Pak. J. Bot., 45(4): 1407-1409, 2013.

CORM AND CORMEL SIZE OF GLADIOLUS GREATLY INFLUENCED GROWTH AND DEVELOPMENT OF SUBSEQUENT CORM PRODUCTION

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Abstract

A study was initiated to evaluate the effect of different cormel sizes on the growth and development of gladiolus corms in the city of Peshawar, Khyber Pakhtunkhwa, Pakistan. The current study was undertaken at Ornamental Horticulture Nursery, Department of Horticulture, the Agriculture University, Peshawar during 2009. Three different cormel sizes (C1 = >1.5 cm and ≤ 2 cm, C2 = >1.0 cm and ≤ 1.5 cm and C3 = >0.5 cm and ≤ 1 cm of gladiolus cultivar "white Friendship". were planted and the effect of cormel size on growth was assessed. Cultivar white Friendship; has white colour, 30–45cm spikes length, bearing 18–20 florets around 9.5–10.5cm size and at average each corm produces 15–20 cormels (AgrihortiCo: Dissemination of Horticultural information). Number of studies indicated that cormel sizes significantly influence consequent growth and development of corms. In the present study, it was observed that corm and cormel size positively effects on various parameters and the highest values were obtained from large size cormels for sprouting percentage (70.40), number of leaves per plant (6.77), survival percentage (77.46), leaf area (61.14 cm^2), plant height (61.25 cm), diameter of corms (3.18 cm), corms weight (9.616 g) and maximum numbers of cormels per plant (4.74). Earliest sprouting was observed in large size cormels (21.5 days), whereas maximum percent increase in cormel size (186.16) was obtained from small size cormels.

Introduction

Gladiolus is an important flowering plant, mostly used as a cut flower and valued for its beautiful and majestic spikes containing attractive, elegant and delicate florets (Ahmad *et al*., 2011). Technically it is known as *Gladiolus grandiflorus* and commonly famous by the name "Sword Lily". It is a cormelous plant native to South Africa and a member of Iridaceae family, which has more than one hundred and fifty known species (Negi *et al*., 1982). The potentiality of gladiolus for florets of vast forms, incredible colors, varying sizes, long vase life and cut flower has made great demand for it and is cultivated all over the world for its eye-catching spikes. (Farid Uddin *et al*., 2002). The chief producing countries are the United States (Florida and California), Holland, Australia, Japan, Italy, France, Poland, Iran, India, Brazil, Poland, China, Malaysia and Singapore (Memon *et al.,* 2009). Gladiolus is propagated from corms and cormels which possesses store food in the form of underground stem. These corms and cormels have the capacity for sustaining the plant while resting until growth resumes after the spring rains start (Larson, 1992). The initiation of flower spikes is the sign of corms and cormels formation and these corms and cormels are produced after full bloom, as the flowers are fading off the food materials goes downward and their size increases (Hartmann *et al*., 1981). The infrequent production of corms and cormels is a great hurdle in mass propagation and eminence cut flower spikes of gladiolus (Singh & Doahre, 1994). One mother corm generally produces one daughter corm of standard size and few cormels. These cormels are auxiliary buds on the corm (Remotti & Loffler, 1995). The cormels produce customary flower spike and daughter corms after two to three seasons which ultimately affect corm cost and commercial production. Cormels are generally graded in to three sizes; large > 1.0 cm diameter, medium ≥ 0.5 cm and < 1.0 cm and small < 0.5 cm. Cormels are treated before storage with hot water solution to eradicate latent fungi, insect, and nematodes (Larson, 1992). Different factors such as corm size influence the production of corms (Mckay *et al*., 1986; Farid Uddin *et al*., 2002). Moreover, the size of corms highly influences the growth and development of gladiolus including flowers and corms production (Bose *et al*., 2003). This may mean and as indicated by Ogale *et al*., (1995) that a direct relation between corms size, flower production and the corms & cormels yield exist. The flower quality and spike length of Gladiolus can be improved by adopting proper package of cultural practices like, timely planting, proper planting distances between rows and plants, weeding and proper irrigation (Lehri *et al*., 2011). Corm size can be better known on the basis of both diameter and weight. It is essential to find out the best corm size on the basis of both corm diameter and weight in order to standardize conventional propagation methods for getting more corm and cormels production.

Materials and Methods

An experiment on "the effect of cormel sizes on the growth and development of gladiolus corms" was conducted at the Ornamental Nursery, Department of Horticulture, the Agricultural University, Peshawar, Pakistan during 2009. Three different cormel sizes of gladiolus cultivar "White Friendship" (C1 = >1.5 cm and ≤ 2 cm, C2 = >1.0 cm and ≤ 1.5 cm and C3 = >0.5 cm and ≤ 1 cm) was used in the experiment implementing the same culture practices for all the treatments. The experiment was laid out in Randomized Complete Block Design with three replications. Prior to cormels plantation, the field was

scrupulously prepared and cleaned from weeds and other inert materials. The length of ridges was kept 100 cm and 10 cormels were planted on a single ridge maintaining 10 cm and 30 cm plant to plant and row to row distance respectively.

Data were recorded for growth parameters such as days to 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}. The recorded data in the experiment was analyzed statistically through Software MSTATC (Michigan State University, USA) and presented below.

Soil sample was taken at a depth of 0-10cm, 10-20cm and 20-30cm and was analyzed to measure the available amount of N, P and K. Table 1 indicates the available amount of NPK of a collected sample.

Table 1. Soil analysis report of the experimental site.

Name of the element	Available quantity
Nitrogen	0.82 mg/Kg
P2O5	0.2 mg/Kg
K2O	43.4 mg/Kg
Organic matter	0.98 %
Electrical conductivity ph	0.80 ds/mohs 8.5

Results and Discussion

Corms and cormel are the popular mean of propagation in gladiolus. The findings of the current study are interpreted in Tables 2 and 3. These results are concerning *Gladiolus grandiflorus* different growth parameters such as 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}. A detailed discussion on these parameters is given as under.

Cormel sizes showed significant ($p \leq 0.001$) effect on days to sprouting. Large size cormels sprouted earlier (21.5 days), next to it were medium size cormels (22.0 days), while late sprouting was observed in small size cormels (22.6 days). Observing the mean values of different cormel sizes, it was revealed that maximum sprouting percentage (70.40) was noted in large size cormels, followed by medium size cormels (67.82) and least sprouting percentage (65.01) was observed in small size cormels. Also various cormel sizes appreciably influenced number of leaves plant^{-1}. Maximum numbers of leaves plant^{-1} (6.77) were produced by large size cormels, closely tracked by medium size cormels (6.32), while minimum numbers of leaves plant^{-1} (6.09) were observed in plants emerging from small size cormels.

Various cormel sizes significantly affected survival percentage (Table 2). The mean values of different size of cormels showed that maximum survival percentage was seen in large size cormels (77.46), followed by medium size cormels (75.92) and the lowest survival percentage was noted in small size cormels (74.38). Leaf area was significantly affected by cormel sizes. The mean values of different cormel size reveals that maximum leaf area was produced by the plants emerged from large size cormels (61.14 cm^2), next by medium size cormels (58.12 cm^2) and minimum leaf area was obtained from small size cormels (57.54 cm^2). The maximum leaf area given by large size cormels was due to having more food assimilates, resulting in plants acquiring optimum growth and development. Also the findings of study revealed that maximum plant height was noted in large size cormels (61.25 cm), followed by medium size cormels (58.59 cm) and the shortest plants were produced by small size cormels (58.03 cm).

Table 2. Effect of different cormel sizes on the plant growth of gladiolus.

Cormel sizes	Days to sprouting	Sprouting % age	Leaves plant^{-1}	Survival % age	Leaf area (cm^2)	Plant height
>1.5 cm and ≤ 2 cm	21.5 B	70.40 A	6.77 A	77.46 A	61.14 A	61.25 A
>1.0 cm and <1.5 cm	22.1 AB	67.8 B	6.32 B	75.92 AB	58.12 B	58.59B
>0.5 cm and ≤ 1 cm	22.6 A	65.02 C	6.09 C	74.38 B	57.54 B	58.03 B
LSD values	**0.814**	**1.452**	**0.221**	**1.655**	**1.789**	**1.285**

Values followed by different letters are significantly different at $p \leq 0.05$ level (lower case) and $p \leq 0.01$ level (upper case according Least Significance Difference (LSD) test

Table 3. Effect of different cormel sizes on corms production of gladiolus.

Cormel sizes	Corm diameter (cm)	Increase in cormel size (%)	Corms weight (g)	Cormels plant^{-1}
>1.5 cm and ≤ 2 cm	3.18 A	69.69 C	9.62 A	4.74 A
>1.0 cm and <1.5 cm	2.74 B	94.98 B	8.21 B	2.59 B
>0.5 cm and ≤ 1 cm	2.49 C	186.16 A	8.02 B	1.20 C
LSD values	**0.183**	**20.460**	**0.388**	**0.388**

Values followed by different letters are significantly different at $p \leq 0.05$ level (lower case) and $p \leq 0.01$ level (upper case according Least Significance Difference (LSD) test

The smallest plants were produced by the medium size cormels planted on 19th April. The reason for this might be that high temperature adversely affected the growth and development of the plants. The mean values of different cormel sizes revealed that maximum diameter of corms was produced by large size cormels (3.18 cm), traced by medium size cormels (2.74 cm), while minimum diameter of corms was produced by small size cormels (2.49 cm). Also maximum percent increase in cormel size was recorded in small size cormels (186.16%), then in medium size cormels (94.98%), and minimum percent increase in cormel size was noted in large size cormels (69.69%), maximum corms weight (9.616 g) was produced by large size cormels, followed by medium size cormels (8.21 g) and the lightest corms were produced by small size cormels (8.02 g). The Mean values regarding different cormel sizes indicated that maximum numbers of cormels plant^{-1} (4.74) were produced by large size cormels, followed by medium size cormels (2.58), while minimum number of cormels plant^{-1} was produced by small size cormels (1.20).

Conclusion

On the basis of current study, it can be concluded that it was a successful venture in terms of corms and cormels production. The large size cormels produced momentous findings in almost all the parameters. The plants produced were vigorous which resolutely produced good quality corms in the environmental conditions of Peshawar, Pakistan.

Recommendation: Keeping in mind the promising findings, large size cormels are recommended for Peshawar growers to obtain best corms production.

Future research: As the current research could not cover the gladiolus production technology, therefore further research is needed.

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(Received for publication 2 May 2011)