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How different planting depth and spacing effect African corn lily corms growth and production

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Abstract

A field trial was carried out to determine how different planting depth and planting distance effect the growth and production of African corn lily at Horticulture Farm, University of Agriculture Peshawar, Pakistan. Randomized Complete Block Design (RCBD) with split plot arrangement was used. Corms were planted at various depths 5, 7.5 and 10 cm and plant to plant distance of 10, 15 and 20 cm. Minimum number of days to sprouting (20.68), sprouting percentage (84.72%), early spike emergence (68.99 days) and maximum number of cormels plant^{-1} (4.86) were taken by the corms planted at the depth of 5 cm whereas maximum number of days to sprouting (25.97), late emergence of spike (74.09 days) and minimum number of cormels plant^{-1} (3.47) were noted in corms planted at the depth of 10 cm. Maximum sprouting percentage (90.28%) was obtained when corms were planted 7.5 cm deep. Regarding different planting distance minimum days to sprouting (20.77), days to spike emergence (69.15) were observed when corms were planted 20 cm apart whereas maximum days to sprouting (27.12) were observed when corms were planted 10 cm apart. Maximum sprouting percentage (90.28%) was obtained when corms were planted 10 cm apart while minimum (83.33%) was obtained when corms were planted 15 cm apart. Maximum number of days to spike emergence (75.10) was taken by the plants grown 10 cm apart. maximum number of cormels plant^{-1} (5.03) was obtained when corms were planted 20 cm wide while minimum number of cormels plant^{-1} (3.32) was obtained when corms were planted 10 cm wide.

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Introduction

African corn lily (*Ixia acaulis*) is a flowering plant commonly known as wand flower or corn lily 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. 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, 2005). 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). The Greek name ixia is derived from the word "*ixios*" meaning birdlime because the plant produces a sticky sap (Watts, 2007). 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 *et al.,* 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 *et al.*, 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). Optimum plant spacing encourage the plant to use the available natural resources as required, making the intercultural operations easier which lead to minimum wastage of nutrients and labor, giving a better vegetative and reproductive yield of bulbous crop (Islam, 2003). Plant spacing is an important aspect of crop production for maximizing yield. It helps increase the number of leaves, branches and healthy foliage. Densely planted crop obstruct the proper growth and development. On the other hand, wider spacing ensures the basic requirements but decrease the total number of plants as well as the total yield. Crop yield may be increased up to 25% by using optimum spacing (Bansal, 1995). So, 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.

Materials and methods

A field trail "How various planting depth and distance effect African corn lily growth and production" was carried out at Horticulture Farm, University of Agriculture Peshawar. Corms of African corn lily were got 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.

The treatments were replicated three times with following details. Mechanical practices like ploughing and leveling were done, clods were broken and weeds were removed in land preparation before sowing. N, P and K were applied as a basal dose at the rate of 100 Kg/Ha each. Nitrogen 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 as and when it was necessary and experimental plots were irrigated every week.

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

Days to sprouting

Mean values regarding days to sprouting are presented in Table 2. Analysis of variance showed that planting depth and planting distance had a significant while their interaction had a non-significant effect on days to sprouting. Mean table of various planting depth showed that minimum number of days to sprouting (20.68) was taken by the corms planted at the depth of 5 cm whereas maximum number of days to sprouting (25.97) was taken by corms planted at the depth of 10 cm.

Table 1. 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

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

	Planting depth (cm)			
Planting distance (cm)	5	7.5	10	Mean
10	25.74	26.96	28.65	27.12 a
15	19.17	23.69	25.00	22.62 b
20	17.13	20.92	24.25	20.77 c
Mean	20.68 c	23.86 b	25.97 a	

LSD values at 5% for planting depth = 0.922598

LSD values at 5% for planting distance = 1.228613.

Mean table regarding different planting distance revealed that minimum days to sprouting **(**20.77) were observed when corms were planted 20 cm apart whereas maximum days to sprouting (27.12) were observed when corms were planted 10 cm apart. Depth of plantation has an inverse effect on the sprouting of a plant because of the distance from the earth surface which causes a delay in sprouting. Present results are in agreement with the results of Hagiladi *et al.* (1992) as they reported that planting the bulbs deeper causes a delayed sprouting in different geophytic plants.

Table 3. Effect of various planting depth (cm) and distance (cm) on sprouting percentage of African corn lily.

	Planting depth (cm)			
Planting distance (cm)	5	7.5	10	Mean
10	87.50	91.67	91.67	90.28
15	83.33	83.33	83.33	83.33
20	83.33	95.83	87.50	88.89
Mean	84.72	90.28	87.50	

Table 4. Effect of various planting depth (cm) and distance (cm) on days to spike emergence of African corn lily**.**

	Planting Depth (cm)			
Planting distance (cm)	5	7.5	10	Mean
10	77.05	73.00	75.26	75.10 a
15	65.70	70.49	74.00	70.06 b
20	64.23	70.22	73.00	69.15 b
Mean	68.99 c	71.23 b	74.09 a	

LSD values at 5% for planting depth = 1.834599

LSD values at 5% for planting distance = 3.08992

LSD values at 5% for interaction = 5.351898.

Sprouting percentage

Means regarding sprouting percentage is shown in Table 3. Analysis of variance showed that sprouting percentage was not significantly affected by planting depth, planting distance and their interaction. Mean table regarding planting depth showed that maximum sprouting percentage (90.28%) was obtained when corms were planted 7.5 cm deep while minimum sprouting percentage (84.72%) when corms were planted 5 cm deep. Mean table pertaining planting distance showed that maximum sprouting percentage (90.28%) was obtained when corms were planted 10 cm apart while minimum (83.33%) was obtained when corms were planted 15 cm apart. Present results are contrary to the results of Hagiladi *et al.* (1992) as they reported a reduced sprouting percentage with an increase in planting depth.

Table 5. Effect of various planting depth (cm) and distance (cm) on number of cormels plant^{-1} of African corn lily.

	Planting depth (cm)			
Planting distance (cm)	5	7.5	10	Mean
10	3.39	3.56	3.02	3.32 c
15	4.60	4.00	3.55	4.05 b
20	6.58	4.68	3.83	5.03 a
Mean	4.86 a	4.08 b	3.47 c	

LSD values at 5% for planting depth = 0.607245

LSD values at 5% for planting distance = 0.492712

LSD values at 5% for interaction = 0.853402.

Days to spike emergence

Mean pertaining to days to spike emergence is presented in Table 4 and their analysis of variance is shown in Table-4a. Analysis of variance revealed that planting depth, planting distance and their interaction significantly affected days to spike emergence. Mean values regarding various planting depth shows that early spike emergence (68.99 days) were recorded when corms were planted 5 cm deep while late emergence of spike (74.09 days) were observed when corms were planted 10 cm deep. Mean data concerning different planting distance shows that minimum days to spike emergence (69.15) was noted when plants were grown 20 cm apart while maximum number of days to spike emergence (75.10) was taken by the plants grown 10 cm apart.

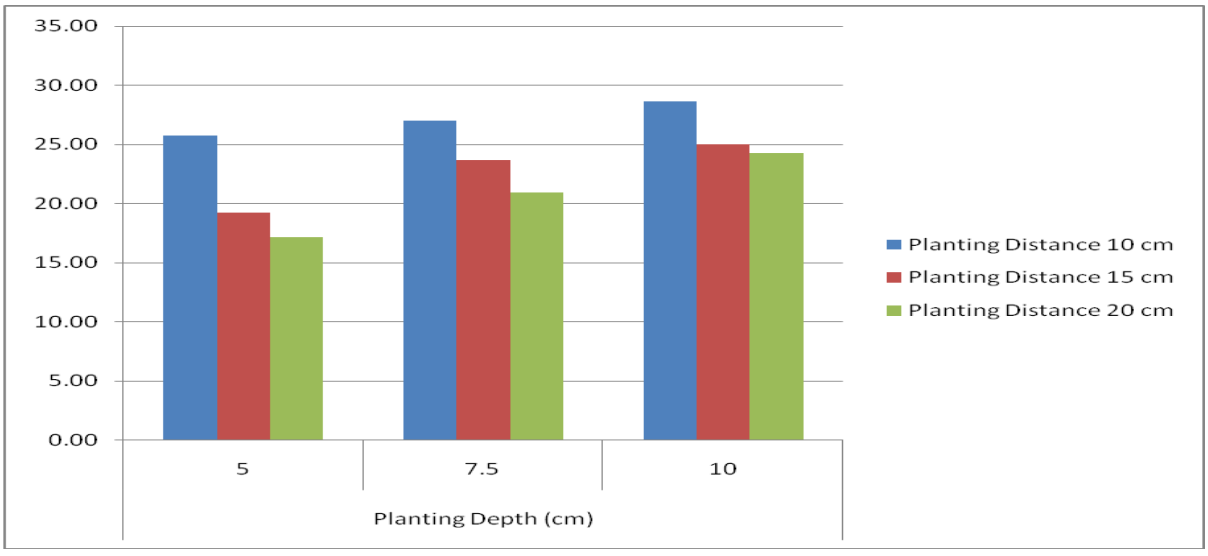

Fig. 1. Effect of planting depth and distance on days to sprouting.

Interaction between planting depth and planting distance revealed that minimum days to spike emergence (64.23) was recorded in plants grown 5 cm deep and 20 cm apart which is not significantly different from days to spike emergence (65.70) in plants grown 5 cm deep and 15 cm apart while maximum number of days to spike emergence (77.05) was recorded in plants grown 5 cm deep and 10 cm apart. At wider plant spacing the plants are free to obtain the available nutrients required to initiate spike emergence in a certain plant hence causes earliness in spike emergence. Results are in accordance with the findings of Bhat *et al.,* (2010), Mukhopadhay and Yadav (1984) who also reported earliness in spike emergence at wider spacing.

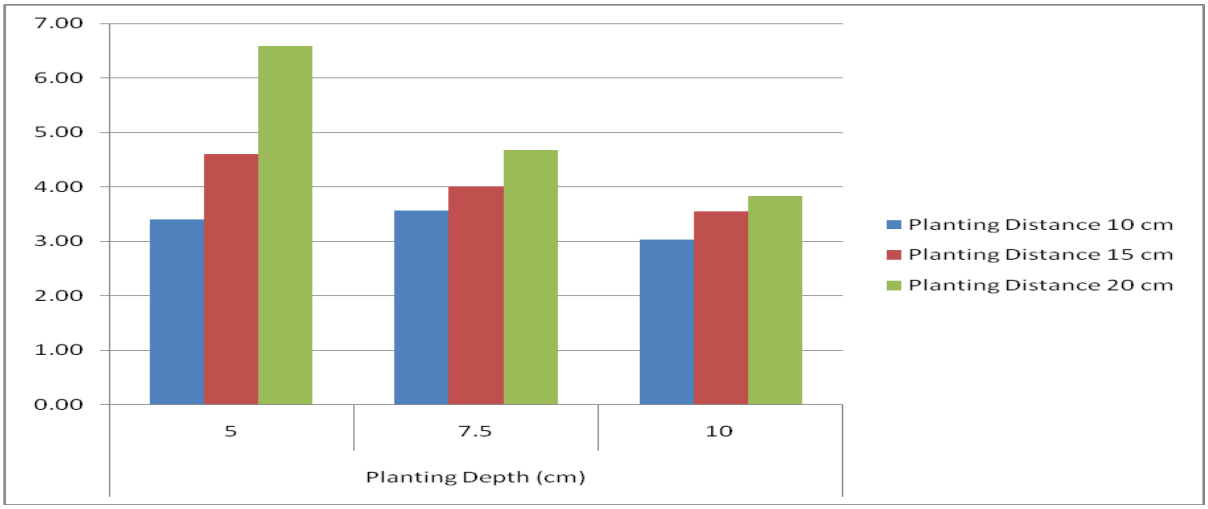

Fig. 2. Effect of planting depth and distance on number of cormels plant^{-1}.

Number of cormels plant^{-1}

Mean values and analysis of variance (ANOVA) regarding number of cormels plant^{-1} are presented in the table and table 9a respectively. Analysis of variance showed that planting depth, planting distance and their interaction had a significant effect on the number of cormels plant^{-1} produced. Mean table regarding planting depth showed that maximum number of cormels plant^{-1} (4.86) when corms were planted 5 cm deep while minimum number of cormels plant^{-1} (3.47) were obtained when corms were planted 10 cm deep. Mean values pertaining to planting distance showed that maximum number of cormels plant^{-1} (5.03) was obtained when corms were planted 20 cm wide while minimum number of cormels plant^{-1} (3.32) was obtained when corms were planted 10 cm wide. Similarly their interaction showed that maximum number of cormels (6.58) was obtained when corms were planted 5 cm deep and 20 cm wide while minimum number of cormels (3.02) was obtained when corms were planted 10 cm deep and 10 cm wide.

Cormel production is important as they are the propagating material of the plant and after 4-5 seasons it attains the size of a corm that produces a quality spike. Wider spacing causes less competition between the plants that is why increased number of cormels plant^{-1} was obtained when planting distance was increased. Present results are in agreement with the results of Sudhakar and Ramesh (2012), Bhat *et al.,* (2010), Mollah *et al.,* (1995) who also reported higher number of cormels production at wider plant spacing.

Conclusion

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 sprouting, plant height, days to spike emergence and number of cormels plant^{-1}is recommended for the growth and production of African corn lily in Peshawar.

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