EFFECT OF PLANTING DATES ON THE GROWTH OF GLADIOLUS CORMS IN PESHAWAR

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ABSTRACT

The effect of planting dates on the growth of gladiolus corms in Peshawar was studied at Ornamental Nursery, Department of Horticulture, Agricultural University, Peshawar, Pakistan during February-September, 2009. The cormels of gladiolus cv. White Friendship were planted on 5 various dates with a regular interval of 15 days i.e. February-18, March- 05, March-20, April-04 and April-19. Planting dates showed significant effects on various parameters and maximum values were obtained from plantation done on 18th February for sprouting percentage (77.12), number of leaves per plant (7.06), survival percentage (82.96), leaf area (65.76 cm^2), plant height (67.39 cm), diameter of corms (3.19 cm), percent increase in cormel size (139.58) and corms weight (10.76 g). Whereas earliest sprouting was observed in cormels planted on 19th April (20.11 days) and maximum numbers of cormels per plant were observed in those planted on 4th April (3.83).

Key Words: **Planting dates, corm size, corm yield, gladiolus, cormel production**

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INTRODUCTION

Gladiolus (*Gladiolus grandiflorus*), popularly known as "Sword Lily" is an ornamental cormelous plant native to South Africa. It belongs to monocot family Iridaceae, having approximately one hundred and fifty known species (Negi *et al.* 1982). This plant is commercially used for cut flowers and occasionally used for landscape purpose. Gladiolus produces very attractive flowers and there is great consumer demand for it. To satisfy customer demand, it is important that gladiolus flower is available round the year. Gladiolus is one of the few plants which produce pleasant cut flowers with long spikes. These spikes are an integral part of almost every cut flower arrangement ranging from table decoration to bucket formation. Gladiolus is cultivated in most of the tropical and subtropical countries of the world. In plains of Pakistan, it blooms profusely during the spring and summer. Gladiolus spikes takes 60 to 100 days after planting to be harvested depending upon the cultivars and time of year (Jenkins, 1963; Jenkins *et al.* 1970).

The stem of gladiolus is herbaceous and the leaves are narrowly linear, flattened at the sides and sheathing at the base. The flowers are bisexual, actinomorphic, perianth petaloid, have 3 stamens and the ovary is completely inferior (Hutchinson, 1959). The propagating material of gladiolus is called "corm" which is a food-storing underground stem. The corm has the ability to maintain the plant while dormant until growth resumes after the spring rains begin. Upon plantation, gladiolus corm produces on its top a new daughter corm each year and itself shrivels and dies. The buds development occurs on the upper surface of the daughter corm from which the new plant grows the following year. The bases of old leaves are thin and dry, which cover the corm. These papery leaves are called husks. The husks overlap each other and meet to form a point at the top. While the new daughter corm is forming on the top of old one, small new corms called cormels or cormlets are produced from the base. These corms and cormels are the chief means of gladiolus propagation. Cormels are usually graded in to three sizes: large more than 1.0 cm diameter, medium 0.5 cm to less than 1.0 cm, and small less than 0.5 cm. Cormels are treated before storage with hot water solution to eradicate latent fungi, insect and nematodes (Larson, 1992).

The cormel formation starts with the initiation of the flower spikes. When the spikes attain full bloom, cormels are produced. After flowering, when the photosynthates are directed downwards, the cormels continue to increase in size (Hartmann *et al.* 1981).

Date of planting plays an important role in regulating growth and quality of gladiolus (Khan *et al.* 2008.). Vegetative growth and quality of gladiolus is improved by proper planting times which also satisfies the consumer's demands (Zubair *et al.* 2006). Planting schedule vary because of differences in photoperiods, temperatures and light intensity (Susan *et al.* 1991). Talia and Traversa (1986) mentioned that better size gladiolus corms were obtained from February and March plantings. Maximum spikes per plant were obtained from April to May plantings while highest number of corms per plant in tuberose was obtained from March and April plantings (Mukhopadhyay and Banker, 1981). Growth and yield of gladiolus, like other plants, depend on proper planting time. The present research work was planned to investigate the best planting time for best gladiolus corms production under agro-ecological conditions of Peshawar, Pakistan.

MATERIALS AND METHODS

An experiment on the effect of planting dates on the growth of gladiolus corms was conducted at the Ornamental Nursery, Department of Horticulture, Agricultural University, Peshawar, during 2009. Gladiolus cultivar (cv.) White Friendship was used in the experiment. The cormels of this cultivar were planted on five different dates with a regular interval of 15 days. The planting dates were scheduled as P_1: February-18, P_2: March-05, P_3: March-20, P_4: April-04, P_5: April-19. For all the treatments the culture practices were the same. The experiment was laid down as Randomized Complete Block Design. The field was thoroughly prepared and cleaned from weeds before planting the cormels. The length of ridges was kept 100 cm and 10 cormels were planted on a single ridge. Plant to plant and row to row distance was kept 10 cm and 30 cm, respectively.

Data were recorded for growth parameters such as days to plant sprouting, sprouting percentage, number of leaves plant^{-1}, survival percentage, leaf area (cm^2), plant height (cm), corm diameter (cm), percent increase in cormel size, corms weight (g) and number of cormels plant^{-1}

RESULTS AND DISCUSSION

The experimental data were analyzed statistically. Mean tables are briefed for interpreting the results regarding days to plant sprouting, sprouting percentage, number of leaves plant^{-1}, survival percentage, leaf area, plant height, corm diameter, percent increase in cormel size, corm weight and number of cormels plant^{-1} of *Gladiolus grandiflorus*.

Days to Plant Sprouting

Means of days to plant sprouting are presented in (Table I) Planting dates ($P \leq 0.01$) showed significant effect on days to plant sprouting. Cormels which were planted on 19th April resulted in earlier sprouting (20.1 days), followed by cormels planted on 4th April (21.3 days), whereas latest sprouting was observed in cormels planted on 18th February (24.0 days). The early sprouting of cormels was due to increase in temperature in late planting dates, which eventually promoted germination, as increase in temperature has a positive effect on the germination of cormels. The same result was also found by Arora and Sandhu (1987), who reported that with early planting, days to sprouting were 20 and with late planting, days to sprouting were 12. The same result was also observed by Hong *et al.* (1989), who reported that a delay in planting decreased the number of days to sprouting.

Sprouting Percentage

The means are given in (Table I). Planting dates ($P \leq 0.01$) remarkably affected sprouting percentage. According to the table of means for different planting dates, maximum sprouting percentage (77.12) was observed in cormels planted on 18th February, followed by cormels planted on 5th March (75.02), while minimum sprouting percentage (56.20) was observed in cormels, planted on 19th April. The maximum sprouting percentage on 18th February might be due the fact that the environmental conditions were favorable for the sprouting at that time. Similar results were also reported by Hong *et al.* (1989) who observed that delay in planting decreased the percent sprouting of cormels. McKay *et al*. (1998) also mentioned the same result that the large corms influenced subsequent plant sprouting and development.

Number of Leaves Plant^{-1}

The mean values regarding number of leaves plant^{-1} are given in (Table I). Various planting dates significantly affected number of leaves plant^{-1}. The mean values of different planting dates showed that maximum number of leaves plant^{-1} (7.06) were produced by cormels planted on 18th February, traced by plantation done on 5th March (6.80), while minimum number of leaves plant^{-1} were observed in cormels planted on 19th April (5.87). The maximum number of leaves plant^{-1} on 18th February was the result of the finding that at that time the plants might had acquired maximum efficiency for development due to ideal condition. Ko *et al.* (1994) also found that earlier planting produced the well developed plants of gladiolus.

Survival Percentage

Table I shows the mean values regarding survival percentage. Various planting dates significantly affected survival percentage. As far the mean values are concerned for different planting dates, the cormels planted on 18th February had maximum survival percentage (82.96), next to it was shown by cormels planted on 20th March (77.14) and the least survival percentage was observed in cormels planted on 19th April (68.62). The maximum survival percentage on 18th February plantation was due to the optimum environmental conditions for gladiolus as during late plantations, the temperature was very high which slightly damaged the plants after sprouting. Shillo *et al.* (2005) also mentioned that the damaging effect of high temperature is generally indirect via its effect on plant water balance. Plants were directly damaged by high temperature during the period from

planting to the first leaf stage. Decrease in soil moisture reduced plant development. The stages immediately after planting and just before spike sprouting are the most sensitive. The study of Khan *et al*. (2008) also gave almost the same result. According to them planting in January significantly increased the bulb survival percentage. In their experiment, the corms were planted from October to January and the best results were obtained from January plantation. This coincides with the present findings, where at low temperature the corms performed better.

Leaf Area (cm^2)

Planting dates significantly affected leaf area. Mean values of different planting dates showed that maximum leaf area (65.76 cm^2) was observed in cormels planted on 18th February, followed by cormels planted on 20th March (61.35 cm^2), while the lowest leaf area was observed in cormels planted on 19th April (51.41 cm^2). The 18th February plantation gave best result because at that time temperature was ideal for the growth of gladiolus. Almost the same results were observed by other scientists as well. As Leena *et al.* (1993) explains that under the climatic conditions of Kerala, November plantation is preferred rather than April for obtaining the best vegetative growth i.e. plant height, number of leaves and leaf area etc.

Plant height (cm)

The mean values regarding plant height reveals that different planting dates significantly affected plant height. Regarding the mean values of different planting dates, maximum plant height was observed in cormels planted on 18th February (67.39 cm), traced by 5th March plantation (62.16 cm), while minimum plant height was observed in those planted on 19th April (51.92 cm). The maximum plant height on 18th February might be the result of ideal condition for photosynthesis through which the plants acquired well developed structure and height. Almost similar results were found by Ko *et al*. (1994) who mentioned that earlier planting produced larger corms and longer stems. Khan *et al.* (2008) also stated that, planting time significantly influenced the vegetative growth of Tulip.

Table-I ***Effect of planting dates on the plant growth of gladiolus.***

Planting dates	Days to sprouting	Sprouting percentage	No. of leaves per plant	Survival percentage	Leaf area	Plant height	No. of cormels $plant^{-1}$	Corms weight(g)	Percent increase in cormel size	Diameter of corms(cm)
18th Feb.	24.0 A	77.12 A	7.06 a	82.96 a	65.76 A	67.39 A	2.36 b	10.76 A	139.58 A	3.1 9 A
5th March	22.9 AB	75.02 AB	6.80 ab	76.91 ab	60.71 B	62.16 B	2.25 b	9.62 AB	131.29 AB	3.01 AB
20th March	22.0 BC	67.04 BC	5.93 c	77.14 ab	61.35 B	60.74B	2.16 b	8.68 BC	117.93 AB	2.88 BC
4th April	21.3 C	63.33 CD	6.31 bc	73.97 bc	55.44 C	54.24 C	3.83 a	7.40 CD	112.40 B	2.63 C
19th April	20.1 D	56.20 D	5.87 c	68.62 c	51.41 D	51.92 C	3.58 a	6.61 D	83.52 C	2.31 D

Diameter of Corms (cm)

The means of analyzed data for diameter of the harvested corms explains that various planting dates significantly affected diameter of corms. Mean values' pertaining to different planting dates showed that maximum diameter of corms was observed in cormels planted on 18th February (3.19 cm), next by cormels planted on 5th March (3.01 cm), while minimum diameter of corms was observed in cormels planted on 19th April (2.31 cm). The 18th February plantation had produced maximum diameter of corms which showed that at that time the plants had best performance due to which they produced more photosynthates which caused big sized corms. Similar results were also obtained by Zubair and Wazir (2006) who suggested that a delay in planting resulted in the decreased diameter of both daughter corms and cormels. Asif *et al.* (2001) also found the biggest corms of tuberose in the month of February.

Percent Increase in Cormels Size

Mean values of different planting dates showed that maximum percent increase in cormel size was observed in cormels planted on 18th February (139.58), followed by cormels planted on 5th March (131.29), and the least percent increase in cormels size was observed in cormels planted on 19th April (83.52). The 18th February plantation produced maximum percent increase in cormels size which might be due to healthy plants production at that time which ultimately accumulated more photosynthates, the sink of which was downward and the result was the maximum increase in cormels size. Khan *et al.* (2008) also mentioned that planting time significantly influenced the vegetative and bulb production characteristics.

Corms Weight (g)

Cormels planted on 18th February gave maximum corms weight (10.76 g), followed by 5th March plantation (9.62 g) and the lowest corms weight was observed in cormels planted on 19th April (6.61 g). The cormels planted on 18th February gave maximum diameter of corms which was due to the best adaptation of gladiolus for that time in which it had obtained well developed and good performing plants which promoted the cormels enlargement. The finding of Suh and Kwack (1990) also showed that the formation of good quality corms was promoted with early planting dates.

Number of Cormels Plant^{-1}

Various planting dates had influenced number of cormels plant^{-1}. Mean values regarding different planting dates showed that maximum number of cormels plant^{-1} were observed in cormels planted on 4th April (3.83), followed by cormels planted on 19th April (3.58), while minimum number of cormels plant^{-1} were given by cormels planted on 20th March (2.16). Maximum number of cormels production by 4th April plantation was due to the reason that gladiolus requires slightly high temperature for cormels production. This result issynergistic with that of Laskar and Jana (1994) who reported that the corms productions were best with planting on 19th March as compare to 7th and 27th February.

Table-II ***Effect of different planting dates corms production of gladiolus***

Planting dates	Diameter of corms (cm)	Percent increase in cormel size	Corms weight (g)	Number of cormels per plant
18th Feb.	3.19 A	139.58 A	10.76 A	2.36 b
5th March	3.01 AB	131.29 AB	9.62 AB	2.25 b
20th March	2.88 BC	117.93 AB	8.68 BC	2.16 b
4th April	2.63 C	112.40 B	7.40 CD	3.83 a
19th April	2.31 D	83.52 C	6.61 D	3.58 a

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