



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2019; 7(6): 1211-1215

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Received: 01-09-2019

Accepted: 03-10-2019

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Effect of different varieties and planting dates on the growth of gladiolus (*Gladiolus grandiflorus*) under Prayagraj condition

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Abstract

An experiment on “effect of different planting dates on growth of different varieties of gladiolus (*Gladiolus grandiflorus*) under Prayagraj conditions” was conducted in Horticulture Research Field, Naini Agricultural Institute (NAI), SHUATS, Prayagraj during 2018-2019. The experiment was laid out in simple factorial randomized block design (FRBD) with three replications and seven varieties in four different months with a view to find out the overall growth of different varieties viz Ocilla, Flevo Spirit, White Prosperity, Extasy, Peter Pears, Charisma, Performer on different planting dates viz 20th October, 23rd November, 20th December 2018, 18th January 2019, on the basis of different growth parameters. Maximum plant height was found in variety ‘Charisma’ (101.63 cm) in October month (100.96 cm), Maximum number of leaves was found in variety ‘Ocilla’ (7.54) in October month (8.91), minimum number of days taken for spike emergence from planting was found in ‘Ocilla’ (68.78 days) in November month (66.21 days), maximum number of florets per plant was found in ‘Ocilla’ (13.85) in October month (14.18), minimum number of days taken for first floret opening was found in ‘Ocilla’ in October month (10.18 days), maximum floret diameter was observed in ‘Ocilla’ (8.25cm) in October month (9.77cm), maximum vase life of spike was found in ‘Ocilla’ (11.08 days) in October month (10.91 days) and maximum Benefit cost ratio was found in ‘Ocilla’ (3.79) in October month (2.18).

Keywords: Different planting dates, gladiolus, varieties and Ocilla

Introduction

Gladiolus is a flower of glamour and perfection which is known as the queen of bulbous flowers due to its flower spikes with florets of massive form, brilliant colors, attractive shapes, varying size and excellent shelf life. The modern hybrids are botanically known as *Gladiolus grandiflorus* belonging to the family Iridaceae. Gladiolus is grown as flower bed in gardens and used in floral arrangements for interior decoration as well as making high quality bouquets (Bose *et al.*, 2003) [5].

Date of planting plays an important role in regulating growth and quality of gladiolus (Khan *et al.*, 2008.) [15]. Vegetative growth and quality of gladiolus is improved by proper planting times which also satisfies the consumer's demands (Zubair *et al.*, 2006) [37]. The Planting schedule of gladiolus varies because of differences in photoperiods, temperatures and light intensity and relative humidity. Maximum spikes per plant were obtained from April to May plantings while highest number of corms per plant in tuberoses was obtained from March and April plantings (Mubhopadhyay and Banker 1981) [19]. Growth and yield of gladiolus, like other plants, depend on proper planting time. (Akpinar and Bulut 2011) [3] reported that the planting time 20th June was found to be the most suitable plantation time when considered sprouting and spiking time and White Prosperity is the best varieties. The present study investigated that the best planting time of different gladiolus cultivar under environmental conditions. The growth and yield of gladiolus like other plants depend upon planting time e.g., number of florets/spikes, spike length, floret diameter, floret length was best with October planting (Dod *et al.*,).

Light, temperature and water are all important in flowering of gladiolus. Planting schedule vary because of difference in photoperiods, temperature and light intensity. Light is the major contributor to growth and development of gladiolus. Two assimilate sinks exist; the inflorescence and corms, and these are greatly affected by photoperiod (Hartmann *et al.*, 1981) [12]. Gladiolus as most common flowering plant, prefer a growing location in full sun for most of the day. Both the presence and absence of light greatly affects flower development.

Flowering of gladiolus is controlled partially by day length provided temperatures are in the proper range.

Materials and Methods

A field experiment entitled "Effect of different planting dates and varieties on growth of gladiolus (*gladiolus grandiflorus*) Under Prayagraj condition" was conducted at Departmental Research Field of Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, during October, 2018 to March, 2019. Total number of treatments were Twenty eight viz. T₁ (Ocilla October), T₂ (Flevo Spirit October), T₃ (White Prosperity October), T₄ (Extasy October), T₅ (Peter Pears October), T₆ (Charisma October), T₇ (Performer October), T₈ (Ocilla November), T₉ (Flevo Spirit November), T₁₀ (White Prosperity November), T₁₁ (Extasy November), T₁₂ (Peter Pears November), T₁₃ (Charisma November), T₁₄ (Performer November), T₁₅ (Ocilla December), T₁₆ (Flevo Spirit December), T₁₇ (White Prosperity December), T₁₈ (Extasy December), T₁₉ (Peter Pears December), T₂₀ (Charisma December), T₂₁ (Performer December), T₂₂ (Ocilla January), T₂₃ (Flevo Spirit January), T₂₄ (White Prosperity January), T₂₅ (Extasy January), T₂₆ (Peter Pears January), T₂₇ (Charisma January), T₂₈ (Performer January).

The area of Prayagraj district comes under subtropical belt in the south east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46 °C - 48 °C and seldom falls as low as 4 °C - 5 °C. The relative humidity ranges between 20 to 94%. The average rainfall in this area is around 1013.4 mm annually. However, occasional precipitation is also not uncommon during winter months.

Results and Discussion

Statistical data on plant height, number of leaves, width of leaves, length of leaves, number of spikes per plant, spike emergence, spike length, number of florets per spike, number of flowers, first floret opening, floret diameter, vase life of spikes of gladiolus are presented in table 1 & table 2.

Regarding plant height in different date of planting and varietal performance was significantly different. Among the different varieties the maximum plant height was observed in the variety 'Charisma' (101.636 cm) followed by 'Ocilla' (101.125cm) and minimum was observed in 'Extasy' (98.492cm). Among the different planting Months October planting recorded the tallest plant (100.962 cm). Similar finding amongst gladiolus varieties have also been reported by Sheikh and Jhon (2005) [31] and Kour (2009) [16] in gladiolus. Plant height depends upon the genetic constitution. The variation in plant height among the various varieties might be due to genotypic differences in phenotypic expression of plant height (Lepcha *et al.*, 2007) [18]. Similar finding amongst gladiolus varieties have also been reported by Dasondhi and Rawat (2006) [10] and Rao and Janakiran (2006) [27] in gladiolus.

Number of leaves per plant increased with different date of planting and varietal performance also had significant effect on it. Among the different varieties the maximum number of leaves was recorded in Ocilla (7.542) followed by Charisma (7.258) and minimum was recorded in Peter Pears (6.517). Among the other planting Months October produced maximum number of leaves (8.91). The number of leaves per plant appeared to be positively correlated with plant height, as the plants in various treatments having more plant height also had more number of leaves. Higher number of leaves in early

planting could be attributed to optimum time of planting and nutrient for growth of plants (Bhattacharjee *et al.*, 1979) [4] in Tuberose. Similar findings have also been reported by Rathod *et al.*, (2011) [28] and Saaie *et al.*, (2012) [34] in gladiolus. Further the variation in number of leaves per plant among the varieties might be due to the genotype influence on phenotypic expression of general vigor of plants as evident from the results on plant height, number and size of leaves and corms. Pavani *et al.*, (2010) [24] also found that earlier planting produced the well-developed plants of gladiolus. Variation in number of leaves per plant in different genotypes has also been reported in gladiolus by Swain *et al.*, (2008) [33]. The interaction effects of planting dates and varietal performance had significantly affected the leaf length. Among the all varieties Ocilla recorded highest leaf length (32.592cm) followed by Extasy (32.308cm) and minimum was recorded in Performer (31.25cm). Among all the planting Months October planting obtained higher leaf length (32.186 cm). the variation in leaf length of the varieties might be due to their genetic makeup (Pragya *et al.*, 2010) [23]. Similar findings on variation in leaf size of different varieties have been reported by Swaroop *et al.*, (2005) [32], Rani and Singh (2005) [26] and Kumar and Yadav (2005) [14] in gladiolus. The favourable effect of October planting on leaf length might be due to less number of leaves of the plant due to higher photosynthesis activity and ultimately enhanced plant growth and leaf length, similar results have been reported by Kumar *et al.*, (2015) [17] in gladiolus

the date of planting and variety had significant effect on leaf width. The maximum leaf width was obtained in White Prosperity (3.323cm) followed by Flevo Spirit (3.195cm) and minimum was recorded in Performer and charisma (2.627cm). Among the different planting Months maximum leaf width was observed in January (3.462cm). The variations in leaf width among gladiolus varieties have also been reported by Kumar and Yadav (2005) [14]. The variation in leaf width might be due to variability in genetic constitution of the varieties stimulating leaf might be due to triggering higher photosynthetic activities which might have favoured cell enlargement which ultimately enhanced the size of leaves as reported by Maniram *et al.*, (2012) [21]. The present result also find support Kumar *et al.*, (2015) [17] in gladiolus.

It is clear from finding that the number of spikes per plant was significantly affected by the varieties and date of planting. The maximum number of spikes per plant was obtained in Ocilla (2.508) followed by Flevo Spirit (2.225) and minimum was obtained in Performer (1.683). Among the different Months maximum number of spikes per plant was recorded in October (2.567). the variation in the number of spikes per plant might be due to variability in genetic constitution of the varieties controlling the apical dominance and intensity of dormancy due to endogenous hormone level, governing the number of sprouts per planted corm. Similar result have also been reported by Neeraj *et al.*, (2000) [22], Safiullah and Ahmed (2001) [30] and Chaurasia *et al.*, (2015) in gladiolus. The early planting of corms increased vegetative growth particularly greater leaf production with larger size resulting in improved photosynthesis and translocation of photosynthetic towards sink may have also increased number of spikes. The finding are in line with the reports of Kumar *et al.*, (2015) [17] and Rocky and Singh (2015) [29] in gladiolus.

It is clear from findings that there were significant differences among the different date of planting and variety performance for this trait. Among the different varieties Ocilla (68.783 days) took the minimum days for spike emergence followed

by Flevo Spirit (96.958 days) and maximum days was recorded in Performer (72.133). Among the different planting Months minimum days of spike emergence was recorded in November (66.21 days). Spike emergence might have been primarily dependent upon the food reserve in the plant that could be related to growth rate of plant regulating accumulation of carbohydrates for slipping (Kumar and Yadav 2005) [14]. It could be assumed that the varieties developing food reserves early and faster might have early emergence of spikes. Similar finding for days taken for spike emergence have also been reported by Basavaraddy (2004) [6] in gladiolus.

The early spike emergence in October planting due to provide favourable climate condition during and optimum temperature and moderate day length (Dhankhar *et al.*, 1999) [9]. Similar finding were reported by Kour (2009) [16] in gladiolus. October planting provided favourable climatic condition during and optimum temperature and moderate day lengths, which might have accelerate the early spike initiation have also been reported by Rathod *et al.*, (2011) [28]. Similar finding were reported by Dhankhar *et al.*, (1999) [9] in gladiolus.

It is clearly from findings that the length of spike increased differences among dates of planting and varieties for spike length. Among the all varieties Maximum spike length was recorded in Ocilla (26.317cm) followed by Flevo Spirit (25.167cm) and minimum was recorded in Performer (23.742cm). Among the all planting months maximum spike length recorded in October (27.862cm). the variation in spike length among the various varieties might be due to genotypic differences in phenotypic expression of spike length. Spike length depends upon the genetic constitution and number of node and internode length Rao and Janakiram (2006) [27]. Another probable reason for variation of spike length among the varieties might be the environmental conditions prevailed during growth stage of spike and after slipping stage. The similar result has been reported by Lepcha *et al.*, (2007) [18] and Swain *et al.*, (2008) [33] in gladiolus.

It is evident from the data that the evaluated data illustrated that there were significant differences among plant varieties and date of planting for number of florets per spike. Among the all varieties maximum number of florets per plants was observed in Ocilla (13.85) followed by Flevo Spirit (12.875) and minimum was recorded in Performer (11.008). Among all planting Month maximum number of floret was observed in October (14.186). The variation in number of florets per spike might be due to their genetic make-up that could have also been influenced by the environmental condition (especially temperature and photoperiod) prevailed during trial period (Lepcha *et al.*, 2007) [18]. The number of florets per spike might have been positively correlated with other morphological characters of the varieties *viz.* number of leaves per plant, rachis length, number of nodes on rachis etc. Similar result on floret number have been reported by Dasondhi and Rawat (2006) [10] and Swain *et al.*, (2008) [33] in gladiolus.

It is evident from the findings that the evaluated data illustrated that there were significant differences among the plant varieties and date of planting for number of flowers. Maximum number of flowers among the all varieties was recorded in Ocilla (11.31) followed by charisma (10.492) and minimum was recorded in Performer (9.492). Among the all planting Month maximum observed in October (12.838).

The data revealed that there were significant differences among the planting dates and varietal performance with respect to the number of days taken for first floret opening.

Among the all varieties Ocilla took the minimum number of days (17.533 days) to first floret opening from spike emergence followed by Peter pears (17.65 days) and maximum number of days was observed in Performer (18.742 days). Among all planting months October planting recorded minimum number of days (10.186 days) first floret opening from spike emergence. Variation in time required for first time opening from spike emergence might be attributed to the genetic constitution of varieties which governs the vegetative and reproductive growth and phase (Sindhu *et al.*, 2014) [35], the result also find support from Kem *et al.*, (2003) [13], Kumar and Yadav (2005) [14] and Swaroop *et al.*, (2005) [32] in gladiolus. Similar finding also have been reported by Rao and Janakiram (2000) [25] in gladiolus. the minimum number of days to first floret opening from spike emergence was noticed with the October planting. The result are in line with the findings of saae *et al.*, (2012) [34].

It is evident from the data (Table 4.1.11) that the varieties and date of planting studied under this experimental had significant difference for floret diameter. Among the all varieties maximum floret diameter was observed in Ocilla (8.258cm) followed by Flevo Spirit (7.917cm) and minimum was observed in Performer (6.817cm). Among the all planting Months maximum floret diameter recorded in October (9.776cm). the variation in floret diameter in phenotypic expression of floret diameter. Floret diameter also depends upon the corm diameter (Dasondhi and Rawat, 2006) [10]. The variation in size of florets in the varieties might be due to their genetic constitution because of different percentage and variation in phenotypic expression of floret size due to sum and products of genotypes and more photosynthesis, cell division and enlargement and ultimately more development of the sink (flowers) and ultimately enhanced floret size. The result also find support from findings of Kumar *et al.*, ((2015) [17] in gladiolus. Favourable growing condition with mild temperature, high relative humidity and low rate of evaporation prevailing during the crop period might have become favourable for bigger size of size of flowers in October planting have also been reported by Mohanty *et al.*, (2012) [20] in gladiolus.

The data revealed that the vase life of spike recorded significant differences among the data of planting and varieties for this trait. Maximum vase life of spike was recorded in Ocilla (11.083days) followed by Flevo Spirit (9.883days) and Minimum was recorded in Performer (8.225days). Among the all planting months maximum vase life of spike was recorded in October (10.914days). The variation in vase life amongst the varieties and planting dates might be due to different level of reserve carbohydrates in the cut spikes (Lepcha *et al.*, 2007) [18]. It could be due to variation among the varieties for production of photosynthates due to variation in photosynthetic area (leaf number and size). Differential sensitivity of the varieties to ethylene could also be a probable reason of variation in vase life (Gupta *et al.*, 2002) [11]. Thus it's concluded that variation in vase life of spike of different varieties may be due to leading differential accumulation of carbohydrates and disparity in sensitivity to ethylene. The result are in line with those of Patil (2003) in gladiolus. The plant from late plantings, the flower initiation and development were confronted with high temperature intensities during late planting. Atremendous heat along with longer day's period might have caused a reduction in growth, quality and vase life of gladiolus drastically. Effect of planting dates on vase life was also reported by (Ushabala *et al.*, 2002) and Sheikh and Jhon (2005) [31] in gladiolus.

Table 1: Effect of different planting dates and varieties on plant height, number of leaves, leaf length, leaf width, number of spikes per plant and days taken for spike emergence of Gladiolus

Symbol	Treatments	Plant height (cm)	Number of leaves	Leaf length	Leaf width	Number of spikes per plant	Days taken for spike emergence
M ₁	October	100.962	8.19	32.186	3.462	2.567	67.486
M ₂	November	98.98	7.271	31.648	3.244	2.19	66.21
M ₃	December	98.905	6.267	31.686	3.239	1.895	70.929
M ₄	January	98.957	6.157	31.514	2.598	1.61	77.062
	F-test	S	S	S	S	S	S
	Se(d)	0.316	0.194	0.033	0.101	0.036	0.165
	C.d. At 5%	0.636	0.39	0.093	0.204	0.072	0.332
V ₁	Ocilla	101.125	7.542	32.592	3.124	2.508	68.783
V ₂	Flevo spirit	98.675	6.725	31.658	3.195	2.225	69.958
V ₃	White prosperity	98.708	6.867	31.558	3.323	1.95	70.633
V ₄	Extasy	98.492	6.992	32.308	2.968	2.208	69.183
V ₅	Peter pears	98.792	6.517	31.433	3.058	2.058	70.633
V ₆	Charisma	101.636	7.258	31.508	2.627	1.825	71.258
V ₇	Performer	98.729	6.9	31.25	2.627	1.683	72.133
	F-test	S	S	S	S	S	S
	SE(d)	0.418	0.257	0.043	0.134	0.047	0.218
	C.D. at 5%	0.841	0.516	0.123	0.27	0.095	0.439

Table 2: Effect of different planting dates and varieties on spike length, number of florets per spike, first floret opening, number of flowers, floret diameter and vase life of spikes of gladiolus

Symbol	Treatments	Spike length (cm)	Number of florets per spike	First floret opening (days)	Number of flowers	Floret diameter	Vase life of spike
M ₁	October	27.862	14.186	14.614	12.838	9.776	10.914
M ₂	November	24.586	13.067	18.486	11.21	7.733	10.31
M ₃	December	24.629	12.452	18.667	10.395	6.667	9.305
M ₄	January	22.21	10.029	21.095	5.705	5.61	8.238
	F-test	S	S	S	S	S	S
	Se(d)	0.268	0.044	0.527	0.225	0.061	0.067
	C.d. At 5%	0.538	0.088	0.398	0.452	0.122	0.134
V ₁	Ocilla	26.317	13.85	17.533	11	8.258	11.083
V ₂	Flevo spirit	25.167	12.875	17.875	9.375	7.917	9.883
V ₃	White prosperity	24.35	11.783	18.925	9.417	7.333	9.533
V ₄	Extasy	24.792	13.342	17.642	10.292	7.45	10.3
V ₅	Peter pears	24.9	12.433	17.65	10.192	7.417	9.7
V ₆	Charisma	24.483	11.742	18.442	10.492	6.933	9.117
V ₇	Performer	23.742	11.008	18.742	9.492	6.817	8.225
	F-test	S	S	S	S	S	S
	SE(d)	0.354	0.058	0.262	0.297	0.08	0.088
	C.D. at 5%	0.712	0.117	0.198	0.598	0.161	0.178

Conclusion

On the basis of finding present investigation, it is concluded that the variety 'Ocilla' was found best in terms of maximum number of spikes per plant (2.508), maximum floret diameter (8.258cm), maximum vase life of spike (11.083) in October month planting at 32 °C Temperature, 90% Relative Humidity and 0.71 mm Rainfall, minimum days taken for spike emergence was found in 'Ocilla' in November month planting at 25 °C Temperature, 85% Relative Humidity and nil Rainfall, Whereas, maximum plant height was found in variety charisma (101.636cm) in October month plating at 32 °C Temperature, 90% Relative Humidity and 0.71 mm Rainfall. Among different planting Months best result was found in October Month in terms of plant height (100.962cm), floret diameter (9.776), vase life of spike (10.914) and maximum Benefit cost ratio was found in 'Ocilla' (3.79) in October month (2.18) at 32 °C Temperature, 90% Relative Humidity and 0.71 mm Rainfall.

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