Research Article

Statical analysis on Growth and Quality on Gladiolus (*Gladiolus hybridus* Hort.)

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Abstract

A field experiment was conducted during winter season of 2015-16 to study "Statical analysis on Growth and Quality on Gladiolus (*Gladiolus hybridus* Hort.)" having 15 treatment combinations of five Varieties (V_1- African Star, V_2- Hunting Song, V_3- Legend, V_4- Pusa Srijana and V_5- Snow Princess) and three planting dates (D_1- 10th October, D_2- 25th October and D_3- 9th November). Correlation with regression studies showed that between dates of planting with vegetative and flower quality characters has been depicted. Plant height had positive correlation with number of leaves per plant, leaf length, leaf width, main stem diameter, number of floret per spike, spike length, rachis length, and floret diameter .

Keywords: varieties, planting dates, gladiolus, Correlation and regression

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Introduction

Gladiolus (*Gladiolus hybridus* Hort.) a member of family Iridaceae is one of the important bulbous ornamental which occupies important position among cut flowers in domestic as well as international market. It is universally acclaimed prestigious cut flower [1]. Gladiolus bulbs, in botanical terminology, are referred to as corms, the main propagating material in gladiolus. A corm is a shortened and thickened section of the stem that appears at the base of the plant [2]. Gladiolus is an important cut flower crop, grown commercially in many parts of the world. It has gained popularity owing to its incomparable beauty, attractive colours, various sizes and shapes of florets, variable spike length and long vase life. Gladiolus produces beautiful spikes from December to March in the plains and from June to September in the hills of India. The Gladiolus is very rich in its varietal wealth and every year there is an addition of new varieties; hence varietal evaluation becomes necessary to find out suitable variety for a particular region. Improvement of any crop is a continuous process and in gladiolus also there is scope to improve the existing cultivars. In gladiolus the most common method of improvement is through hybridization. Since the gladiolus is highly heterozygous, it becomes more essential to evaluate. Like all other economical plants, the growth and development of gladiolus is governed by its genetic makeup and environmental factors of the growing region and various management practices. Among the various agro-techniques, the optimum planting time is of outmost importance. Present research efforts aim at standardization of planting date and suitability of varieties for local climate and edaphic conditions of the sub-humid zone of Rajasthan.

Date of planting plays an important role in improving the vegetative growth, quality and bulb production of gladiolus [3]. Which also satisfies the consumer's demands [4]. Earlier planting is beneficial as it allows plants to mature and increases the probability of harvesting prior to inclement fall weather. The mean values regarding plant height reveal that different planting dates significantly impacted on the plant height of *Gladiolus* [5]. Different planting schedule supply gladiolus steadily to the market as well as it adds to the beauty of the landscape longer. The timing of flowering from various planting dates is quite predictable under ideal environmental conditions. The growth and yield of gladiolus like other plants depend upon planting time e.g., number of florets/spike, spike length, floret diameter, floret length was best with October planting [6].

The present research work was planned to investigate the growth and flowering quality of gladiolus in early and late growing season and to study its correlation and regression with average weekly temperature (^{0}C) under agro-ecological conditions of sub-humid zone of Rajasthan and to establish a protocol for 10th October planting dates with 'Hunting Song' which is commercially feasible and easily adoptable with minimum capital investment.

Materials and Methods

A field experiment was conducted during winter season of 2015-16 at College of Horticulture & Forestry, Jhalawarat. Corms of gladiolus cultivars were collected from College of Horticulture and forestry jhalawar (Rajasthan). Healthy and uniform size corms of 4-5 cm diameter were planted at different planting dates. The experiment consisted of 15 treatment combinations (V_1D_1, V_1D_2, V_1D_3, V_2D_1, V_2D_2, V_2D_3, V_3D_1, V_3D_2, V_3D_3, V_4D_1, V_4D_2, V_4D_3, V_5D_1, V_5D_2, V_5D_3) comprising of five varieties (V_1- African Star, V_2- Hunting Song, V_3- Legend, V_4- Pusa Srijana and V_5- Snow Princess) and Three planting date (D_1- 10th October, D_2- 25th October and D_3- 9th November. The observations plant height was recorded in centimeters from ground to tip of the spike, Leaf length, leaf width, spike length, rachis length, and floret diameter recorded in centimeter, number of leaves produced was counted after emergence of spike, number of floret per spike counted after full blooming of all spike florets, length of 4th leaf from base to tip of the leaf and stem diameter in (cm) was measured with the help of digital vernier calipers. The number of spikes produced per mother corm, number of spikes produced per plot was counted.

Statistical analysis

The experimental data are to be recorded during the course of investigation for various characters under study with appropriate statistical analysis [7] along with suitable interpretation. The relation of the different growth and flowering quality parameters and average weekly temperature (^{0}C) were assessed through regression and co-relation analysis.

Result

Vegetative parameters

The influence of date of planting on various growth parameters has been presented in (**Table 1**). Correlation between dates of planting with vegetative characters has been depicted (**Figure 1A-1E**).

Table 1 Correlation and Regression with average weekly temperature (^{0}C) on growth of gladiolus

Varieties	Plant height		Number of leaves per plant		Leaf length		Leaf width		Main stem diameter	
	r	**y**	**r**	**y**	**r**	**y**	**r**	**y**	**r**	**y**
African Star	0.99	0.50-3.64x	0.09	6.17+0.03x	-0.23	64.88-0.41x	-0.96	3.50-0.04x	0.95	0.23+0.03x
Hunting Song	0.99	69.25+1.62x	0.95	5.97+0.09x	-0.26	62.77-0.39x	-0.99	4.19-0.99x	0.97	0.70+0.02x
Legend	0.99	78.69+0.84x	0.99	6.24+0.08x	0.73	43.85+0.51x	-0.77	4.19-0.03x	0.68	0.37+0.03x
Pusa Srijana	0.96	47.10+1.94x	0.59	6.01+0.05x	-0.84	66.31-0.62x	0.99	1.46+0.06x	0.98	1.01+0.01x
Snow Princess	0.61	89.64+0.61x	0.98	3.64+0.14x	-0.66	83.48-0.81x	-0.88	8.06-0.13x	0.99	0.13+0.04x

r = Correlation; **y** = Regression of y on x

It was observed that plant height, number of leaves per plant and stem diameter has been positive correlation in almost all the tested varieties r = (+) 0.99 to r = (+) 0.99 along with corresponding regression (Table 1 and Figure 1A-1E). The maximum positive correlation was however, observed in almost all varieties r = (+) 0.09 to r = (+) 0.99 accept variety Snow Princess r = (+) 0.61 in plant height.

The number of leaf per plant also showed positive correlation almost in all the varieties based on planting dates, the 'African Star' (V_1) showed minimum positive correlation r = (+) 0.09 when compared with other varieties along with corresponding regression (Table 1 and Fig 1A-1E).

The leaf length also has positive correlation only with variety Legend (V_3) r = (+) 0.73 when compared with other varieties. However, and other hand 'Pusa Srijana' (V_4) had only positive correlation and remaining all other varieties could not showed positive correlation (Table 1 and Figure 1A-1E).

All the five varieties had positive correlation with main stem diameter based on planting dates. The maximum positive correlation was however, observed with 'Snow Princess' (V_5) r = (+) 0.99 followed by 'Pusa Srijana' (V_4), 'Hunting Song' (V_2) r = (+) 0.97, 'African Star' (V_1) r = (+) 0.95 and 'Legend' (V_3) r = (+) 0.68 with corresponding regression (Table 1 and Figure 1A-1E).

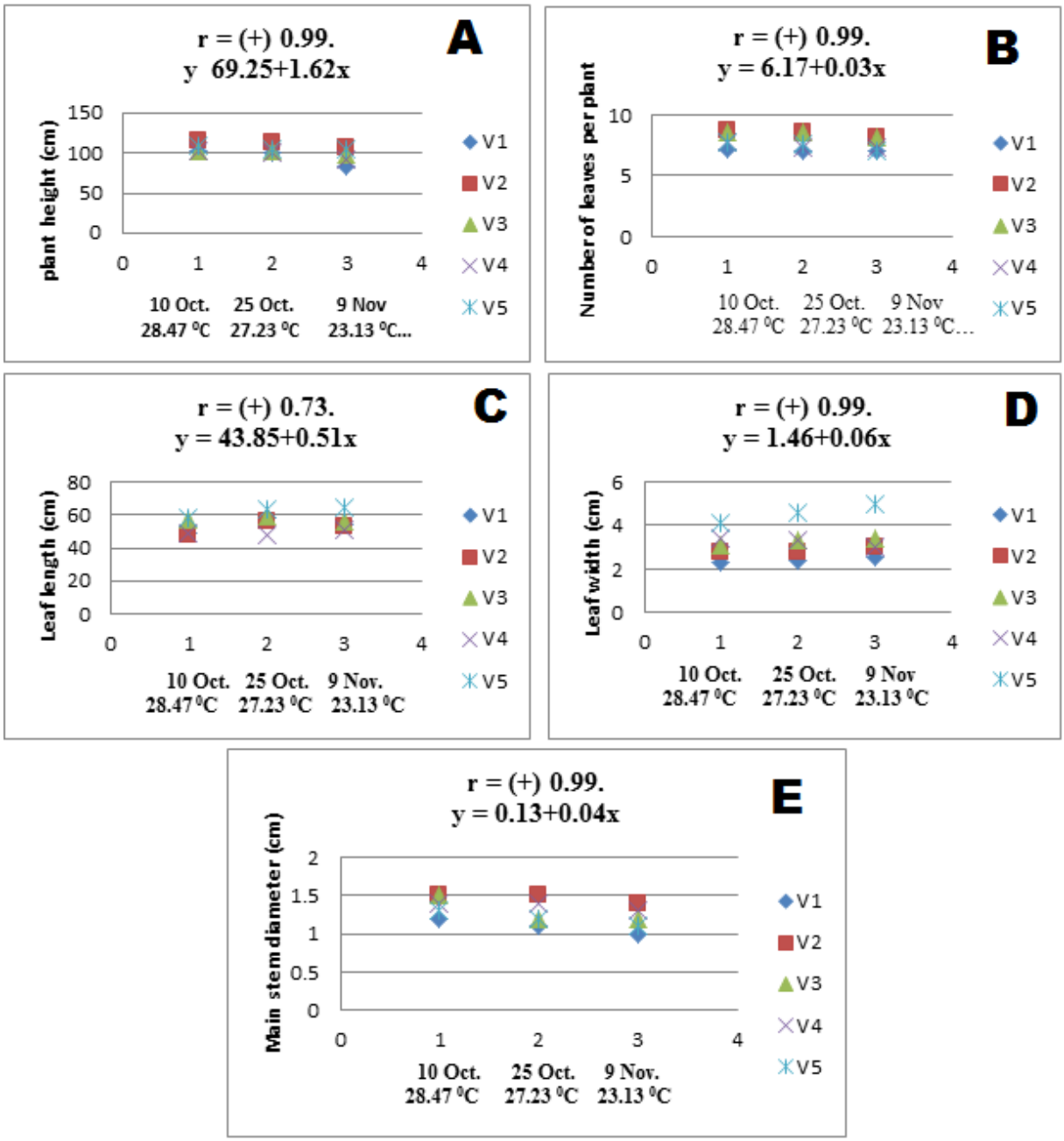

Figure 1 Correlation and regression of date of planting on vegetative growth in gladiolus (A-E)

Flower quality parameters

The maximum correlation in number of floret per spike was observed with variety African Star (V_1) and Hunting Song (V_2) r = (+) 0.99 followed by 'Legend' (V_3) r = (+) 0.98, 'Pusa Srijana' (V_4) r = (+) 0.91 and 'Snow Princess' (V_5) r = (+) 0.78 with corresponding regression (**Table 2** and **Figure 2A-2D**) based on planting dates.

The spike length has positive correlation in almost all varieties, the maximum correlation was observed with 'African Star' (V_1) r = (+) 0.99 followed by 'Snow Princess' (V_5) r = (+) 0.92, 'Hunting Song', (V_2) 'Pusa Srijana' (V_4) r = (+) 0.89 and 'Legend' (V_3) has minimum correlation r = (+) 0.80 with corresponding regression (Table 2 and Figure 2A-2D).

The rachis length showed positive correlation with date of planting in almost all five varieties African star (V_1), 'legend' (V_3) and 'Pusa Srijana' (V_4) has correlation r = (+) 0.99 while 'Hunting Song' (V_2) has minimum correlation r = (+) 0.62 as compared to other varieties along with corresponding regression (Table 2 and Figure 2A-2D).

Table 2 Correlation and Regression with average weekly temperature (0C) on flower quality of gladiolus

Varieties	Number of florets per spike		Spike length (cm)		Rachis length (cm)		Floret diameter (cm)	
	r	y	r	y	r	y	r	y
African Star	0.99	6.66+0.27x	0.99	10.15-2.95x	0.99	2.82-1.64x	0.99	4.02+0.17x
Hunting Song	0.99	5.07+0.37x	0.89	29.78+2.08x	0.62	38.42+0.61x	0.66	8.78+0.04x
Legend	0.98	8.29+0.12x	0.80	46.93+0.95x	0.99	20.92+0.70x	0.86	8.28+0.04x
Pusa Srijana	0.91	8.01+0.19x	0.89	24.79+1.74x	0.99	15.25+0.99x	0.95	5.97+0.11x
Snow Princess	0.78	9.07+0.16x	0.92	8.66+2.53x	0.95	30.64+0.53x	0.93	6.21+0.10x

r = Correlation y = Regression of y on x

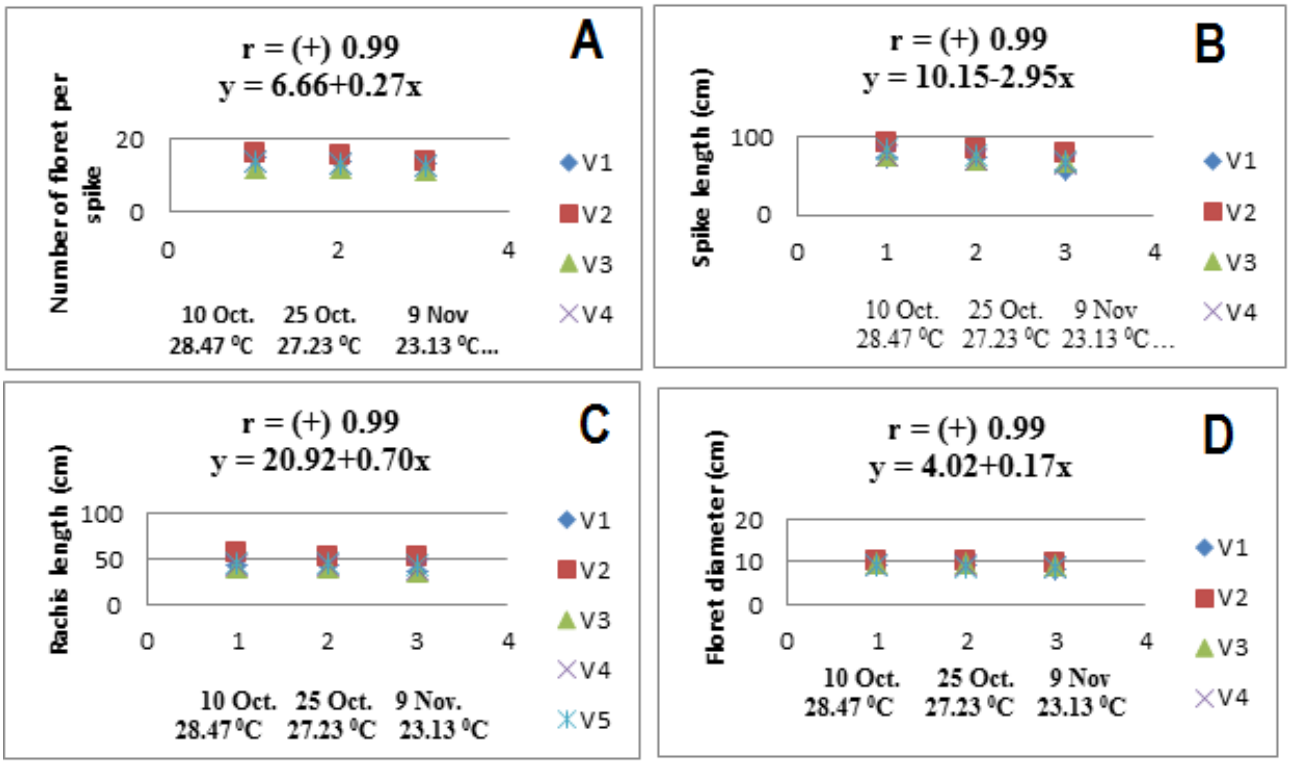

Figure 2 Correlation of date of planting on quality in gladiolus (A-D)

The floret diameter had positive correlation in all varieties. The maximum correlation was observed with 'African Star' (V_1) r = (+) 0.99 followed by 'Pusa Srijana' (V_4) r = (+) 0.95, 'Snow Princess' (V_5) r = (+) 0.93, 'Legend' (V_3) r = (+) 0.86 and 'Hunting Song' (V_2) has minimum positive correlation r = (+) 0.66 along with corresponding regression (Table 2 and Figure 2A-2D).

Discussion

Vegetative parameters

The influence of date of planting on various growth parameters has been presented in (Table 1). Correlation between dates of planting with vegetative characters has been depicted (Figure. 1A- 5E).

The increase in plant height of gladiolus at high temperature was reported by [8] in gladiolus. Gladiolus planted on 10th October produced longest plant. During this time average temperature (28.47 ^{0}C) showed that plant height was appeared to be positive correlation r = (+) 0.99 with higher temperature and long day length.

The maximum Number of leaf per plant was produced in plant with greater height and well developed structure. A positive correlation r = (+) 0.99 was observed between number of leaf per plant and temperature was reported by [9] in gladiolus. The maximum number of leaf per plant was observed plant grown under warmer temperature and long day lengths.

The increasing leaf length at high temperature has been reported [9] in gladiolus that elevated temperature within the appropriate range result in increased leaf length. A positive correlation r = (+) 0.73 was observed between temperature and leaf length.

The positive correlation r = (+) 0.99 between temperature and leaf width was also observed (Table 1 and Figure. 1D). The results were in line with the finding of [4] who reported increase in leaf length at high temperature.

The increase in main stem diameter of gladiolus at high temperature was reported by [8] in gladiolus. Gladiolus planted on 10th October observed highest stem diameter. During this time average temperature (28.47 ^{0}C) shows that main stem diameter was appeared to be positive correlation r = (+) 0.99 with higher temperature and long day length.

Quality parameters

The increase in number of floret at high temperature is also reported by [10] who found more number of florets per spike, when planting was done during 10th October. A positive correlation r = (+) 0.99 between temperature and number of florets.

The increase in spike length at high temperature is also reported by [11] in gladiolus who found highest spike length, when planting was done during 10th October. A positive correlation r = (+) 0.99 between temperature and spike length.

The increase in rachis length of gladiolus at high temperature was reported by [11] in gladiolus. Gladiolus planted on 10th October produced highest rachis length. During this time average temperature (28.47 ^{0}C) shows that rachis length was appeared to be positive correlation r = (+) 0.99 observed between temperature and rachis length with higher temperature and long day length.

The increase in floret diameter at high temperature is also reported by [12] who found highest floret diameter, when planting was done during 10th October. A positive correlation r = (+) 0.99 between temperature and floret diameter was observed in (Table 2 and Figure 2D).

Conclusion

From the above experiment it can be concluded that the growth and quality parameters show positive correlation, negative correlation and regression with the highest positive correlation for plant height, Number of leaves per plant, leaf length, leaf width, Main stem diameter, Number of floret per spike, Spike length, Rachis length and Floret diameter with average weekly temperature.

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