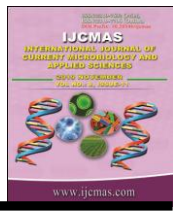
Int.J.Curr.Microbiol.App.Sci (2019) *8*(11): 656-662

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 11 (2019)**
Journal homepage: http://www.ijcmas.com



Original Research Article https://doi.org/10.20546/ijcmas.2019.811.079

Effect of Planting Time and Growing Conditions on Sprouting and Growth of *Gladiolus* Cv. American Beauty

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Keywords

Gladiolus, Planting date, Growing conditions, Corm, Spike, Floret

Article Info

Accepted:
07 October 2019
Available Online:
10 November 2019

A B S T R A C T

Effect of planting time and growing conditions on sprouting and growth of gladiolus cultivar American Beauty was studied Precision Farming Development Center of Department of Horticulture, CCS Haryana Agriculture University, Hisar. Maximum percentage of sprouting of corms (99.32%), number of leaves per plant (8.81), leaf area (105.97cm$^{2)}$ and plant height (106.12 cm) was observed in 15th October planting. Whereas, minimum percentage of sprouting of corms (71.75%), number of leaves (6.95), leaf area (88.20 cm^{2}), and plant height (92.12 cm) were recorded under 15th December planting. However, minimum number of days required for corm sprouting (11.77 days), spike initiation (105.5 days), basal floret opening (119 days), last floret opening (127.3 days) were observed in 15th October planting. Whereas, maximum number of days taken to sprouting of corms (18.75 days), spike initiation (114.4 days), basal floret opening (126.8 days), last floret opening (134.6 days) were recorded under 15th December planting. Among the growing conditions shade net house was significantly superior to the open field condition in respect to percentage of sprouting (86.00%), leaf area (105.25 cm^{2}), plant height (106.50 cm), days required to spike initiation (107.9 days), basal floret opening (121.1days), and last floret opening (129.7days). However, minimum number of days to corm sprouting (12.10 days) and maximum number of leaves per plant (8.85) was recorded in open field condition.

Introduction

Gladiolus is one of the most popular cut flower in international and domestic markets and is grown commercially in India to an extent 9.37 thousand hectare with a production of 707 million spikes in India NHB, (2013). It has magnificent spike having normally 10-18 florets opening gradually. It has a long keeping quality and can stand transportation to long distances even through packed dry. The cultivation of gladiolus on commercial basis is being done around big cities in India. In the plains of North India, good quality spikes can be produced by planting suitable varieties from September to December Swarup *et al.*,

(1972), Khanna *et al.,* (1983). Vegetative growth and flower quality of gladiolus is improved by proper planting times which also satisfy the consumer's demands Zubair *et al.,* (2006). It prefers cool and dry conditions, and temperature plays a major role in growth and flowering of crop. The semi-arid climate of Hisar offers suitable environment for growing of cut flowers in winter months from November to February. Date of planting have an important role in regulating growth and flower quality of gladiolus Khan *et al.,* (2008). However early and late production is advantageous due to short supply of flowers in the market and higher remunerative prices.

The performance of gladiolus was influenced by prevailing day length at various stages of growth Shillo *et al.,* (1976). Among the various agro-techniques, the optimum planting time is the most important, present research efforts aim at standardization of planting time and suitable growing condition for climatic conditions of Hisar region.

Materials and Methods

This experiment was laid out at the Precision Farming Development Center of Department of Horticulture, CCS Haryana Agriculture University, Hisar during the year 2010-11.The soil of the experimental plot was sandy loam in texture and climate in general was semi-arid. The experiment was laid out in a randomized block design with 24 treatments and 4 replications. Corms of gladiolus cultivar American Beauty was planted at three planting dates 15th October, 15th November, 15th December. Two growing conditions were taken open field and shade net house. The shade net house made of iron pipes and covered with agro shade net of 50 mm mesh size to provide shade to the crop. The corms were planted with a spacing of 30 X 20 cm in the experimental plots of net area of 1 m^2 each, which accommodate 15 plants per plot.

Results and Discussion

The experimental data was analyzed statistically by Randomized Block Design (RBD). Tables are briefed for interpreting the results regarding Number of days required for sprouting of corms, Percentage of sprouting of corms, Number of leaves per plant and leaf area, plant height, Number of days taken for spike initiation, Number of days taken for opening of basal and last floret, of gladiolus variety American beauty.

Soil of the experimental site

The soil of the experimental site was analyzed for various physico-chemical attributes and the data are presented in Table 1. On the basis of soil analysis, the soil was found to be sandy loam in texture, medium in organic carbon, low in available nitrogen, medium in phosphorus and high with respect to available potassium.

Number of days to corm sprouting

Data present in Table 2 depicted that number of days taken for sprouting of corms was significantly affected by growing conditions. Days required for sprouting of corms ranges from (12.10-18.13 days). Minimum numbers of days (12.10 days) required for sprouting of corms were recorded under open field condition while maximum (18.13 days) under shade net house growing condition. Planting dates has significant effect on number of days taken for sprouting of corms. Minimum numbers of days (11.77 days) require for sprouting of corms were recorded on 15th October planting and maximum (18.75 days) on 15th December planting. It revealed that sprouting of corms was affected by prevailing temperature at the time of planting. During October to November the average temperature ranges between 24.8-19.4 °C respectively which is optimum for corm sprouting Arora *et*

al., (1987). Better performance of the genotype under 15th October planting for the sprouting and vegetative growth characters may be attributed to prevalence of optimum temperature for plant growth and development. Whereas, the late planting is subjected to relative less time span available for accumulation and assimilation of photosynthates as a result of which vegetative growth of plant get deteriorated. However, results are in close conformity with results of several workers Arora *et al.,* (1987), Banker and Mukhopadhyay (1980), Dod *et al.,* (1989). The reason for late sprouting under late sown condition may be due to downfall in temperature which started decreasing from beginning of November. Nijiasure *et al.,* (2005) also reported similar results, where minimum numbers of days were taken for corm sprouting in gladiolus cv. American Beauty in October planting under Maharashtra conditions. Corms planted on 15th October took minimum number of days for sprouting under both growing conditions and increased with late planting (15th December). Nijiasure *et al.,* (2005) also reported similar results. Performance of gerbera cultivar varies with the region, season, and other growing conditions Horn *et al.,* (1974).

Percentage of sprouting of corms

The data showed (Table 2) that percentage of sprouting was significantly affected by growing conditions. Maximum percentage of sprouting of corms (86.00 %) was found under shade net house condition as compared to open field condition (83.38 %). Planting dates has a significant effect on percentage of sprouting of corms. Maximum percentage of sprouting of corms (99.32 %) was recorded on 15th October planting and minimum percentage of sprouting of corms (71.75%) was observed on 15th December planting. In late planting i.e. 15th December planting under shade net house and open field conditions percentage of sprouting was not significant. Growing conditions and planting dates have cumulative effect on percentage sprouting of corms. Maximum (100 %) sprouting of corms was recorded under shade net house and minimum (98.65 %) in open field condition in 15th October planting. Minimum sprouting percentage was recorded in 15th December planting. This might be attributed to the fact that during early planting the day and night temperature was very favorable for sprouting of corms. The decrease in temperature during November and December has affected the percentage of sprouting particularly the corms which were planted on 15th December. Similar results were reported by Bhat and Ahmad (2007) in gladiolus planting under Kashmir condition.

Number of leaves per plant

It is perusal from the data (Table 2) that number of leaves per plant of gladiolus cv American Beauty was found significantly affected by growing conditions. Maximum number of leaves (8.85) was recorded under open field condition and minimum (6.75) under shade net house condition. Planting dates has also significant difference on number of leaves per plant. Maximum numbers of leaves (8.81 leaves) were recorded in 15th October planting and minimum numbers of leaves (6.95 leaves) were recorded on 15th December planting.

Better performance of cultivar under early planting for the vegetative growth might be attributed to prevalence of optimum temperature for plant growth and development. Variation in number of leaves was also recorded in gladiolus cv. Friendship Sujatha and Singh, (1991). Maximum number of leaves (10.40) was found in 15th October planting under open field and minimum (7.22) under shade net house condition. Minimum numbers of leaves (6.10) were recorded in 15th

December planting under shade net house and maximum (7.85) in open field condition. Significant variation in number of leaves and leaf area due to different planting dates and growing conditions was observed under shade net house. Variation in production of leaves by different varieties has been reported previously in gerbera Bhattacharjee (1981), chrysanthemum Jayaprakash (1998), gladiolus Kalasaraddi (1996) and carnation Patil (2001).

Leaf area (cm^2)

Maximum leaf area per plant (105.25 cm^2) was noted in plants grown under shade net house and minimum (89.30 cm^2) in open field. Maximum leaf area (105.97 cm^2) was noted on 15th October planting and minimum (88.20 cm^2) was recorded in late planting 15th December. Delay in planting shows negative effect on vegetative growth of plant.

Plant height (cm)

Maximum plant height (106.50 cm) was recorded under shade net house and minimum (94.08 cm) under open field condition. Planting date has a significant effect on plant height. Maximum (106.12 cm) plant height was recorded in 15th October planting and minimum (92.12 cm) in 15th December planting. Early planting (15th October) of corms provide better plant height (106.12 cm) as compare to late planting (15th December) which was recorded 92.12 cm. The plants grown inside the shade net house were significantly taller than the plants grown in open field conditions. The results of present investigation were in conformity with the results of Nijiasure *et al.,* (2005) in gladiolus cultivar American beauty.

Number of days to take for spike initiation

Minimum numbers of days (107.9 days) for spike initiation were recorded under shade net house and maximum (112.7 days) in open field condition. Minimum numbers of days (105.5) were recorded in 15th October planting and maximum (114.5 days) in late planting, which might be due to poor light duration available to the plant. Significance of light during growing period for gladiolus was also reported by Mckay *et al.,* (1981b). Shiva and Dadlani (2002a) also reported early spike initiation of gladiolus grown under greenhouse conditions in November planting in comparison to open field under Delhi condition. Similarly, Laurie *et al.,* (1979) suggested that earliness in flowering inside the greenhouse could be due to rise in soil temperature as indicated by higher temperature inside greenhouse conditions as compared to open field.

Number of days to take for opening of basal floret

Minimum numbers of days (121.1) were recorded in plants grown under shade net house and maximum (124.5) in open field condition. Effect of planting dates were found to be significant and minimum number of days (119.0) were recorded in 15th October planting and maximum number of days (126.8) were recorded in 15th December planting. Earliest opening of basal and last floret was found under shade net house condition. This is due to favorable environment inside the shade net house at the time of opening of florets. Plants grown on 15th October took minimum number of days for opening of basal and last floret, respectively.

Reduction in time requirement by genotype for the above floral characters may be attributed to the fact that cultivar had a early exposure to congenial climatic conditions as compare to late planting during which temperature is low. Similar results were obtained by Dod *et al.,* (1989). Gaikward and Patil (2001) have also observed similar results in chrysanthemum varieties under open and poly house conditions.

Table.1 Physico-chemical analysis of the experimental field soil

Character	Contents	Method of determination
Texture	Sandy loam	**International Pipette method**
Organic carbon (%)	0.30	**Walkley and Black rapid titration method**
pH	8.2	**1:2 soil water suspension**
EC (dS m^{-1})	0.27	**1:2 soil water suspension**
Available nitrogen (kg ha^{-1})	178	**Alkaline permanganate method**
Available phosphorus (kg P_2O_5 ha^{-1})	4	**Olsen's method**
Available potassium (kg K_2O ha^{-1})	**198.1**	**Flame photometric method**

Table.2 Sprouting and vegetative growth character

Treatments / Time of planting	Days to corm sprouting	Percentage of sprouting	No. of leaves per plant	Leaf area (cm^2)	Plant height (cm)	Days to spike initiation	Days to basal floret opening	Days to last floret opening
15th Oct.	11.77	99.32	8.81	105.97	106.12	105.5	119.0	127.3
15th Nov.	14.80	83.00	7.63	97.66	102.62	111.0	122.6	131.9
15th Dec.	18.75	71.75	6.95	88.20	92.12	114.5	126.8	134.6
C.D (P=0. 05)	**2.27**	**2.33**	**0.32**	**1.75**	**4.76**	**3.44**	**4.14**	**2.24**
Growing Conditions								
Open field	12.10	83.38	8.85	89.30	94.08	112.7	124.5	132.9
Shade net	18.13	86.00	6.75	105.25	106.50	107.9	121.1	129.7
C.D (P=0.05)	**1.85**	**1.90**	**0.26**	**1.43**	**3.88**	**2.81**	**3.32**	**1.82**
C.D (P=0.05) (Time of planting X Growing condition)	**N.S.**	**3.29**	**0.46**	**N.S.**	**N.S.**	**N.S.**	**N.S.**	**N.S.**

Number of days to take for opening of last floret

Minimum numbers of days (129.7) were recorded under shade net house and maximum (132.9 days) were recorded in open field condition. Minimum number of days (127.3) taken for opening of last floret were recorded in 15th October planting and maximum number of days (134.6) were recorded in 15th December planting. Increase in time requirement by the genotype for the above vegetative characters may be due to low temperature which results in late basal floret and last floret opening stage. These results are in close conformity with the results obtained by Saini *et al.*, (1988), Banker and Mukhopadhayay (1980).

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How to cite this article:

Sonia Singh, S.K. Sehrawat and Sushil Sharma. 2019. Effect of Planting Time and Growing Conditions on Sprouting and Growth of *Gladiolus* Cv. American Beauty. *Int.J.Curr.Microbiol.App.Sci*. 8(11): 656-662. doi: https://doi.org/10.20546/ijcmas.2019.811.079