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GROWTH AND FLOWERING OF ASIATIC LILY CV. POLLYANNA AS INFLUENCED BY DIFFERENT GROWING ENVIRONMENTS

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Abstract

An experiment was conducted in open field (T_1), Polyhouse (T_2) and shade net (T_3) conditions at Horticultural Experimental Field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, during *Rabi* season of 2014-15 and 2016-17 to assess the performance of Asiatic lily cv. Pollyanna under different growing conditions. The experiment was laid out in Randomized Block Design with five replications and three treatments. The study indicated the effect of temperature, humidity and light under protected as well as open field conditions on the performance of plant growth and floral characters. The various growth and vegetative parameters like plant height (47.82cm), leaf area (15.6cm^2), plant spread (18.86cm) and stem length (49.78cm) were recorded to be highest under shade net conditions whereas the floral parameters like early bud emergence (42days), early flower opening (33.62days) was observed in poly house. Similarly, number of buds (4.16), flower diameter (133.16mm) and vase life (13.72days) was also found to be maximum in polyhouse conditions.

Key words: Asiatic lily, growth, flowering, growing environment

Introduction

Lilium is cultivated worldwide and is one of the most important genera for cut flower, pot plant and garden plant. Lilium has been admired for its aesthetic beauty and has been depicted as a symbol of purity and regality. The genus *Lilium* of the family Liliaceae comprises around 100 species and more than 9,400 cultivars. Due to its size, beauty and longevity *Lilium* is one of the ten most superior cut flowers in the world (Thakur *et al.,* 2005). As a cut flower, it is now the fourth most important crop in the Netherlands. (Anonymous, 2011). Lilies produce very attractive flowers with a wide range of colours and shapes, therefore, they make excellent cut flowers, wonderful flowering potted plants and have a great ornamental value for landscape purposes. Owing to their large and attractive flowers having capacity to rehydrate after a long transportation, popularity of *Lilium* is gaining fast in our country. The cultivars of genus *Lilium* are highly appreciated by the horticulturists for their outstanding range of colour, fragrance and adaptability to several environmental conditions (Bahr and Compton, 2004). Among the lily groups, Asiatic lily is much preferred and covers maximum area under lily cultivation due to and its hardiness & easy cultivation. Lilies are grown primarily for their flowers and thus, flowering is the most important event in its growth and developmental cycle. Quality of *Lilium* depends on characteristics of flowers and inflorescences, *i.e.* tepal and leaf colour, flower diameter, stem height and diameter that influence the final buyer's perception and can obtain a higher price in the market. These qualitative traits can be modified by environmental factors, such as light, photoperiod and temperature during winter or summer season which can cause flower abortion, blast or malformation, reduction in flower size and stem length, faded colour of leaves and tepals.

Plant environment affects growth, development and productivity of crops, temperature and light being the most crucial factors. Crop yield have been reported to depend on the responses of plants to environmental influences (Ellis *et al.* 1990), for example, temperature has considerable influence on crop timing and yield (Pearson,

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1992) and light is primary determinant of crop growth. Throughout lily forcing, temperature has the greatest influence on the rate of growth and development (Riviere, 1978). High temperature enhances development and increase not only initiation of buds, flowers and fruits but also their abortion due to increasing demand for assimilates (Marcelis and de Koning, 1995). Light changes not only affects plant morphology, physiology and microstructure but also has an important impact on production. Increasing light intensity increases photosynthesis, which increases the rate of flower development and the number of flowers formed, reduces bud abortion and enhances the total flower potential (Wilkins and Dole, 1997). Thus an experiment was conducted to assess the most suitable growing environment for Asiatic lily.

Materials and methods

The present experiment entitled "Growth and Flowering of Asiatic Lily cv. Pollyanna as influenced by different growing environment" was conducted at Horticultural Experimental Field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, during *rabi* season of 2014-15 and 2016-17. The study was laid out as Randomized Block Design with 3 different treatments (Open field $\mathbf{T_1}$ / Polyhouse $\mathbf{T_2}$ /Shadenet $\mathbf{T_3}$) which were replicated 5 times. Twenty five number of plants per replications were used. Standard horticultural practices and plant protection measures were taken prior to planting. Weeds and stubble were removed and the land was brought to a fine tilth by ploughing 3 to 4 times in shade net, polyhouse as well as open field. Raised beds were prepared in open fiels, shade net and polyhouse. The bulbs were planted at a depth of 6-8cm. The experimental site was kept weed free by periodic hand weeding. Irrigations were given as and when required, during crop growth period. Timely observations related to growth and flowering parameters was recorded. Data was recorded on plant height (cm), leaf area (cm^2), plant spread (cm), stem length (cm), stem girth (mm), days to bud emergence, days to flower opening, number of buds, flower diameter (mm) and vase life (days). These data were subjected to analysis of variance technique (ANOVA).

Results and discussion

Growth parameters

Data on growth characters (table 1) showed that three different growing conditions affected plant height, leaf area, plant spread, stem length and stem girth and maximum plant height (47.82cm), maximum leaf area (15.6cm^2), maximum plant spread (18.86cm) and maximum stem length (49.78cm) was recorded under Shade net $\mathbf{T_3}$ as compared to Polyhouse $\mathbf{T_2}$ and Open field $\mathbf{T_1}$ conditions. Mohanthy and co worker also reported maximum stem length under protected environment than open field in rose. Whereas maximum stem girth (14.14 mm) was found in open field which may be due to less plant height which resulted in increase in the girth of stem. This might be due to a modification of climatic condition throughout the crop growth period coupled with better assimilation of nutrients. The minimum plant height, plant spread and stem length under open field might be due to high temperature which is the major regulator of development processes. Higher temperatures have more adverse effect on net photosynthesis than lower temperatures leading to decreased production of photosynthates above a certain temperature (Reddy *et al.*, 1999). However temperature, light and relative humidity can be regulated and modified under the protected conditions and therefore better growth characters can be obtained. Leaf area was maximum under shade net $\mathbf{T_3}$ which may be due to change in leaf morphology, wherein plants grown under shade conditions develop large thin leaves with lesser stomata to compensate for the reduction in light intensity by increasing the surface area for the process of photosynthesis.

Floral parameters

Data on floral characters (table 2) revealed that minimum days taken for bud emergence was observed

Table 1: Influence of different growing environment conditions on growth parameters of Asiatic lily cv. Pollyanna

Treatment	Plant height (cm)	Leaf Area (cm^2)	Plant spread (cm)	Stem length (cm)	Stem girth (mm)
Open field (T_1)	23.4	8.26	8.74	27.38	14.14
Polyhouse (T_2)	43.68	14.38	14.9	48.26	13.4
Shadenet (T_3)	47.82	15.6	18.86	49.78	12.54
CV	2.11	7.43	4.27	2.26	5.42
CD (5%)	1.19	1.40	0.89	1.39	1.07

Table 2: Influence of different growing environment conditions on floral parameters of Asiatic lily cv. Pollyanna

Treatment	Days to bud emergence	Days to flower opening	No. of buds	Flower diameter (mm)	Vase life (days)
Open field(T_1)	50.76	38.42	3.36	126.4	10.94
Polyhouse(T_2)	42	33.62	4.16	133.16	13.72
Shadenet(T_3)	54.72	41.04	1.58	119.66	8.78
CV	2.90	3.07	15.77	1.44	8.58
CD(5%)	2.11	1.71	0.71	2.69	1.42

in poly house $\mathbf{T_2}$ (42 days) followed by open field condition $\mathbf{T_1}$ (50.76 days) and maximum days was found to be in shade net $\mathbf{T_3}$ (54.72 days) and similarly minimum days taken to flower opening was observed in poly house $\mathbf{T_2}$ (33.62 days) followed by open field $\mathbf{T_1}$ (38.42 days) and maximum was found to be in shade net $\mathbf{T_3}$ (41.04 days). This might be due to accumulation of photosynthates which triggered early initiation of flowers. The early bud initiation was observed during high temperatures, which promoted quicker transition from the vegetative state to the reproductive state. Polyhouse climate influenced the crops to early bud emergence and flower opening earlier than open field and shade net due to the advancement of required heat unit or thermal time of the crops which were grown inside the polyhouse. Maximum number of buds was found to be in polyhouse $\mathbf{T_2}$ (3.36) followed by open field condition $\mathbf{T_1}$ (3.36) and minimum number of buds was observed in shade net $\mathbf{T_3}$ (1.58). This might be due to favourable climatic conditions coupled with faster growth, plant spread and sufficient accumulation of photosynthates inside the polyhouse as compared to open field and shade net. Similarly maximum flower diameter (133.16mm) and vase life (13.72days) was observed in polyhouse $\mathbf{T_2}$ followed by open field $\mathbf{T_1}$ and shade net $\mathbf{T_3}$. This may be due to better light and temperature conditions inside the polyhouse coupled with leaf area which enabled the accumulation of more amount of photosynthates thus resulting in more flower diameter and better quality flower.

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