                    |
| 28   | High Hopes Open Seedling              | 11.00                    | 7.00                       | 35.00               | 3.66               | 2.66                   | 46.66                    |
| 29   | White Prosperity(Check)               | 11.66                    | 6.00                       | 37.33               | 3.66               | 1.66                   | 20.0                     |
|      | C. D.                                 | 2.228                    | NS                         | 1.297               | 0.834              | 0.774                  | 2.915                    |
|      | C.V.                                  | 10.333                   | 7.368                      | 1.909               | 13.572             | 18.239                 | 5.334                    |

Similar results have also been reported by Nagaraju and Parthasarthy (2001); Kumar and Yadav (2005); Arora and Sandhu (1987); Kem *et al.*, (2003). For garden display of gladiolus, it is essential to remain in flower for longer time, but in the present study the spike longevity in field was statistically non-significant, however, its range was observed from 14.33 -26.00 days and maximum was in Nauvalux x Candyman hybrid.

Vase life of spike in normal tap water was seen in the range of 11.00 to 16.00 days and it was maximum in Smokey Lady x Oscar hybrid. Due to genetic diversity, length and width of leaves was differed significantly under the study and it was maximum 55.66 cm and 6.66 in Swarnima x Viola hybrid. Corm and cormels multiplication are a problem in gladiolus cultivation resulting shortage of good quality and quantity planting material. Hence, we need to develop higher multiplier hybrids or varieties.

In the present study, eight hybrids had recorded three or more than three corms per plant and these hybrids are: Smokey Lady x Oscar, Green Pasture x Regency, Chandni x Snow Princess, Vidushi Mutant, Canada x Green Willow, P-16-1 x Eurovision, Salmon Queen Open Seedlings and Melody Open Seedlings, but remaining hybrids also recorded 2.0 or more than 2.00 per plant as compared to check where, it was 1.66 corms per plant.

The variation in number of corm per plant in various hybrids of gladiolus might be due to the genetic makeup of hybrids/genotypes. Similar results were also reported by Zubair *et al.*, (2013). Number of cormels per plant recorded maximum 77.33 in Smokey Lady x Heady Wine hybrid followed by Vidushi Mutant 74.66, Canada x Green Willow 72.00 and it was minimum 14.33 per plant in P-16-1 x Eurovision as compared to check and other hybrids. Further, the results of all the characters may be attributed to the genetic makeup of hybrids/genotypes having different hormonal levels, especially gibberellic and abscisic acid, temperature

requirements, dormancy and stored food reserves which resulted in different vegetative and flower growth under prevailing agro-climatic conditions. Similar results have also been reported by Momin *et al.*, (2015); Churasia *et al.*, (2015); Naresh *et al.*, (2015); Saleem *et al.*, (2013); Sarkar and Chakraborty (2014) and Ahmed *et al.*, (2002). Variations for different traits was also observed by Kalasaraddi (1996) and Shiramgond (1997); Sidhu and Arora (2000) in different gladiolus hybrids. Variability in gladiolus genotypes has also been reported with the genetic constitution of genotypes.

Certain hybrids/genotypes generally revealed exotic nature and exhibit genetic basis for the expression of certain traits even in useful appealing characters. It has been also observed in gladiolus by Misra and Singh (1998) and Anuradha and Gowda (1990). The results of present investigation are in accordance with the findings of Gupta *et al.*, (2001). Variation for spike length and rachis length was also observed by Hegde (1996). Similar results were also obtained by Gupta *et al.*, (2002).

Moreover hybrids/genotypes varied in the corm production depending upon their hereditary traits and their response to the climatic conditions prevailing in the area. Rao and Sushma (2015); Jana and Das (2013); Shaukat *et al.*, (2012); Hossain *et al.*, (2011) also observed variations in the number of corms of different gladiolus. Sharma and Gupta (2003) reported that availability of more food material stored in bigger sized mother corms that helped in better plant growth might be associated with the beneficial effect and corms production depends on the size of corms.

These findings confirm the results of present investigation. It can be concluded from the present study that amongst the gladiolus hybrids evaluated and based on the results for various vegetative, flowering and corm traits indicate that hybrids such as Chandni x Snow Princess, P-16-1 x Eurovision, Melody Open Seedlings and High Hopes Open Seedlings shown as earliness and its range was from 76.00 – 88.33 days after planting. Number of corms

per plant was seen in many hybrids such as Smokey Lady x Oscar, Chandni x Snow Princess, Vidushi Mutant, Canada x GreenWillow, Candyman x Anjali, Salmon Queen Open Seedlings and Melody Open Seedlings respectively as compare to remaining hybrids and check.

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