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Full Length Research Paper

A study of the performance of two prominent cultivars of *Gladiolus grandiflorus* and to find the effect of three planting dates on growth, production and quality of flowers

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The present study was initiated to elucidate the performance of two internationally acclaimed cultivars of *Gladiolus grandiflorus*, Summer Rose and Friendship and to find the effect of three planting dates on growth, production and quality of flowers. Ethiopia is a grower and exporter of cut flowers but gladiolus has not found a place among the flowers cultivated and traded probably due to inadequacy of planting material and lack of scientific information on the crop. Henceforth, the study was conducted to evaluate two prominent varieties and three planting dates on growth and flowering of gladiolus. The studies revealed that the variety Summer Rose performed excellently well as regards the vegetative and floral characters and is ideal for undertaking cultivation by commercial flower growers for export purposes. The variety Friendship also exhibited good performance in terms of growth and flowering and could be quite suitable for flower production for the Ethiopian domestic markets. Among three planting dates tested, planting corms during mid-April indicated better growth performance and produced good quality flower spikes.

Key words: Gladiolus, varieties, planting dates, growth, flowering.

INTRODUCTION

Floriculture has attained the status of one of the most important high value agricultural industry in many developing as well as under-developed countries of the world. There has been a considerable increase in production, trading and consumption of flowers owing to its marked aesthetic importance and high economic value (Sheela, 2008). Floriculture is increasingly regarded as a viable diversification from the traditional field crops due to higher returns per unit area and increased habit of "saying it with flowers". From the symbols of aesthetics and love, flowers have transformed into an industry, generating both income as well as employment (Singh, 2006).

Floriculture plays a major role in Ethiopia's efforts to beat unemployment. Floriculture is so blooming that in the near future, it could even overtake exports of coffee and other high value export-oriented horticultural commodities. Low air- freight cost from Addis Ababa,

proximity to European, West Asian, Middle East markets are real advantages. EHPEA (Ethiopian Horticulture Producer Exporters Association (Zelalem, 2015), reported that 180 million US dollars was earned by exports of flowers during 2010-11, and it is estimated that by 2016 Ethiopia will attain a status of the second largest flower exporter in Africa as well as the fourth largest in the world with an export earnings of 550 million US dollars. The cool climatic conditions of Ethiopian highlands with warm sunny days and cooler nights are quite ideal for growing cut flowers even in the out-door conditions.

Over the last 20 years, the demand for cut flowers has increased significantly and important changes occurred in consumption patterns. Rather than occasional purchases of traditional species for special occasions, flowers are becoming a regular decorative part of middle and upper-income homes.

Gladiolus is a flower of breathtaking beauty with a wide range of colours, size and form. Its attractive inflorescence has won for it, a place of pride in gardens and commercial value as a cut flower. Except true blue and green practically all colors are available in gladiolus. Gladiolus flowers have a good vase life and withstand transporting very well. They are extensively used in flower arrangements, making of bouquets and for indoor decorations (Arora et al., 2002).

Gladiolus is a popular bulbous cut flower and has great demand in international markets. It is known as the queen of bulbous plants, which is valued for its good looking flower spikes (Chanda et al., 2000; Riaz et al., 2007). Its magnificent inflorescence with broad spectrum of colors, made it gorgeous as an important cut flower of United States and other flower trading centers of the world. Gladiolus is also good for flower beddings in gardens, pot cultures, rockeries etc (Abbasi et al., 2005). The major producing countries are United States (Florida and California), Holland, Italy, France, Bulgaria, India, and Israel (Riaz et al., 2007).

The modern cultivars and hybrids have originated from South Africa and are taxonomically identified as *Gladiolus grandiflorus* Andrews belonging to family Iridaceae (Dole and Harold, 2005). It is popularly known by the name "Sword Lily". The plant is propagated by corms and cormels and completes life cycle in four to five months (Negi et al., 1982). The varieties of gladiolus used for study, Summer Rose and Friendship are *primulinus* type (hooded flowers, medium size) and they bear double florets with more than six petals (Bose and Yadav, 1989). Temperature is the most important factor controlling flowering in gladiolus. Short days accelerate flowering under any given temperature with adequate light. Summer crops are normally harvested after 70 to 80 days and winter grown crops after 140 days (Halvey, 1985). In general, 60 to 80% relative humidity is ideal for growth and flowering of gladiolus (Fairchild, 1979). At the fag end of life cycle, corms and cormels of gladiolus undergo a period of dormancy ranging from 40 to 70 days depending upon the cultivars and environmental conditions (Dehertough, 1996).

Even though the climatic conditions of Ethiopia are quite ideal for growing gladiolus, due to lack of quality planting material and inadequacy of technical knowledge, it has not figured as an important commercial flower in Ethiopia. This research program was initiated with the objectives of testing the performance of gladiolus in the agro-climatic conditions of Haramaya University, which is situated in Eastern Ethiopia.

MATERIALS AND METHODS

The study was conducted as pot culture under out-door conditions at the Rare Research Station of the Haramaya University. Two prominent gladiolus varieties, viz., Summer Rose, Friendship and three planting dates, viz., mid-February, mid-March and mid-April were tested during 2014, beginning with *Belg* (summer cum short rainy season) and the experiments extended up to the end of July which coincided with *Meher* (the long rainy season) of Ethiopia. Genetically stable, disease-free certified corms of gladiolus varieties were brought from the government owned and approved Lal Bagh Gardens, Bangalore, India.

The experimental site is situated in the eastern geographical area of Ethiopia. The area is located at a latitude of 9° 26' E and at a longitude of 42° 03' E. Rare Experiment Station of the Haramaya University is elevated at an altitude of 1980 m above mean sea level.

The climate of the region is quite suitable for wide varieties of horticultural crops that can be planted throughout the year (Table 3). The site is representative of a sub-humid mid latitude agro-climatic zone. Rainfall distribution is bimodal, the short rainy season from March to April and the long rainy season from June to October. The coolest season of a year is between November to January and commencing from February onwards, the climatic conditions are congenial for the cultivation of tropical as well as sub-tropical flower and vegetable crops. The monthly range of variation in meteorological parameters during year 2014 (http://hararconnection.com/hnrs.htm) are: (i) rainfall 33.4 mm (March) to 211.2 mm (September) (ii) mean minimum temperature 8.1°C (January) to 12.5°C (June) (iii) mean maximum temperature 16.3°C (August) to 28.3°C (May) (iv) relative humidity 51% (March) to 84% (September).

Design and layout

The study was programmed as a pot culture experiment and was laid out according to Completely Randomized Design (CRD). The two gladiolus varieties chosen for the study viz., Summer Rose (light rose colored) and Friendship (pink colored) comprised the main treatments and three planting dates viz., middle of February, March and April were the sub-treatments. Each variety was replicated fifteen times with one potted plant in each replication. So, for one planting date for the two varieties there were thirty potted plants and since the study was conducted for three planting dates, altogether the experiments included a total population of ninety potted plants.

The pots used were 20 cm diameter, 25 cm depth and were filled with a growing media by mixing one part each of well dried, powdered farm yard manure and good top soil. NPK fertilizer (17: 17: 17 mixture) was given to each pot at a dose of 25 g at 1 month and 2 months after planting of gladiolus corms. Light irrigation was

given once daily to the pots by using water cans. Leaf area was measured in all the treatments at 75 days after planting by recording the length, breadth of leaves and multiplying by the factor (Cohat, 1993). Plants were observed for incidence of diseases and routine plant protection measures were adopted.

Flower spikes were harvested when the lower most mature floret showed signs of opening (bud-break stage). Vegetative and floral characters of gladiolus were recorded as per descriptors specified by Manning and Goldblatt (2008). The corms and cormels were lifted from the pots when the foliage turned light yellow color. The data collected from experiments were subjected to analysis of variance technique (ANOVA) for Completely Randomized Design (Steel et al., 1997). SAS software program version 9.1.3 (SAS Institute, 2003) was used to compare treatment means by Least Significant Difference test (LSD) at 5% probability level. Monthly meteorological data for the year 2014 (source Rare Research Station of Haramaya University) is depicted in Table 3.

RESULTS AND DISCUSSION

Effect of varieties on vegetative growth characters of gladiolus

The results presented in Table 1 revealed significant differences between the varieties tested, Summer Rose (V1) and Friendship (V2) for all vegetative characters studied, viz., days to 100% corm sprouting, plant height, number of shoots/leaves per plant, leaf area (cm^2) and *Fusarium* disease incidence. No significant difference was observed in the number of cormels received between the two varieties.

More number of days were taken for 100% corm sprouting in the variety Friendship (49.67) and rather less for the variety Summer Rose (42.56). Maximum plant height was recorded in Summer Rose (74.29 cm) as against in Friendship (68.16). The number of shoots and leaves per plant were higher in Summer Rose (1.53 and 8.51, respectively) when compared with Friendship (1.18 and 6.76, respectively). The incidence of *Fusarium* disease was rather lower in the variety Friendship (1.40%) and slightly more in the variety Summer Rose (1.89%).

It could be elucidated from the findings (Table 1) that the variety Summer Rose was superior to Friendship since it attained 100% sprouting of corms earlier and the plant height, number of shoots as well as leaves per plant and leaf area were more in Summer Rose. Though incidence of *Fusarium* disease was slightly higher in Summer Rose, this variety produced more cormels per plant. Similar superior performance of variety Summer Rose was observed in earlier experiments (Abbasi et al., 2005; Sheela, 2008).

Effect of planting dates on vegetative growth characters of gladiolus

The results (Table 1) further revealed significant variations in planting dates with regard to vegetative growth characters of gladiolus viz., days to 100% corm sprouting, plant height, number of leaves per plant, leaf area and yield of cormels. As far as the characters, number of shoots per plant and incidence of *Fusarium* disease, no significant difference was exhibited among different planting dates.

Planting during mid-April showed the earliest sprouting of all corms (32.67 days) and it was slightly delayed in the mid-February planting (43.00 days). Plant height was more in mid –April planted corms (77.27 cm) when compared with the low plant height (67.58 cm) of mid-February planting. Number of leaves per plant was more in mid-April planting (8.62) which were on par with mid-March planting (8.50). Leaf number was lowest in mid-February planting date (7.76). Leaf area was comparatively higher in the mid-April planting (578.57 cm^2) which was also on par with the mid-March planting (525.68 cm^2). However, significant difference was observed for these two planting dates over the lower value of mid-February planting (451.41 cm^2). The dates of planting indicated significant difference for number of cormels, the lowest in mid-February planting (2.65) and the highest in mid-April planting (5.88). However, there was no difference in cormel number between mid-February and mid-March plantings. The meteorological factors that prevailed from April to June were conducive for the growth characters and similar response has been observed previously (Cohat, 1993).

Summary of the results (Table 1) revealed that among the three planting dates adopted for the study, mid-April planting was superior to the other two planting dates in terms of vegetative growth characters and so this planting date could be recommended for adoption by the progressive flower growers of Ethiopia. The better response of April plantings could be due to the favourable climatic factors viz., optimum temperature, rainfall and sunshine hours that prevailed during this growth period. Similar results on the behavior of growth and flowering in gladiolus under favourable climatic conditions has been reported earlier in United States (Fairchild, 1979; Halevy, 1985) and in Pakistan (Muhammad et al., 2013).

Effect of varieties on floral characters of gladiolus

Statistical analysis of the data as revealed in Table 2 showed significant difference between the two varieties for all floral characters studied viz, days to 100% spike emergence, spike length, rachis length, number of florets per pike, size of florets, blooming period and vase life. Days taken for 100% emergence of spikes were more for variety Friendship (107.06) and comparatively less for the variety Summer Rose (95.28). Spike length was higher in variety Summer Rose (56.57 cm) and comparatively lower in Friendship (52.28 cm). Rachis length also showed a similar trend to that of spike length, being higher in Summer Rose (45.77 cm) and lower in Friendship (40.83 cm). Number of florets per spike was more in Summer Rose (12.10) and rather less in Friendship (10.02).

Table 1. Effects of varieties and planting dates on vegetative growth characters of gladiolus.

Treatment	Days to 100% corm sprouting	Plant height (cm)	No. of shoots per plant	No. of leaves per plant	Leaf area (cm^2)	Number of cormels	*Fusarium* disease incidence
Variety							
Summer Rose	(V 1) 42.56	74.29	1.53	8.51	619.67	4.54	1.89
Friendship	(V 2) 49.67	68.15	1.18	6.76	544.37	4.28	1.40
C.D (P=0.05)	3.01	2.55	0.07	0.42	66.48	NS	0.28
Planting date							
Mid-February	(P 1) 43.00	67.58	1.02	7.76	451.41	2.65	2.15
Mid-March	(P 2) 37.11	70.77	1.04	8.50	525.68	4.05	1.93
Mid-April	(P 3) 32.67	77.27	1.09	8.62	578.57	5.88	1.79
C.D (P=0.05)	4.25	3.61	NS	0.48	64.02	1.73	NS

NS: Not Significant.

Table 2. Effects of varieties and planting dates on floral characters of gladiolus.

Treatment	Days to 100% spike emergence	Spike length (cm)	Rachis length (cm)	No of florets per spike	Size florets (cm)	Blooming period (days)	Vase life (days)
Variety							
Summer Rose (V1)	95.28	56.57	45.77	12.10	10.93	8.50	11.75
Friendship (V2)	107.06	52.28	40.83	10.02	9.44	7.68	8.22
C.D (P=0.05)	4.65	2.32	2.04	0.67	0.55	0.30	0.45
Planting date							
Mid-February (P1)	108.33	55.64	41.27	10.74	9.82	6.40	7.32
Mid-March (P2)	103.22	57.50	44.18	11.55	10.65	7.88	9.61
Mid-April (P3)	94.54	61.16	47.66	13.02	11.77	9.72	12.55
C.D(P=0.05)	6.59	3.27	2.85	0.96	0.73	1.45	1.20

Ethiopian Size of florets also revealed significant variation between the varieties, the values being 10.93 and 9.44 cm for the varieties Summer Rose and Friendship, respectively. Blooming duration as noted in days for individual florets was 8.50 and 7.68 for the varieties Summer Rose and Friendship., though the values were statistically significant, the extent of variation was rather less. The post-harvest vase life was more for Summer Rose (10.75 days) when compared with a low value for Friendship (8.22 days). The superior performance of variety Summer Rose was noted earlier (Arora et al., 2002).

The variety Summer Rose was undoubtedly superior to Friendship in terms of gladiolus spike characters, flower (floret) qualities and the extended post-harvest vase life. So, this variety can be recommended for cultivation by commercial flower farms particularly for exports and at the same time, the variety Friendship is advisable for cultivation by growers for supply to the domestic markets.

Effect of planting dates on floral characters of gladiolus

Analysis of the data pertaining to the effect of planting dates on floral characters of gladiolus for the three treatments, viz., mid-February, mid-March and mid-April plantings are presented in Table 2. All the floral characters studied exhibited significant variations for the parameters, viz., days to 100% spike emergence, spike length, rachis length, number of florets per spike, size of florets, blooming period and vase life of spikes. Days to 100% spike emergence was achieved early in mid-April planting (94.54) which showed significant difference between mid-February and mid-March planting dates (108.33 and 103.22 days, respectively). No significant difference was observed between mid-February and mid-March planting dates as far as 100% spike emergence was was concerned.

Table 3. Climatic factors of the Rare Experimental Site (Haramaya University), Eastern Ethiopia during 2014.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean	Total
Rainfall	0.00	0.00	33.40	106.00	72.40	86.15	62.35	164.80	211.20	75.95	0.00	0.00	67.74	812.95
Mean minimum temperature	8.1	9.5	11.4	12.2	11.8	12.5	10.6	10.2	11.1	10.5	9.6	8.5	10.5	126.0
Mean maximum temperature	19.8	21.7	23.7	26.5	28.3	24.0	22.4	16.3	21.6	20.4	19.5	18.7	21.9	262.9
Relative humidity	62	58	51	53	57	65	76	78	84	82	71	77	67.8	814

Source: Meteorological Observatory, Rare Research Station, Haramaya University.

In general, the mid-April planting was superior for the spike length rachis length, the figures being 61.16 and 47.66 cm, respectively. The values were proportionately lower for mid-February planting with spike length (55.64 cm) and rachis length (41.27 cm). Number of florets per spike was maximum for mid-April planting (13.02) and minimum for mid-February planting (10.74). The size of florets also showed a similar trend as that of number of florets with a high in mid-April planting (11.77 mm) and slightly low in mid-February planting (9.82 mm). The blooming of individual florets after bud-break (opening) ranged from a high of 9.72 days in mid-April planting to a low of 6.40 days in mid-February planting. Vase life of flower spikes after harvesting was maximum in mid-April planting (12.55 days) as against the minimum in mid-February planting (7.32 days). The climate factors that were experienced from April onwards were congenial for flowering and floral characters of gladiolus and similar results were recorded previously (Dehertogh, 1996; Dole and Wilkins, 2005).

The results of spike and floral characters (Table 2) are in line with the vegetative growth parameters wherein the mid-April plantings were superior over the other two plantings. The climatic factors, especially the temperature regimes, rainfall and humidity from April to September, 2014 (Table 3) were quite congenial for the growth and flowering of gladiolus. Hence, planting of gladiolus corms during mid-April season can be well adopted by florists and farmers of Eastern Ethiopia. These observations fall in line with the findings of previous experiments on gladiolus (Abbasi et al., 2005; Sheela, 2008).

Conflict of Interest

The authors declare that they have no conflict of interest.

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REFERENCES

Abbasi NA, Hafiz IA, Ahmad T, Saleem N (2005). Growing *Gladiolus,* Proceedings of the National Seminar on Streamlining, Production and Export of Cut flowers and House plants, 2nd to 4th March, 2005. Horticulture Foundation of Pakistan.

Arora JS, Misra RL, Singh K, Bhattacharya SK (2002). *Gadiolus*, Project Co-ordination Report, All India Co-ordinated Research Project on Floriculture, New Delhi, India.

Bose TK, Yadav LP (1989). Commercial Flowers. Naya Prakash, Calcutta, India.

Chanda S, Barma G, Roychowdhury N (2000). Influence of different levels of nitrogen, phosphorus and potassium on growth and flowering of gladiolus. Indian J. Hort. 13:76-86.

Cohat J (1993). Gladiolus. In: Hertogh AD and Lenard (ed), The Physiology of Flowering Bulbs. Elsevier, Amsterdam.

Dehertogh AA (1996). Gladiolus. In: Holland Bulb Forcer's Guide, 5th Ed, International Flower Bulbs Centre, Hillegom, Netherlands.

Dole JM, Wilkins HF (2005). Floriculture, Principles, Species. Pearson Prentice Hall, USA.

Fairchild L (1979). How to grow Gladiolus. North American Gladiolus Council, Edgewood, Maryland. Bulletin 139.

Halevy AH (1985). Gladiolus. In Handbook of Flowering. CRC Press, Boca Raton, Florida.

Manning J, Goldblatt P (2008). The *Iris* Family: Natural History and Classification. Portland, Oregon: Timber Press. pp. 138-142.

Muhammad A, Waquas A, Jamil S, Muhammad I (2013). Effect of different planting dates on growth and development of *Gladiolus grandiflorus* L. under ecological conditions of Faisalabad, Pakistan. Universal J. Agric. Res. 1(3):110-117.

Negi SS, Sharma TV, Raghava SP, Shrinivasan VR (1982). Variability studies in gladiolus. Indian J. Hort. 39:269-272.

Riaz T, Khan SN, Javaid A (2007). Scenario of *Gladiolus* production in Punjab. Pak. J. Botany 39:2389-2393.

SAS (Statistical Analysis System) (2003). SAS version 9.1.3 © 2002-2003. SAS Institute, Inc., Cary, North Carolina, USA.

Sheela VL (2008). Flowers for trade. New India Publishing Agency, New Delhi, India.

Singh AK (2006). Flower Crops Cultivation and Management. New India Publishing Agency, New Delhi, India.

Steel RGD, Torrie JH, Dicky DA (1997). Principles and procedures of statistics: A biological approach. McGraw Hill Book, USA

Zelalem M (2015). Ethiopia to emerge as world's fourth largest flower exporter. EHPEA (Ethiopian Horticulture Producer Exporters Association). Addis Ababa.