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Response of African corn lily to various planting depth and distance

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Abstract

An experiment was conducted to study the effect of planting depth and planting distance on the growth and production of African corn lily at Horticulture Farm, University of Agriculture Peshawar, Pakistan during the year 2012. The experiment was laid out in Randomized Complete Block Design (RCBD) with split plot arrangement. Corms were planted at various depths 5, 7.5 and 10 cm and plant to plant distance of 10, 15 and 20 cm. Minimum days first floret opening (74.38) was recorded at 5 cm depth while depth of 7.5 cm gave the highest number of florets spike^{-1} (10.85) and diameter of daughter corms (2.37 cm). Maximum spike length (23.30 cm) was obtained at 10 cm depth which is not significantly different from spike length (22.46 cm) recorded at 7.5 cm depth while the shortest spike (19.57 cm) was obtained at 5 cm depth. Maximum number of florets spike^{-1} (11.31) and diameter of daughter corms (2.34 cm) was obtained at 20 cm width which are at par with number of florets spike^{-1} (10.33) and diameter of daughter corms (2.19 cm) recorded at 15 cm width. Also the lengthiest spike (23.47 cm)and earliness in first floret opening (75.55) was recorded at 20 cm. Combined effect of 5 cm deep and 20 cm wide plantation resulted in earliness of first floret opening (68.13). Planting depth of 7.5 cm and planting distance of 15 cm is recommended for better growth and production of African corn lily in Peshawar.

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Introduction

African corn lily (*Ixia acaulis*) is a flowering plant commonly known as wand flower or corn lily. The genus *Ixia* consists of a number of cormous plants native to South Africa from the Iridaceae family and Ixioideae subfamily. Some of them are known as the corn lily. Attractive to bees and other insects such as monkey beetles. The name *Ixia* is named after the Greek name for bird droppings; a reference to the consistency of the plant's sap. It produces corms as a storage organ which are dug up after the death of the plant. It performs well in bright sun, but flower is affected by high intensity of sunlight so partial shade protects the delicate flower. It requires rich and fertile soil with a proper drainage. Corn lilies and other *Ixia* species are usually grown from corms; these should be planted on top of sand at a depth of 10 cm, and about 10 cm apart into a rich well drained soil. The corms can be planted in spring for flowers at the end of summer or at the beginning of winter for spring flowers. It is possible to grow *Ixia* from seed, though it may take more than three years for them to flower, simply cover the seed in soil after the last frost of spring. Ixia members can be grown in either sunny or partially shaded areas of the garden. The flowers are produced in multiple colors according to the cultivar. The flower is shaped like a star or a saucer having six perianth segments and three stamens. Shape of the leaves is like a sword or a lance and only three to five leaves per plant are produced. Maximum provision of light is important for ixia to give better results when grown in a container (Bryan, 1992). African corn lily is a perennial plant which grows in winter, give flowers from spring to summer. It belongs to family Iridaceae and genus Ixia which is native to South Africa and consists of 50 different species. In Europe on commercial scale ixia hybrids are grown as cut flowers whereas a garden plant in warmer regions of United States of America (Dehertogh and Lenard, 1993). Planting depth and spacing is very important for a successful crop, the planting depth is usually taken two to three times the diameter of the bulb, planting distance vary from one to two inches to as much as several feet according to the need of each plant (Thomas, 2009). Proper plant spacing plays an important role in providing suitable sunlight, availability of moisture and nutrients required by the crop for a better quality and production (Sanjib, 2002). Planting depth adversely affect the corm or cormel production and delays flowering. Spacing also affects the flowering, corm growth and cormel production. Wider spacing showed best results regarding flowering, corm growth and cormel production (Afrin, 2007). Hence, there is a scope of increasing yield and quality of flower, corm and cormel production of African corn lily by using appropriate planting depth and distance. A lot of research work has been conducted regarding planting depth and spacing in other flowering plants. However such treatments have not been tested so far on African Corn Lily. Therefore keeping in view the importance of planting depth and spacing the present research work has been carried out with the following objectives.

1. To find out suitable corms depth for better vegetative and reproductive growth.

2. To determine the reasonable plant spacing for better vegetative and reproductive growth of Arican Corn Lily.

Materials and methods

An experiment "Response of African corn lily to various planting depth and distance" was carried out at Horticulture Farm, University of Agriculture Peshawar, in the year 2012. Corms of African corn lily were purchased from Awan Gardens Islamabad and planted in the Month of February 2012 at the planting depth of 5 cm, 7.5 cm and 10 cm with the planting distance of 10 cm, 15 cm and 20 cm. The experiment was laid out in Randomized complete block design (RCBD)with split plot arrangement having planting depth in the main plot and planting distance in the sub plot. Mechanical practices like ploughing and leveling were done, clods were broken and weeds were removed in land preparation before sowing. P and K were applied as a basal dose at the rate of 100 kg/ha. Nitrogen at the rate of 100 kg/ha was applied

in split doses, 1st dose was applied after emergence of the plant and 2nd dose was applied at three leaf stage. Appropriate cultural practices like weeding, hoeing etc was done uniformly and experimental plots were irrigated every week.

Treatments detail.

Planting depth Levels:	Planting distance Levels:
D1= 5 cm	S1= 10 cm
D2= 7.5 cm	S2= 15 cm
D3= 10 cm	S3= 20 cm

Statistical procedure

The collected data was subjected to analysis of variance (ANOVA) according to Steel and Torrie (1980). After getting the significant variation, the mean was further assessed for differences through least significant difference (LSD) test.

Results and discussion

Plant height (cm)

Mean values concerning the plant height are shown in Table-1. Analysis of variance showed that various levels of planting depth and planting distance significantly affected the plant height while their interaction was not significant. Mean values of different planting depth showed that maximum plant height (38.14 cm) was recorded when corms were planted 7.5 cm deep which is not significantly different from corms planted 10 cm deep (37.34 cm) whereas minimum plant height (33.75 cm) was obtained when corms were planted 2 cm deep.

Table 1. Effect of various planting depth (cm) and distance (cm) on plant height of African corn lily.

	Planting depth (cm)			
Planting distance (cm)	5	7.5	10	Mean
10	30.68	34.18	34.99	33.28 b
15	35.51	39.29	36.09	36.96 a
20	35.05	40.95	40.93	38.98 a
Mean	33.75 b	38.14 a	37.34 a	

LSD values at 5% for planting depth = 1.772889

LSD values at 5% for planting distance = 2.229452

Means followed by same letters are not significantly different by using LSD at 0.05% (upper case) level of significance.

Mean values of planting distance showed that maximum plant height (38.98 cm) was obtained when corms were planted 20 cm apart which is not significantly different from the plant height (36.96 cm) obtained at the distance of 15 cm while minimum plant height (33.28 cm) was obtained when corms were planted 10 cm apart. Increase in plant height at wider spacing is may be due to the fact that plants can spread their roots to an extent from where they can easily take suitable amount of nutrients required for a healthy growth without any sort of competition between them. Present results are also supported by Bhat *et al.,* (2010), Mollah *et al.,* (1995), Nilimesh and Roychowdry (1989) as they reported an increase in plant height at wider spacing. Also the deeper plantation of corms give better plant height as the plant establish their roots at a suitable depth for the uptake of the nutrients, present results are in agreement with the results of Sharmila *et al.,* (2008).

Days to first floret opening

It is cleared from the analysis of variance that there is a significant effect of planting depth, planting distance and their interaction on days to first floret opening (Table-2). Means of various planting depth shows that least number of days taken to open the first floret (74.38) was recorded in plants grown 5 cm deep while most number of days taken to open the first floret (80.93) was recorded in plants grown 10 cm deep. Mean values of planting distance shows that minimum days to first floret opening (75.55) was recorded in plants grown20 cm apart from each other while maximum number of days to first floret opening

(80.02) was observed in plants grown at a distance of 10 cm. Similarly, the interaction between planting distance and planting depth shows that minimum number of days (68.13) was taken by plants grown 5 cm deep and 20 cm apart while maximum days to first floret opening (81.62) were taken by the plants grown 10 cm deep and 10 cm apart. Close spacing in plants causes more competition for available nutrients, sunlight and moisture which causes a delayed opening of the florets. Present results are in agreement with the findings of Singh (1996) who also reported a delay in flowering at closer spacing.

Table 2. Effect of various planting depth (cm) and distance (cm) on days to first floret opening of African corn lily.

	Planting depth (cm)			
Planting distance (cm)	5	7.5	10	Mean
10	81.43	77.00	81.62	80.02 a
15	73.58	78.93	80.48	77.66 b
20	68.13	77.81	80.70	75.55 c
Mean	74.38 c	77.91 b	80.93 a	

LSD values at 5% for planting depth =2.407111

LSD values at 5% for planting distance =1.959944

LSD values at 5% for interaction=3.394722

Means followed by same letters are not significantly different by using LSD at 0.05% (upper case) level of significance.

Number of florets spike^{-1}

Data pertaining to number of florets spike^{-1} is presented in Table-3. Mean data showed that planting depth and planting distance had a significant effect on number of floret spike^{-1} while their interaction was not significant. Mean values regarding planting depth revealed that maximum number of florets spike^{-1}(10.85) was recorded in plants grown at 7.5 cm depth which is not significantly different from number of florets spike^{-1} (10.53) in plantsgrown10 cm deep while at a depth of 5 cm the number of florets spike^{-1}(9.49) was minimum.

Table 3. Effect of various planting depth (cm) and distance (cm) on number of florets spike^{-1} of African corn lily

	Planting depth (cm)			
Planting distance (cm)	5	7.5	10	Mean
10	8.51	9.62	9.53	9.22 b
15	9.88	10.74	10.39	10.33 a
20	10.08	12.20	11.66	11.31 a
Mean	9.49 b	10.85 a	10.53 a	

LSD values at 5% for planting depth =0.463303

LSD values at 5% for planting distance =1.052994

Means followed by same letters are not significantly different by using LSD at 0.05% (upper case) level of significance.

Mean values pertaining to planting distance revealed that maximum number of florets spike^{-1} (11.31) was recorded when plants were grown 20 cm apart from each other which is at par with the number of florets spike^{-1} (10.33) obtained at the distance of 15 cm while minimum number of florets spike^{-1} (9.22) was obtained at the distance 10 cm. Number of florets spike^{-1} increases the beauty of the flowering spike, spike with more florets on it can fetch a better price in the market. The fact that at wider plant spacing the plants have to compete less with each other regarding sunlight, space, nutrients and availability of water, so

produces more number of florets spike^{-1}. Present results are in accordance with the findings of Sudhakar and Ramesh (2012), Bhat *et al,* (2010), Nilimesh and Roychowdary (1989), Mukhopadhay and Yadav (1984). Also the planting depth has a direct relation with the number of florets per spike due to the suitable amount of nutrients taken by the plant from an optimum depth. Results are similar to the results of Sharmila *et al.* (2008) as she reported higher number of florets spike^{-1} at deeper plantation.

Table 4. Effect of various planting depth (cm) and distance (cm) on spike length of African corn lily.

	Planting depth (cm)			
Planting distance (cm)	5	7.5	10	Mean
10	17.50	20.45	22.29	20.08 c
15	20.60	21.97	22.78	21.78 b
20	20.63	24.95	24.82	23.47 a
Mean	19.57 b	22.46 a	23.30 a	

LSD values at 5% for planting depth =1.88543

LSD values at 5% for planting distance =1.42215

Means followed by same letters are not significantly different by using LSD at 0.05% (upper case) level of significance.

Spike length (cm)

Means regarding spike length is presented in Table-4. Analysis of variance showed that planting depth, planting distance had a significant effect on spike length while their interaction was not significant. Mean values regarding planting depth revealed that the lengthiest spike (23.30 cm) was recorded when corms were planted 10 cm deep which is at par with the spike length (22.46 cm) recorded when corms were planted 7.5 cm deep while minimum length of the spike (19.57 cm) was recorded when corms were planted 5 cm deep. Mean values pertaining to planting distance showed that lengthiest spike (23.47 cm) was recordedwhen corms were planted 20 cm apart while shortest spike (20.08 cm) was recorded when corms were planted 10 cm apart. Spike length is an important feature of a quality cut flower as the market demands depend upon the spike length.

Table 5. Effect of various planting depth (cm) and distance (cm) on diameter of daughter corms (cm) of African corn lily.

	Planting Depth (cm)			
Planting Distance (cm)	5	7.5	10	Mean
10	1.69	2.01	1.82	1.84 b
15	1.79	2.37	2.42	2.19 a
20	1.99	2.72	2.32	2.34 a
Mean	1.82 c	2.37 a	2.19 b	

LSD values at 5% for planting depth=0.148452

LSD values at 5% for distance=0.16208

Means followed by same letters are not significantly different by using LSD at 0.05% (upper case) level of significance.

Plant needs optimum space where the plant has to compete less for the available nutrients, moisture content and sunlight to get a healthy spike. Present findings are in agreement with the results of Sudhakar and Ramesh (2012), Mollah *et al.* (1995) and Banker and Mukhopadhay (1984) as they reported the highest spike length was obtained at wider spacing. Depth of the plant is also decisive in

getting the proper amount of required nutrients from the soil to have a better spike length. The results are similar to the findings of Sharmila *et al.* (2008) who reported highest spike length obtained at deeper plantation.

Diameter of daughter corms (cm)

Data regarding diameter of daughter corms is presented in Table-5. Analysis of variance showed that planting depth, planting distance significantly affected the diameter of daughter corms while their interaction was not significant. Mean table pertaining to planting depth showed that the maximum diameter of daughter corms (2.37 cm) was obtained in corms planted 7.5 cm deep while minimum (1.82 cm) diameter of corms was obtained when corms were planted 5 cm deep. Mean values regarding planting distance shows that maximum diameter of daughter corms (2.34 cm) was obtained when corms were planted 20 cm apart from each other which is at par with diameter of daughter corms (2.19 cm) recorded when corms were planted 15 cm apart while minimum diameter of daughter corms (1.84 cm) was recorded when corms were planted 10 cm apart. At wider spacing plants have to compete less for the availability of sunlight, water and nutrients which results in a good vegetative growth causing a suitable amount of storage food in the corms. Similar results were obtained by Sudhakar and Ramesh (2012), Ahmed *et al,* (2010), Incalcaterra (1992) who also reported wider plant spacing gave bigger and better quality corms.

Conclusions

It was concluded from the experiment that a planting depth of 7.5 cm and a planting distance of 15 cm significantly affected days to first floret opening, spike length, number of florets spike^{-1} and diameter of daughter corms and is recommended for the growth and production of African corn lily in Peshawar.

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