"PERFORMANCE OF DIFFERENT ANTHURIUM (*Anthurium andreanum* L.) CULTIVARS UNDER POLYHOUSE"

A thesis submitted to the

MAHATMA PHULE KRISHI VIDYAPEETH,

RAHURI-413722, DIST. AHAMADNAGAR,

MAHARASHTRA STATE (INDIA)

by

Miss Anita Rudraksha Shetye

Reg. No. 04/206

In partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE (AGRICULTURE)

In

HORTICULTURE

DEPARTMENT OF HORTICULTURE

MAHATMA PHULE KRISHI VIDYAPEETH

COLLEGE OF AGRICULTURE,

PUNE – 411 005

MAHARASHTRA

2007

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DEDICATION

Affectionately
Dedicated to
My
Beloved Parrents
And
Siblings

.....Anita

CANDIDATE'S DECLARATION

I hereby declare that the thesis entitled **"PERFORMANCE OF DIFFERENT ANTHURIUM (*Anthurium andreanum* L.) CULTIVARS UNDER POLYHOUSE"** or part there of has not been submitted by me or any other person to any other University or Institute for a Degree or Diploma.

Place : Pune

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This is to certify that the thesis entitled, **"Performance of different anthurium (*Anthurium andreanum* L.) cultivars under polyhouse",** submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (AGRICULTURE) in HORTICULTURE** embodies the results of a bonafide research carried out by **MISS. ANITA RUDRAKSHA SHETYE,** under the guidance and supervision of **Dr. S. N. Ambad,** and that no part of the thesis has been submitted for any Degree, Diploma or publication in any other form.

Place : Pune
Date : 19/5/2009

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Associate Dean

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Place : Pune - 5

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(Miss Anita R. Shetye)

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LIST OF ABBREVIATIONS

%	:	Per cent
/	:	Per
@	:	At the rate of
C. D.	:	Critical Difference
Cm	:	Centimeter (s)
Cv.	:	Cultivar
DAP	:	Days after planting
et al.	:	Et alibi (and others)
etc	:	Et cetera
Fig.	:	Figure
i.e.,	:	that is
m	:	Meter (s)
m^2	:	Square meter
^0C	:	Degree centigrade (Celsius)
SE	:	Standard error
var.	:	Variety
viz.	:	Namely

ABSTRACT

"PERFORMANCE OF DIFFERENT ANTHURIUM (*Anthurium andreanum* L.) CULTIVARS UNDER POLYHOUSE"

By
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Research Guide : Dr. S. N. Ambad
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The investigation entitled "Performance of different anthurium (Anthurium andreanum L.) cultivars under polyhouse" was conducted during 05th February 2005 to 05th February 2006 at Modibaug , College of Agriculture, Pune. The experiment was laid out in Completely Randomized Design with seven treatments (varieties) and five replications. The varietes under test were 'Aymara', 'Elan', 'Grace', 'Esmeraldy', 'Emperor', 'Flame' and 'Jewel'. The varieties were tested under low cost polyhose and semi shade conditions with shading net to avoid excess sunlight. The tissue cultured plants of 10 weeks were planted in media comprising of coconut husk, cocopeat etc.

It was evident from the investigation that cv. 'Esmeraldy' had superior performance over all other varieties. In this variety characters like number of days required for initiation of new leaf after planting, number of leaves per plant per year (7.5), early flowering (160.4

days), yield per plant per year (5.7 flowers), better stalk and spathe length (32.00 cm and 8.2 cm respectively) with wide spathe and bold spadix was observed. The vase life of 12.8 days was also significantly superior over all other varieties. 'Flame' and 'Elan' were other two varieties with better values of observational parameters.

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INTRODUCTION

1. INTRODUCTION

Anthurium is a tropical plant of great beauty grown either for cut flowers or for attractive foliage. It is very popular flower among arrangers, professionals and amateurs, because of its bold effect and long lasting quality. The name anthurium is derived from the Greek language, *anthos* means flower and *oura* means tail, referring to the spadix. The genus *Anthurium*, with over 700 species (Sheffer and Croat, 1983) belongs to the largest family 'Araceae'. Basically most of the Anthurium species are native to tropical rain forests and are primarily epiphytic in nature. Anthurium is supposed to be a native of Colombia, Peru, Central and South America, Brazil and Venezuela and have been grown in England since early nineteenth century. It is a national flower of Mauritius. Commercially, Anthurium is grown throughout the world especially in the United States (Florida) and The Netherlands.

Anthurium is divided into two broad groups *viz.*, flowering and foliage. Further anthuriums can be divided into four basic groups; *Anthurium andreanum* cultivars, inter-specific hybrids between *Anthurium andreanum* and dwarf species, currently referred to as 'Andreacola' types, *A. scherzeranum* hybrids and foliage *anthuriums*. Amongst various spp. *Anthurium andreanum* and *Anthurium scherzerianum* are cultivated extensively for the production of flowers.

Anthurium is a perennial, herbaceous, semi terrestrial plant using aerial roots for anchorage. Plant is erect with long, lobed heart shaped, green leaves. Anthurium produces heart shape flower having lacquered reddish orange or scarlet spathe with yellow and white

pendant spadix. Spathe is nothing but modified leaf, spadix has hundreds of bisexual, sessile flowers. Anthurium flower is popularly known as 'oil cloth flower' or 'tail flower' or painter's palette' and the latter, 'flamingo flower'. It is suitable for cultivation under greenhouse and widely grown for its handsome foliage and coloured spathe.

Warm greenhouse with shading, to avoid direct sunshine and humid condition is a basic need for anthurium. Generally most of the anthurium types grow well at light intensities ranging from 1500-2500 foot candles. Anthurium is primarily propagated by tissue culture and available commercially as microcuttings. Anthuriums can also be propagated by suckers. Planting is done either on beds or in pots for commercial cultivation. Anthurium prefers evenly moist media especially in actively growing stage. Anthurium does not tolerate saturated, poorly drained soil mixes. Anthuriums are not grown in open tropical region. The plant produces blooms throughout the year, one bloom emerging from the axil of every leaf. Flowers are usually harvested once a week at $1/3^{rd}$ quarter of female phase maturity. Firmness of the peduncle and colour change of the spadix is used as maturity indices.

Anthurium grows best with day temperature of 25^0C to 28^0C and night temperatures of 18^0C to 20^0C. The optimum temperature for vegetative growth 18.30C and flowering 21^0C to 23.9^0C is required (Higaki and Paul, 1978). Night temperature between 4-10°C can result in slow growth and yellowing of lower leaves. Anthurium does not tolerate frost or freezing conditions. Anthuriums are shade loving plants found growing best under highly humid condition (RH 70 to 80 per cent).

Now a days, hundreds of varieties are coming and are available in different colours. The greatest demand exists for Bright red and bright orange colours all over the world, followed by white and lastly pink. Double coloured varieties are also becoming popular.

Amongst tropical cut flowers, anthurium ranks second next to Orchid in global trade. *Anthurium andreanum* cultivation is mainly concentrated in Hawaii, Holland, Mauritius and Caribbean states which are the major producer countries of the world. The major importing countries are USA, Canada, Germany, Europe and Japan. The popularity of growing anthurium as cut flower has rose tremendously in the past few years and now it has become an important export oriented crop (Singh, 1998).

The Indian coastal region is well suited for cultivation of anthurium as it prevails a hot and humid climate with plenty of sunshine and rainfall. Adaption of greenhouse technology has opened new avenue for profitable cultivation of anthurium.

In India, anthurium industry has not developed at required level and is still in its infancy. Anthurium is commercially cultivated in the states of Kerala, Tamilnadu, and Karnataka and to the limited extent in Maharashtra. The flowers are sold in metropolitan cities like Pune, Mumbai, Delhi, Bangalore and Hyderabad.

The domestic market for anthurium flower is increasing rapidly and many growers/professionals/entrepreneurs are keen to undertake production of anthurium.

Floriculture trade of the world is reported to be around US $80billion per annum. Out of which more than 60 percent is from cut flowers. Indian contribution to the world trade is less than 1 percent.

In India flowers are grown in an area of 88,000ha with production of 6 lakh tonnes of loose flower. The cultivation of flowers under protected condition is 10,000ha with production of 500million cut flowers (Anonymous, 2005).

Global cut flower trade has been dominated by the Netherlands. There are more than 140 flower producing countries of which fifteen countries account for 75% of global consumption. Global consumption of cut flower is valued at 55 billion US dollars, of which 9.00 billion US dollars worth cut flower are imported. World cut flower market is growing at the rate of 6-9 % annually (Singh, 2005).

In Maharashtra about 14,938ha area is under open condition flower crop with the production of about 89,114million tonnes per year. The cultivation of flower under protected conditions is comparatively recent development. The total area under protected cultivation of flower is 259 ha, comprising more than 2000 production units.

The total cut flower production in the state is estimated to be about 5416 lakh stems per year. Export of floricultural produce from Maharashtra during the 2006 was about 2500 lakh stems per year. (Anonymous, 2006)

The floriculture sector in Maharashtra, till date is at the nascent stage and mostly confined to flower cultivation for religious and social events. In Maharashtra, few projects of anthurium under protected conditions are located around Pune, Nashik and Alibaug. Standardization of agro techniques in anthurium for commercial cultivation is a need of an hour. The growers feel it difficult to undertake the production due to lack of technical Know-how. Besides

this planting material is very costly and sporadic information on varietal aspect is available.

Anthurium fetches better price than other flowers. The commercial cultivation of anthurium in homes and under greenhouse is catching up. Moreover it requires less labour as anthurium cultivation lasts for five to six years. It is important to select proper cultivars for cultivation which is worth for the economic returns. To persuade the farmers for growing anthurium on large scale and to increase the export, it is necessary to choose right cultivar which is better in respect to quality and yield. Hence, the present investigation was carried out with a view to evaluate performance of different varieties with the following objectives;

1) To test the feasibility of growing anthurium.
2) To assess the performance of different cultivars.
3) To study the floral characters of various cultivars.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

Anthurium (*Anthurium andreanum)* is tropical ornamental plant and has gained importance as major cut flower of modern era. The cultivation of anthurium is relatively new in India. The production is confined only with growers in Salem district (Kerala), Banglore (Karnataka), Alibaug , Pune and Nashik (Maharashtra). In Kerala studies have been conducted on anthurium, however the information on varieties, package of practices etc. is lacking. Therefore systematic review of previous work done was undertaken before conduct of trial.

Performance of different Anthurium cultivars under polyhouse.

In order to select suitable cultivars, some investigations were made in different parts of world, of 113 clones evaluated by Kamemoto and Nakasone (1963), 13 were recommended for commercial cut flower production including Haga white, Nitta, Kaumana, Ozaki, Kansako No. 1 and Hirose.

Leffring (1975) conducted 3-year studies on Anthurium andreanum plants under shaded condition so as to receive at least 45 per cent of the available light by means of an automatic system on the outside of the greenhouse. Overhead sprinklers prevented leaf scorch on sunny days. Under these conditions plant growth rate increased and the average flower production rose from 5-12 flowers per plant per year.

Trial was conducted on anthurium by Steen and Holsteyn (1975) and concluded that anthurium produce more number flowers when they are less heavily shaded, and more light is provided. There was possibility of causing damage to the flowers, unless care was taken to prevent condensation.

Twenty lines of *Anthurium andreanum* were evaluated under 50 per cent shade for eight important characters like stalk length and spathe length, spath and spadix diameter, basal lobe length, number of flower lobes overlap and number of blisters. Most of the lines were found suitable to grow in Banglore conditions with 50 per cent shade and were found to be ideally suited (Aswath *et al.* 1977).

The data about the performance of 20 *Anthurium andreanum* clones grown from tissue culture was evaluated & presented. It was concluded that 15 clones were best. In cvs Avo-Cintha and Avo-Nette flower production was better. (Hetman *et al.* 1981).

Gelder *et al* (1984) conducted an experiment on anthurium. The plant and inflorescence characteristics were evaluated of 34 anthurium andreanum cultivars in 5 colour group. Fourteen were highly rated including Favorite (orange), Mirjam (red), Rico (rose), Sarina (White and rose) and Poolster (white).

In an evaluation trial conducted by Leeuween (1984) cultivars Avo-Nette, Avo-Tineke, Favorite, Germa, Avo-Claudia, Avo-Ingrid, Nova-Aurora, Avo-Jose, Jamaica, Hornette, Sarina and Avo-Anneke were considered the best.

Henny *et al.* (1988) described and illustrated a new interspecific hybrid named 'Southern Blush' originating from a cross between large pink *Anthurium andreanum* and *Anthurium amnicola* dwarf spp. They noticed that the spathes were 70 mm long and 50 mm wide and medium pink with slight lavender tint and the leaves were lanceolate and about 25 cm long.

A trial was conducted on *Anthurium andreanum* cultivars, Typ2 and Iga Gold under polyhouse with or without shading. Typ2 cultivar showed faint purple colour around noon on the upper leaves when shading was absent and Iga Gold showed no such symptoms. Typ2 also showed increased shoot formation in response to unshaded condition and upper leaves diameter was reduced as a result of high temperature. Vaselife was similar for both shaded and unshaded plants. (Vierig, 1990)

It was reported that Arabella is more uniform and compact than Arndt's flamenco Red. It is an early flowering, medium sized plant with dark green short leaves. The spathe is broad with free lobes, a shallow sinus and recurving spadix. Spathe and spadix were found to be red. (Arndt, 1991).

Henny and Hamilton (1992) conducted an experiment on *Anthurium scherzerianum* cv. 'Amazone' and 'Renate' by using Gibberellic acid at 0, 125, 250, 375, or 500 milligrams active ingredient per liter as a foliar spray. Cv. Amazone treated with GA3 produced significantly more flowers, but the increase was small. There was little difference in bloom count due to treatment rate. In the second experiment, cv. Renate grown at low light intensity responded similarly to cv. Amazone by producing a significant, although a slight increase in blooms. Cv. Renate grown at high light and receiving high GA3 levels.

Paull *et al.* (1992) conducted a study on effect of seasonal and factorial combinations of N, P and K on post-harvest vase life on cut flower of anthurium (*Anthurium andreanum*) cv. Ozaki. Results revealed that vase life varied from 8 to 69 days. Mean maximum temperature during the two months before harvest and during post-harvest life were positively related and explained 53 per cent variation. At the investigated fertilizer rates, high N reduced post-harvest life of flower at 22°C, and was alleviated by K, whereas P did not influence it. Nitrogen and K-fertilization explained 13 per cent and 17 per cent, respectively of the variation. The type of fertilizer affected the reason for the end of the post-harvest life of flower. Spadix necrosis and spathe condition was important at low N and P and high K-fertilizer rates. Loss of spathe gloss was important at high N and low K fertilization levels. Pre-harvest factors explained 63-71

per cent of the variance of post-harvest life. Optimum fertilizer rate for maximum post-harvest life was 0, 224 and 448 kg per hactor of N, P and K were equally effective.

Twenty one cultivars of tissue cultured anthurium were potted in 15.2 cm standard pots from 72 cell plugs and grown in fibre glass over covered greenhouse. After 38 weeks growth, data were collected on plant foliage, canopy, height,width, leaves and inflorescence count and colour of leaves and inflorescence (Henley and Robinson, 1994).

Chen *et.al.* (1999) reported that anthurium cultivars perform under interior conditions, the post production performance of 2 commercial cultivars (Julia and Red Hot) and 3 hybrids (46-6, 432-20 and 439-1) were evaluated in interior rooms under two light intensities: 16µmol m-2 s-1 (100 foot candles as low light) and 48 µmol m-2 s-1 (300 foot candles as high light) for 5 months. Plant height and width, total no. of buds, open flowers, new and senescenced leaves were measured before and after plant placement in interior rooms. Results showed that the monthly average no. of new leaves produced during 5 months period ranged from 1.2-5.4 under low light and 2.2-4.8 under high light depending on cultivars.

The German cv. Arabella is an early flowering, medium sized plant with short dark green leaves. Spathe is broad with free lobes and shallow sinus and recurring spadix. Spathe and spadix are red. Crossing between A. antioquinse × Rotolante evolved the var. Ruth Morat syn. Lady Ruth. Spathes with a mean width and length of 50.1

and 76.8mm, respectively. Anthurium × Red hot is a new interspecific hybrid pot plant originating from a cross between cv. Southern blush and cv. Lady Jane. The typical characters of these varieties are lanceolate, dark green leaves, 18-20 cm long, base 11-12 cm wide, peduncle grey-orange (20-28 cm), above soil surface. When spathe is fully open (6-7 cm) long, 4-5 cm wide and medium red at anthesis, gradually changing to a lighter red, prior to senescence. Spadix orange-red apically blending to red at base, 3-4 cm long, 5-6 mm wide (Henny 1999).

Simon and Bala (1999) reported results on trial of five growing media used for growing plants of several *Anthurium andreanum* cultivars. Plants grown in the control media of coconut husk and coconut fibrebast, gave the highest yield. The media of gravel and fibrebast gave the second highest yield.

Vegetatively propagated lines of six hybrid anthurium cultivars (Pink Aristocrat, Patty Anne, Purple Viking, Royal Pink, Royal Orange and Royal Red) were planted in pots and grown under warm (highest temperature of 30°C) or hot (highest temperature of 35°C) conditions in greenhouse. The effect of a single foliar application of GA3 (500mg/lit) was evaluated after 7, 9 and 13 months. After 7 months, plants treated with GA3 did not promote flower production or result in taller plants. Plants under warm and hot conditions, except for Pink Aristocrat, had similar degrees of foliar injuries in April, but plants under warm conditions had better quality in July than those under hot conditions. Yellow leaves and necrosis on leaf margins

were apparent on plant in the hot area. Pink Aristocrat was most (<20 flowers) and Royal Red was the least (2 flowers) floriferous after one year. Flower colour of Royal Red was unaffected by high temperature, where as the flowers of the other cultivars faded under hot conditions. Growing these cultivars at highest air temperature of 30°C is recommended for good quality and high flower count (Wang-Yin-Tung and Wang, 1999).

Pawar (2000) conducted an experiment on effect of different substrates on *Anthurium andreanum* (cv. Tropical Red) and sustrate coconut coir + wooden charcoal (1:1v/v), coconut coir pieces alone, coconut coir pieces + wooden charcoal + brick pieces (1:1v/v) and wooden charcoal alone are the best for cv. Tropical red flower production under polyhouse condition.

Borrelli (2001) reported that anthurium can be grown on a variety of substrates. Optimum growing conditions are described, with special attention to fertigation, shading against excessive heat or light, air temperature and humidity. Seedlings (20-25 cm long) come into production after 7 months but the highest yields and best quality are obtained in the forth year.

Jawaharlal *et al.* (2001) conducted an experiment on effect of six different potting media used alone in shed net house in *Anthurium andreanum* (cv. Temptation) and potting media, cocopeat + leaf mould resulted in to highest number of branches and suckers per plant and also produced shortest pre blooming period and increased

inflorescence longevity. Cultivation in cocopeat alone produced the highest flower number.

Praneetha *et.al.* (2002) evaluated eight *Anthurium andreanum* cultivars and two Anthurium scherzerianum cultivar for their flower yield and floral characters, under 50% shade net condition in Yercaurd. Observations were recorded on various flowering parameters and keeping quality. Among the *Anthurium andreanum* cultivars, AA-43 and LadyJane recorded the highest number of flowers/plant per year, followed by AA-2 and AA-29, AA-2 produced the longest flower stems, followed by AA-69 and AA-29. The maximum values for spathe length and spathe width were observed in AA-2 and AA-29 respectively. The maximum spadix length and longest vase life were recorded by AA-2 of the two *Anthurium scherzerianum* cultivars, AS-1 had higher values of the observed parameters, except for number of flowers/plant per year, however, there was no significant difference in AS-1 and AS-2.

Singh *et.al.* (2003) fourteen varieties of *Anthurium andreanum* were evaluated for two consecutive years (2000-01 and 2001-02). Out of 14 varieties, four varieties viz., Honey, Wrinkled orange, Mauritius and Agnihotri were found to perform well for the observed characters in the shed net at Andaman conditions. The varieties Honey and Wrinkled orange recorded maximum number of flowers/plant/year (25.5 and 24.6, respectively). The flower stalk length was 22.4 cm in Honey. Amongst 14 varieties, Honey performed better for most of the

characters followed by Wrinkled orange and Agnihotri under 75% shade Andaman conditions.

Talia –Mac *et al.* (2003) evaluated six new cultivars of Anthurium viz., (Carnaval, Neon, Queen, Sante, Terra and Vanilla) for the productivity and quality in soilless culture and under heated glasshouse. Terra was the most productive with 9.4 cut flowers per plant followed by Neon and Vanilla, respectively, with 7.3 and 7.0 flowers per plant. The least productive was Carnaval with 4.6 flowers. Regarding quality, Queen showed bigger spathe with a mean length (23 cm and width of 18 cm), where as Sante exhibited the smallest spathe (10 cm for both parameters on average). Differences were also observed in stem height, with Queen the longest (averaging 53 cm) and Sante the shortest (31 cm on average).

In Anthurium eighteen genotypes have been tested under Coimbatore condition. The preliminary observation on plant growth and flower yield showed that the varieties Temptation, Sunset orange, Sunshine orange and Leema white were found to be promising. The maximum plant height of 28.45cm was recorded by the variety Tiffany. The maximum flower yield/plant was recorded in Mini (11.28). The highest stalk length (56.87cm) was measured by Tiffany white. The maximum of 0.68 cm was measured as diameter of the flower stalk and the maximum of flower diameter of 11.87 cm was measured by the variety Rosalin. The longest vase life period of 10.27 days was also recorded (Anonymous 2004).

Leonardo and Quitos (2005) studied that the nine varieties of anthurim procured from Baguio and La Trinidad, Benquet were evaluated against locally grown cultivars (cv. Nitta) to identify the best varieties adapted to low land condition and to evaluate performance of different varieties.

Srinivas (2006) a study was conducted to evaluate the performance of Anthurium varieties for cut flower production. Five varieties viz., Hondura, Senator, Pasricha, Tinora and Tropical were evaluated for their vegetative, physiological and flower characters. Vegetative and flower characters were significantly invariable in different varieties, Var. Hondura recorded maximum plant height (29.91cm), number of leaves (7.31), canopy height (22.19 cm), stalk length (35.44 cm), and spadix length (4.56 cm). Cv Senator produced maximum leaf length (16.45 cm), leaf width (8.91 cm). canopy width (6.75 cm) as compared to other varieties. Physiological parameters such as chlorophyll, caretenoids, anthocynins and wax contents were significantly influenced by varieties.

MATERIAL AND METHODS

3. MATERIALS AND METHODS

The experimental details, materials used and methods followed, techniques adapted during the course of investigation entitled "Performance of different cultivars of Anthurium (*Anthurium andreanum* L.) under polyhouse" are systematically explained in this chapter. Compilation of data, statistical analysis and presentation has also been explained.

3.1 Experimental site:

The present investigation entitled "Performance of different Anthurium (*Anthurium andreanum L.*) cultivars under polyhouse" was undertaken during the year 2004-05 at Modibaug, Department of Horticulture, College of Agriculture, Pune-411005.

3.2 Geographical location, climate and weather conditions:

Pune is situated in mid-west Maharashtra at an altitude of 559m above mean sea level. It is located in tropical region at 18.32^0 N latitude and 73.51^0 E longitudes. The mean annual rainfall varies from 650-750mm and is normally distributed during June to October. The average maximum and minimum day temperature recorded during the period of experiment was 39.50°C and 17.60°C, and maximum and minimum relative humidity 93 and 23 per cent respectively. The data regarding weather conditions prevailing at Pune during the course of investigation is presented in Appendix 1.

3.3 Materials:

The details of the materials used and analytical procedures adopted are described as under.

3.3.1 Varieties:

Seven numbers most promising varieties namely Aymara, Elan, Grace, Esmeraldy, Emperor, Flame and Jewel available in India and grown for cut flowers were selected for investigation. The varieties stand true for the characters like growth, flowering, rooting and suckering.

3.3.2 Polyhouse:

The planting was done under, naturally ventilated polyhouse (Cost effective polyhouse) erected at Modibaug, Department of Horticulture, College of Agriculture, Pune-5. It was having provision of side ventilation. The shading net was also provided to reduce the light intensity as and when necessary.

3.3.3 Pots for plantation:

Earthen pots having top diameter of 30 cm and height of 25 cm were used for planting different varieties of anthurium.

3.3.4 Fertilizers:

Water soluble inorganic fertilizers in the proportion of 1:1:1 NPK were used to nourish the plants throughout the period of investigation.

3.4 Methods:

3.4.1 Experimental Details:

1) Crop : Anthurium

2) Statistical design: : Complete randomized design (CRD).

3) Number of replication : 5

4) Number of treatments : 7

5) Type of experiment : Pot culture

6) Number of plants/treatment : 50

7) Date of plantation : 05/02/05

8) Date of first observation : 05/04/2005

9) Date of last observation : 05/04/2006

3.4.2 Treatment details:

The details of the treatments are presented in table: 1

Table: 1

Sr. No.	Treatment	Name of Variety
1.	V1	Aymara
2.	V2	Elan
3.	V3	Grace
4.	V4	Esmeraldy
5.	V5	Emperor
6.	V6	Flame
7.	V7	Jewel

3.4.3 Experimental Methodology:

3.4.3.1 Selection of varities:

Varieties were selected on the basis of various plant characteristics viz. growth of plants, suckering habit, rooting habit, flower colour, popularity in market etc.

3.4.3.2 Preparation of planting media:

The substrate comprising of coconut shells and cocopeat was used to fill the pots. The coconut shells were cut into pieces and soaked into the water for 30 days to enable the leaching of salts and get moist. A little bit of brick pieces and charcoal was also added to the media.

While filling containers, bottom pot hole was covered by for closing the drainage hole partially. A layer of charcoal and brick pieces up to 2 cm was placed over it. Later coconut shells and cocopeat was added. Lastly 2 cm layer of sphagnum moss spread on it. The top 2 cm portion was kept empty to apply water and fertigation.

Before filling the pots disinfection of pots & substrate was done. The cocopeat was soaked in boiling water. The sphagnum moss was completely drenched by using Bavistin solution to prevent the fungal infection.

The pots after disinfection were filled with disinfected substrate & watered one day prior to planting.

3.4.3.3 Planting:

The 10 weeks old plants of Anthurium were procured from 'Kumar Bioplants', Hadapsar, Pune and planted in earthen pots. Water was applied as and when necessary.

3.4.3.4 Application of fertilizers:

No fertilizer was applied at the time of plantation. The application of fertilizer was started after 3 weeks of plantation. The fertilizers were applied twice a week initially for four months, and then at alternate days. The water soluble fertilizer of 1:1:1 (NPK) grade was used @ 2 gm per litre. The foliar spray of micronutrients @ 2.5 ml per litre was applied once in fortnight. The spray of GA3 @ 100 ppm was undertaken. The water soluble fertilizers were applied manually. Daily 0.5 litre water was applied to each pot.

3.4.3.5 Cultural operations:

3.4.3.5.1 Weeding:

Regular weeding was done as and when necessary and pots were kept free of weeds.

3.4.3.5.2 Watering:

The pots were watered at an alternate day during winter & rainy season and daily during summer.

3.4.3.5.3 Plant protection measures:

Regular plant protection measures were followed as precautionary measure to keep the plants free from pests & diseases. Drenching with 0.1% Bavistin was followed at an interval of 3 days to prevent attack of soil borne diseases. Demecron (0.8 ml/litre) was sprayed at an interval of 15 days to prevent incidence of pests like aphids and mealy bugs.

3.4.3.5.4 Plant Growth Regulator:

GA3 @ 100 PPM was sprayed at an interval of 15 days on foliage of the plant.

3.4.3.5 Harvesting:

The harvesting was done early in the morning or in the evening with the help of a secateur. The flowers were harvested with long stalk and when spathe was fully opened and spadix exhibited $1/3^{rd}$ quarter of female phase maturity. Generally spikes were ready for harvesting within 7-10 days after appearance of spathe. The stalk of the flower was immediately kept in water to supplement supply of water.

3.4.4 Plan of layout:

Layout plan was laid as per the statistical design to accommodate all treatments. Plan is attached seperately.

3.4.5 Sampling method:

The data from observational plant was collected for vegetative, floral and post harvest parameters of anthurium. The observations recorded from all the replications were systematically tabulated and

Figure number 1: Plan of Layout

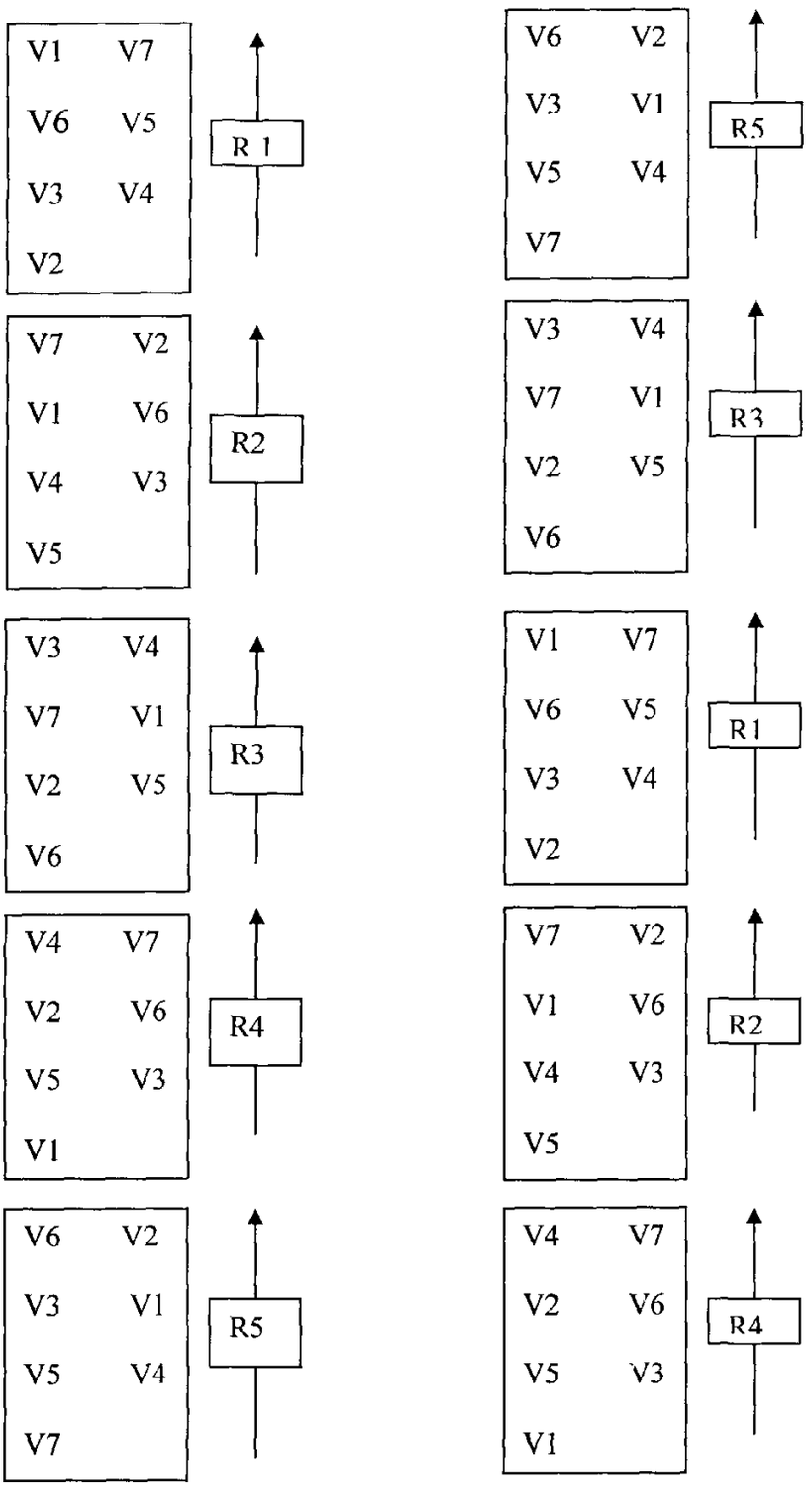


Plate 1. Experimental plot of Anthurium.

statistical analysis was done to assess the significance of the treatments.

3.5 Observations recorded:

The experimental plot was under daily supervision for all the characters for which the observations were to be recorded. No sooner the character appeared on the plant noting was done in the field book and later fed to the data.

3.5.1 Vegetative growth characters:

3.5.1.1 Days for appearance of first new leaf:

The time taken to emerge the first new leaf was recorded by counting number of days from planting.

3.5.1.2 Number of leaves produced per plant per year:

During period of investigation emergence of each new leaf was observed carefully and record was maintained to work out mean no. of leaves/plant/year.

3.5.2 Floral characters

3.5.2.1 Days for commencement of flowering:

The time taken by each treatment to commence flowering was recorded by counting the number of days from planting to first flowering.

3.5.3 Flower Quality Parameters:

3.5.3.1 Length of the flower stalk (cm):

The length of stalk was measured from the base of flower stalk to the neck of flower with the help of scale.

3.5.3.2 Diameter of flower stalk (cm):

The diameter of the flower stalk was measured by using Vernier calliper.

3.5.3.3 Length of spathe (cm):

The spathe length from the joint of the peduncle to the tip was measured and recorded.

3.5.3.4 Spathe width (cm):

The spathe width measured and mean was calculated.

3.5.3.5 Diameter of the spadix (cm):

The spadix diameter was measured by the Varnier callipers and the mean was recorded.

3.5.4 Quantitative characters (Yield).

3.5.4.1 Number of flowers per plant.

The flowers were harvested as and when ready for harvesting throughout period of investigation. Note of each harvesting was done and compilation of data was done at end of trial.

3.5.4.2 Vase life:

The uniform size flowers from individual variety were selected after harvesting and kept under laboratory for vase life studies. The flowers were kept in fresh tap water which was changed daily. The basal portion of stalk was cut off daily to avoid the blockage of conducting tissue.

3.6 Statistical Analysis:

The statistical analysis was done by standard statistical method suggested by Panse and Sukhatme (1985).

RESULTS

4. RESULTS

The observations recorded during investigation entitled "Performance of different anthurium cultivars (*Anthurium andreanum* L.) under polyhouse condition" were tabulated and statistical analysis was done for vegetative, floral and post harvest characters of the anthurium. The findings of the investigation are presented systematically under this chapter.

4.1 Vegetative growth

4.1.1 Days required for appearance of first new leaf

The results presented in Table number 2 and figure 2 indicated that there was significant difference in the varieties under study. The days required for appearance of first new leaf after planting were significantly less (4.20) in V4 (Esmeraldy). It was followed by V6 (Flame) and V2 (Elan) having corresponding values of 4.6 and 4.8 respectively. However, V6 (Flame) and V2 (Elan) were found to be at par to each other. The maximum days required for appearance of first new leaf was found in V5 (Emperor). V1-V2 and V1-V3 were found to be at par to each other. Although the difference between varieties was statistically significant, the values were in the range of 4.2 to 5.4 days. Hence hardly there was difference of one day which has no much importance .

Plate 2. Variety Esmeraldy

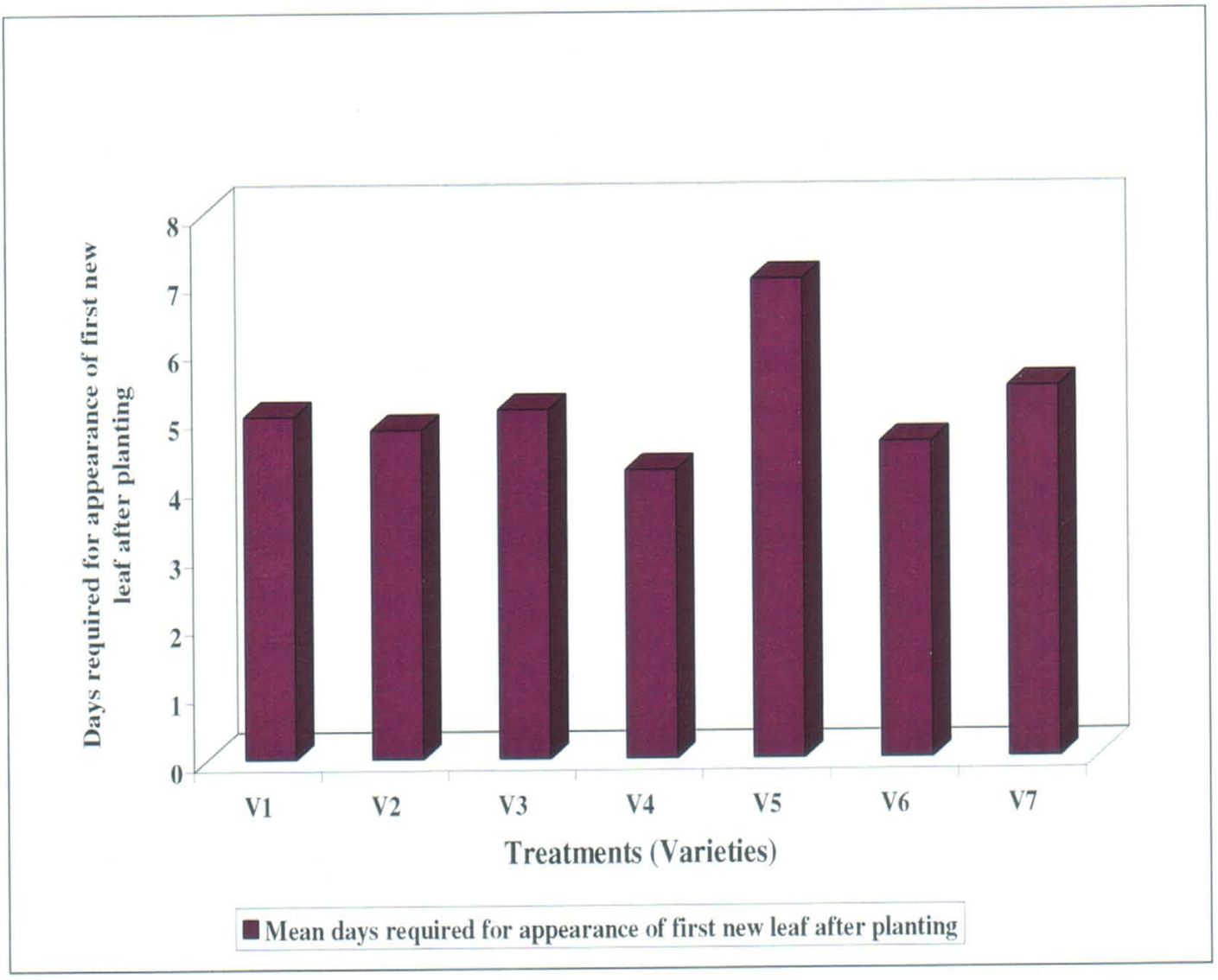
Plate 3. Variety Flame.

Table 2 : Days required for appearance of first new leaf after planting.

Sr. No.	Name of the variety	Mean
1	Aymara (V1)	5.0
2	Elan (V2)	4.8
3	Grace (V3)	5.1
4	Esmeraldy (V4)	4.2
5	Emperor (V5)	7.0
6	Flame (V6)	4.6
7	Jewel (V7)	5.4
General Mean		5.15
SE±		0.11
CD @ 5%		0.31
CV%		4.78
F ratio		*

* Denotes Significance at 5% level of significance

Figure 2: Days required for appearance of first new leaf after planting



4.1.2 Number of leaves per plant per year

Data presented in Table number 3 and Figure 3 indicated that the number of leaves per plant were highly significant in the varieties under test. Esmeraldy (V4) recorded highest number of leaves (7.5), it was followed by Flame (V6) having (7.1) leaves per plant per year. There was decreasing trend in number of leaves in Elan (V2), Aymara (V1), Grace (V3), Jewel (V7) and Emperor (V5). All these varieties has comparatively less number of leaves than V4 and V6. The number of leaves per plant were in the range of 6.1 recorded in Emperor (V5) and 7.5 in Esmeraldy (V4). As this character is important for growth and development of plant, the difference in number of leaves per plant indicated variation of the varieties for this character.

4.1.3 Days required for appearance of first flower

The data presented in Table number 4 and Figure 4 showed that, there was significant difference among the varieties for this character. The numerical figures in the table revealed that the days required for appearance of first flower differs in all the varieties. Esmeraldy (V4) required 160.4 days for emergence of first flower. The Flame (V6) had a second rank with 162.5 days for initiation of first flower. Rest of the varieties had recorded ascending trend in days required for first flower initiation. More number of days were required for flowering and the varieties were found late. The varieties had sequence of V2, V1, V3, V7 and V5. Maximum number \of days were required in Emperor (193.6), it was followed by Jewel (180.6), Grace (176.4), and Aymara (174.5). All these varieties had different values for this character.

Table 3: Number of leaves per plant per year.

Sr. No.	Name of the variety	Mean
1	Aymara (V1)	6.7
2	Elan (V2)	6.9
3	Grace (V3)	6.5
4	Esmeraldy (V4)	7.5
5	Emperor (V5)	6.1
6	Flame (V6)	7.1
7	Jewel (V7)	6.2
General Mean		6.7
SE±		0.07
CD @ 5%		0.204
CV%		2.354
F ratio		*

* Denotes Significance at 5% level of significance

Figure 3: Number of leaves per plant per year

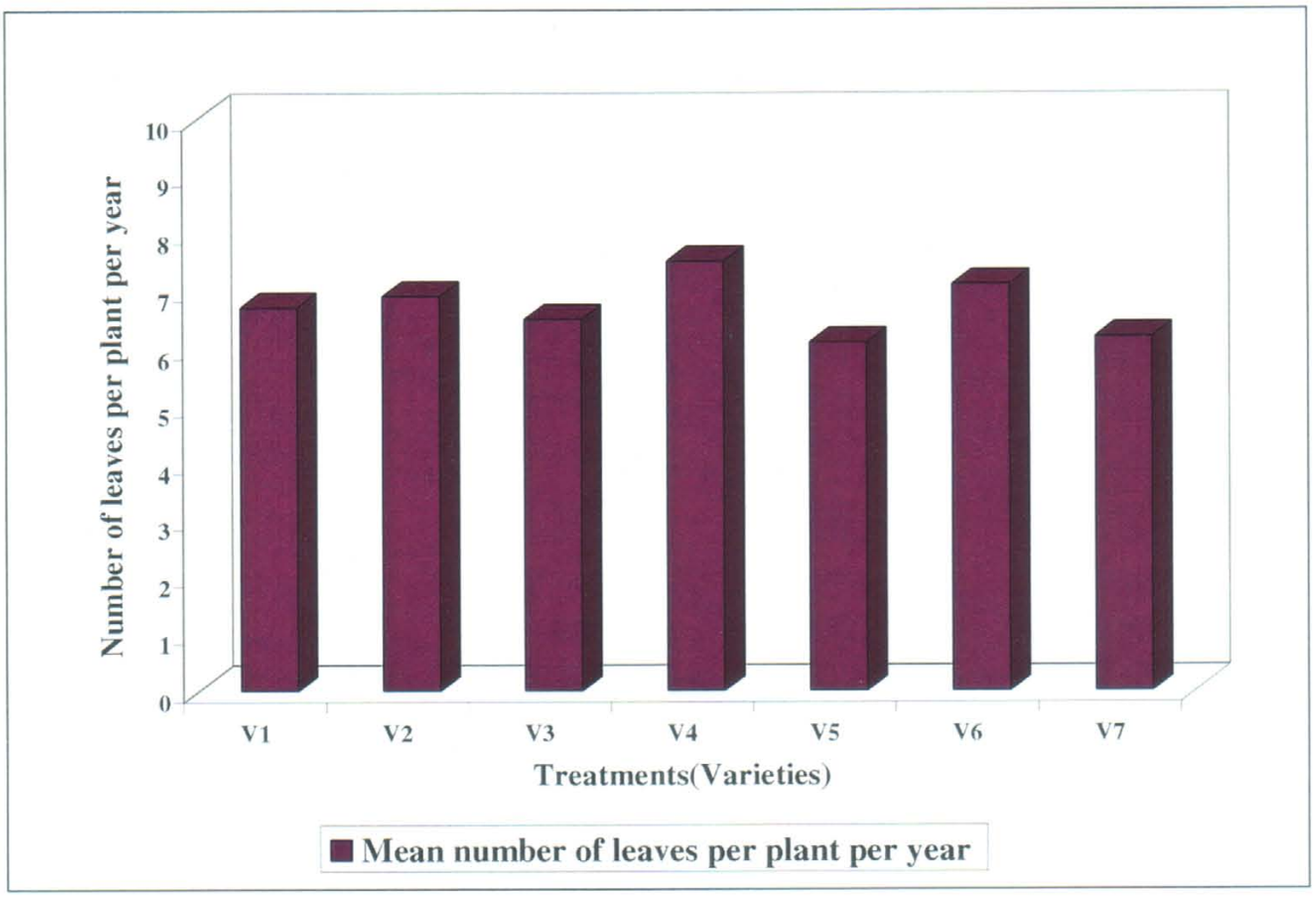
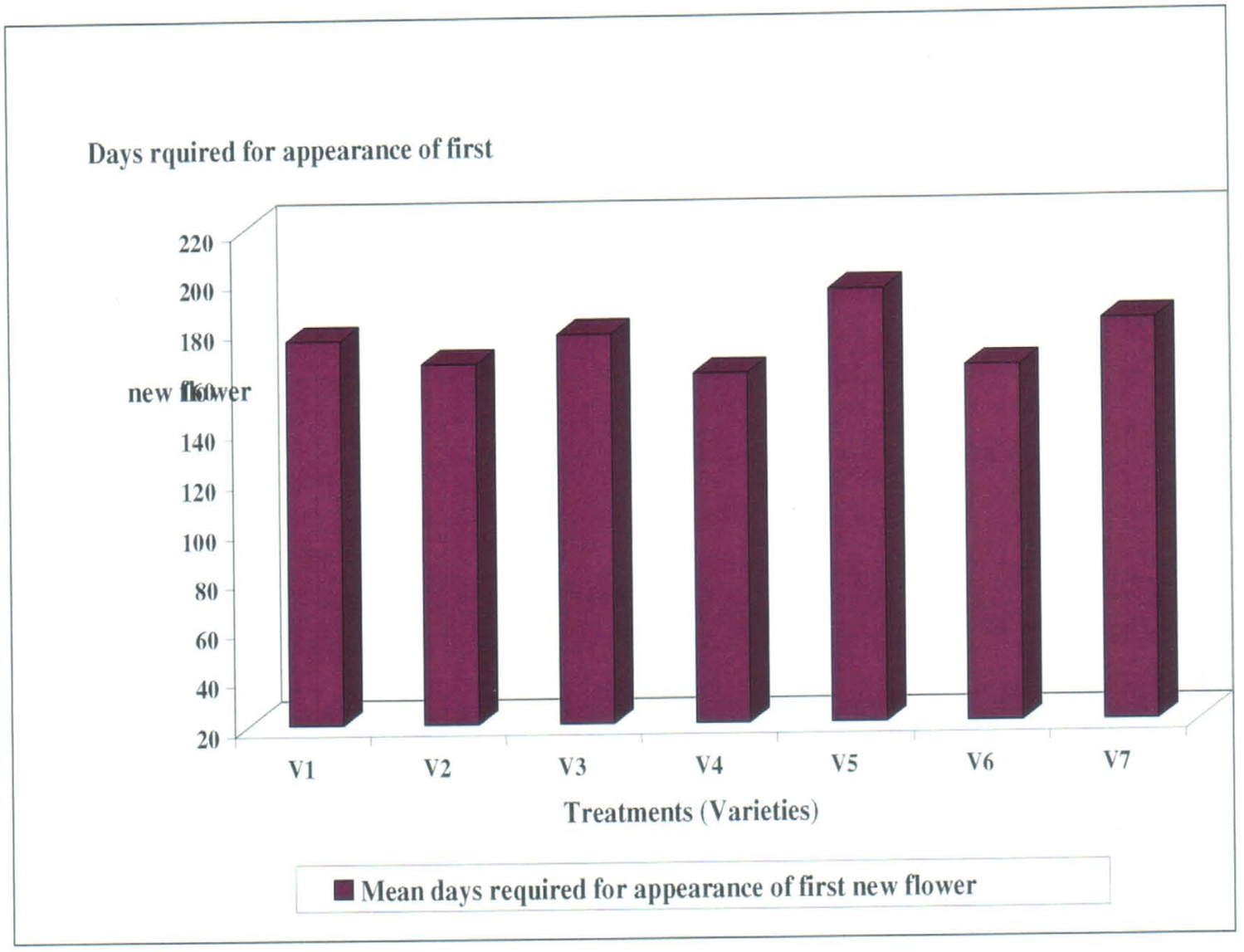


Table 4: Days required for appearance of first new flower

Sr. No.	Name of the variety	Mean
1	Aymara (V1)	174.5
2	Elan (V2)	164.9
3	Grace (V3)	176.4
4	Esmeraldy (V4)	160.4
5	Emperor (V5)	193.6
6	Flame (V6)	162.5
7	Jewel (V7)	180.6
General Mean		173.27
SE±		0.75
CD @ 5%		2.17
CV%		0.96
F ratio		*

* Denotes Significance at 5% level of significance

Figure 4: Days required for appearance of first new flower



4.1.4 Number of flowers per plant per year

The results in Table number 5 and Figure 5 revealed that there was significant difference in number of flowers per plant per year. For this character also Esmeraldy (V4) had significantly higher yield of 5.7 flowers per plant per year. However, it was at par with V6 (Flame). The minimum numbers of flowers were observed in Emperor (3.7). The varieties V2 - V6, V1 - V2, V4 - V6 were statistically at par to each other. This is the yield contributing character and was in the range of 3.7 to 5.7 being recorded in Emperor (V5) and Esmeraldy (V4) respectively. Rest of the varieties had yield figures in between these two values.

4.1.5 Stalk length (cm)

The results represented in Table number 6 and Figure 6 indicated that the varieties had variation in stalk length of the flower. The longer stalk length of 32.00 cm was observed in Esmeraldy (V4). The lowest stalk length (25.30) was recorded in Emperor (V5). V7 and V3 were at par to each other. Similarly V3 and V1 were also at par to each other having 28.2 and 27.5 cm stalk length respectively. Elan (V2) recorded stalk length of 29.6 cm. The varieties had significant difference to exhibit their variation in this character.

Plate 4. Variety Elan.

Plate 5. Variety Jewel.

Table 5: Number of flowers per plant per year

Sr. No.	Name of the variety	Mean
1	Aymara (V1)	4.7
2	Elan (V2)	5.0
3	Grace (V3)	4.3
4	Esmeraldy (V4)	5.7
5	Emperor (V5)	3.7
6	Flame (V6)	5.2
7	Jewel (V7)	4.0
General Mean		4.66
SE±		0.2074
CD @ 5%		0.6006
CV%		9.9563
F ratio		*

* Denotes Significance at 5% level of significance

Figure 5: Number of flowers per plant per year

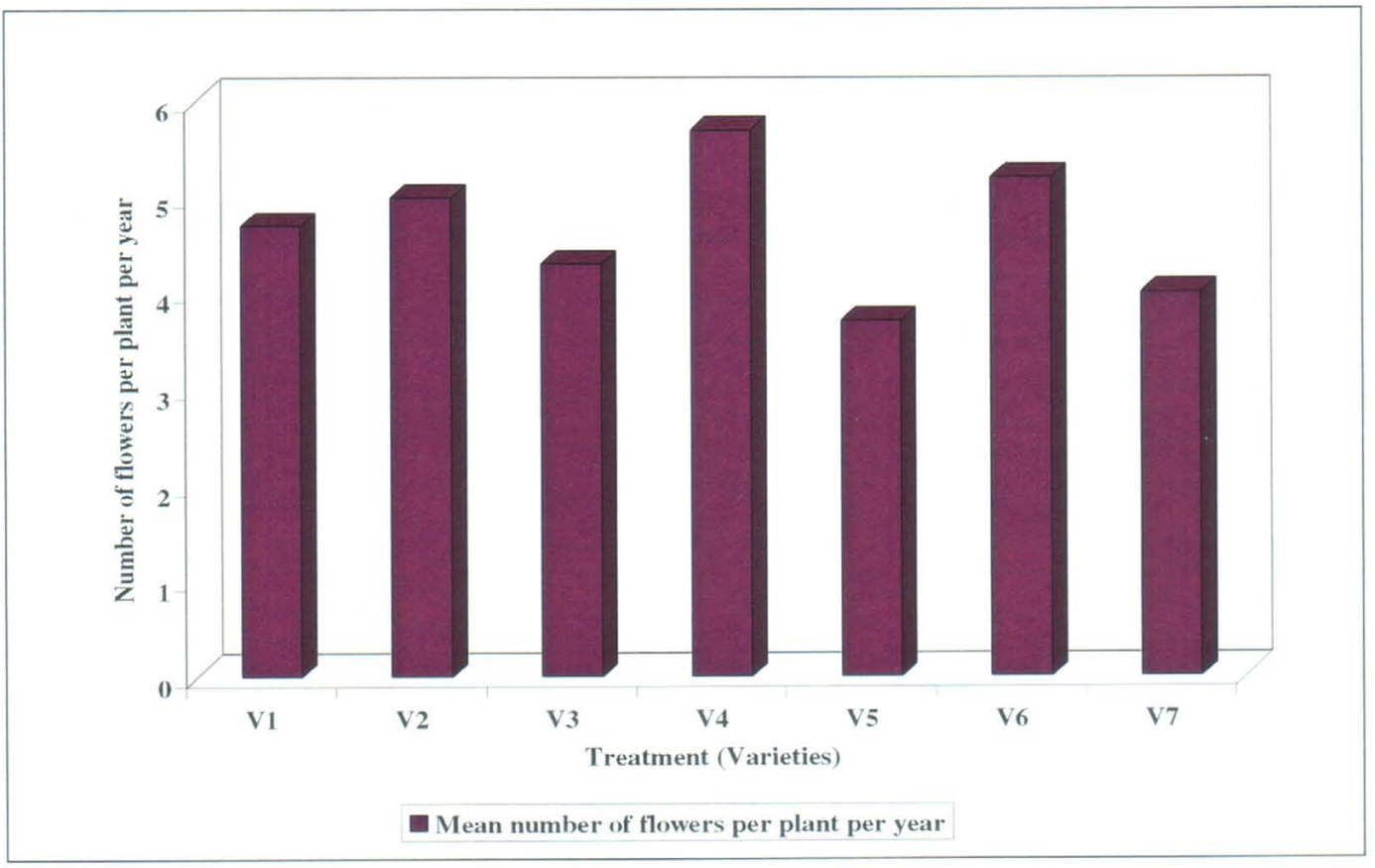


Table 6 : Stalk length (cm).

Sr. No.	Name of the variety	Mean
1	Aymara (V1)	28.2
2	Elan (V2)	29.6
3	Grace (V3)	27.5
4	Esmeraldy (V4)	32.0
5	Emperor (V5)	25.3
6	Flame (V6)	30.5
7	Jewel (V7)	26.2
General Mean		28.4
SE±		0.336
CD @ 5%		0.974
CV%		2.641
F ratio		*

* Denotes Significance at 5% level of significance

Figure 6 : Stalk length (cm)

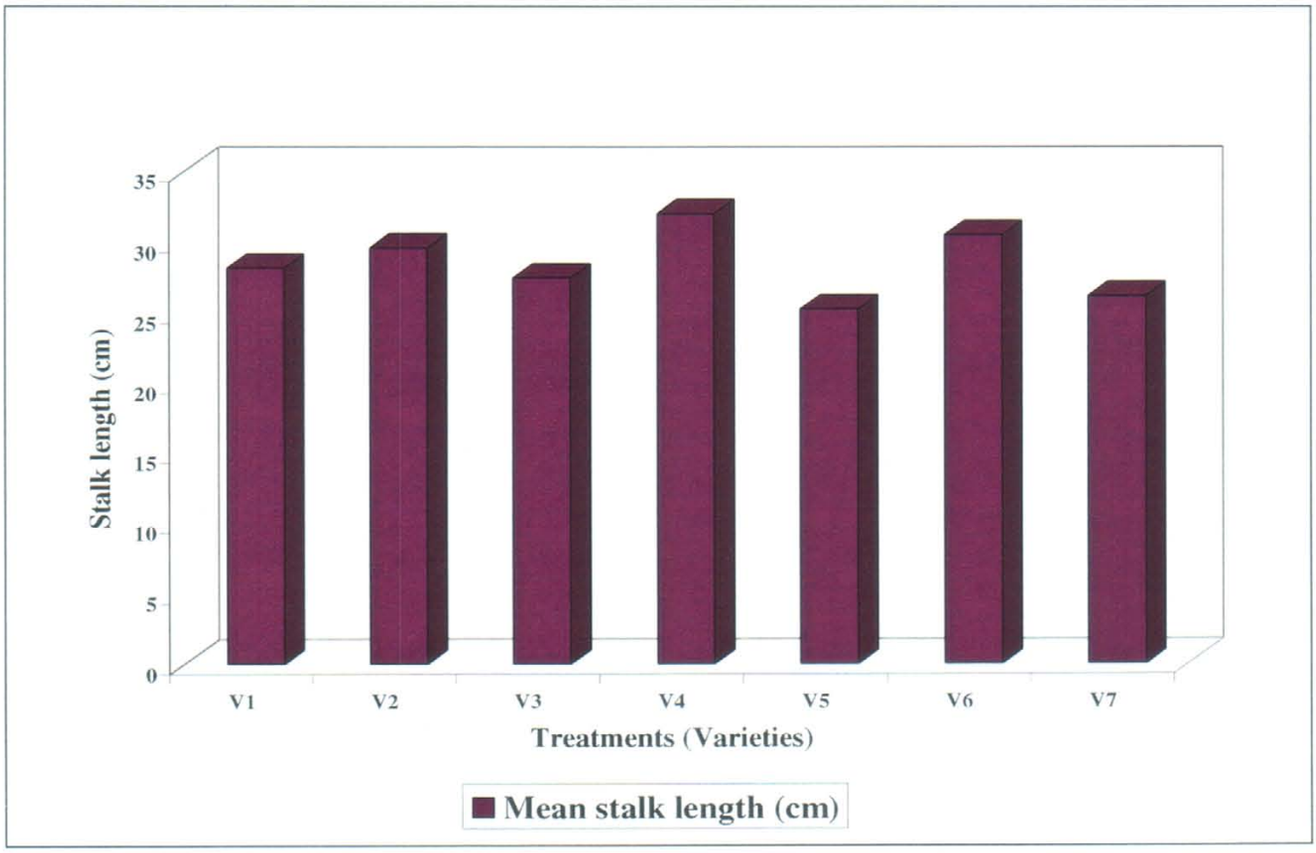


Plate 6. variety Aymara.

Plate 7. Variety Emperor.

4.1.6 Spathe length (cm)

The data presented in Table number 7 and Figure 7 showed that Esmeraldy (V4) had longest spathe length of 8.2 cm. It was followed by Flame (7.8), Elan (6.8) and Aymara (6.3). The minimum spathe length (5.1) was observed in Emperor (V5). Significantly less spathe length was found in Jewel (5.5) and Grace (5.9). All these varieties were statistically inferior to Esmeraldy (V4), the Flame being ranked the second position had spathe length of 7.8 cm.

4.1.7 Spathe width (cm)

The data presented in Table 8 and Figure 8 indicated that Esmeraldy (V4) had maximum spathe width (7.5) than all other varieties that means bigger size spathe was observed in this variety. It was followed by Elan (V2) where the spathe width of 7.00 cm was observed. The rest of the varieties had decreasing trend of spathe width. The minimum spathe width (5.8) was observed in Emperor (V5). All these varieties had comparatively less spathe width than Esmeraldy (V4).

4.1.8 Spadix diameter (cm)

The results presented in Table number 9 and Figure 9 showed that there was significant difference in varieties for this character. Unlike other characters, here also Esmeraldy (V4) had significantly maximum spadix diameter (0.49 cm) than all other varieties. It was followed by Elan (V2) where corresponding value of spadix diameter was 0.45 cm. The Flame (V6) recorded spadix diameter of 0.39 cm. There was decreasing trend in V1, V3, V7 and V5. The minimum diameter (0.25) was observed in Emperor.

Table 7 : Spathe length (cm).

Sr. No.	Name of the variety	Mean
1	Aymara (V1)	6.3
2	Elan (V2)	6.8
3	Grace (V3)	5.9
4	Esmeraldy (V4)	8.2
5	Emperor (V5)	5.1
6	Flame (V6)	7.8
7	Jewel (V7)	5.5
General Mean		6.5
SE±		0.093
CD @ 5%		0.287
CV%		3.407
F ratio		*

* Denotes Significance at 5% level of significance

Figure 7: Spathe length (cm)

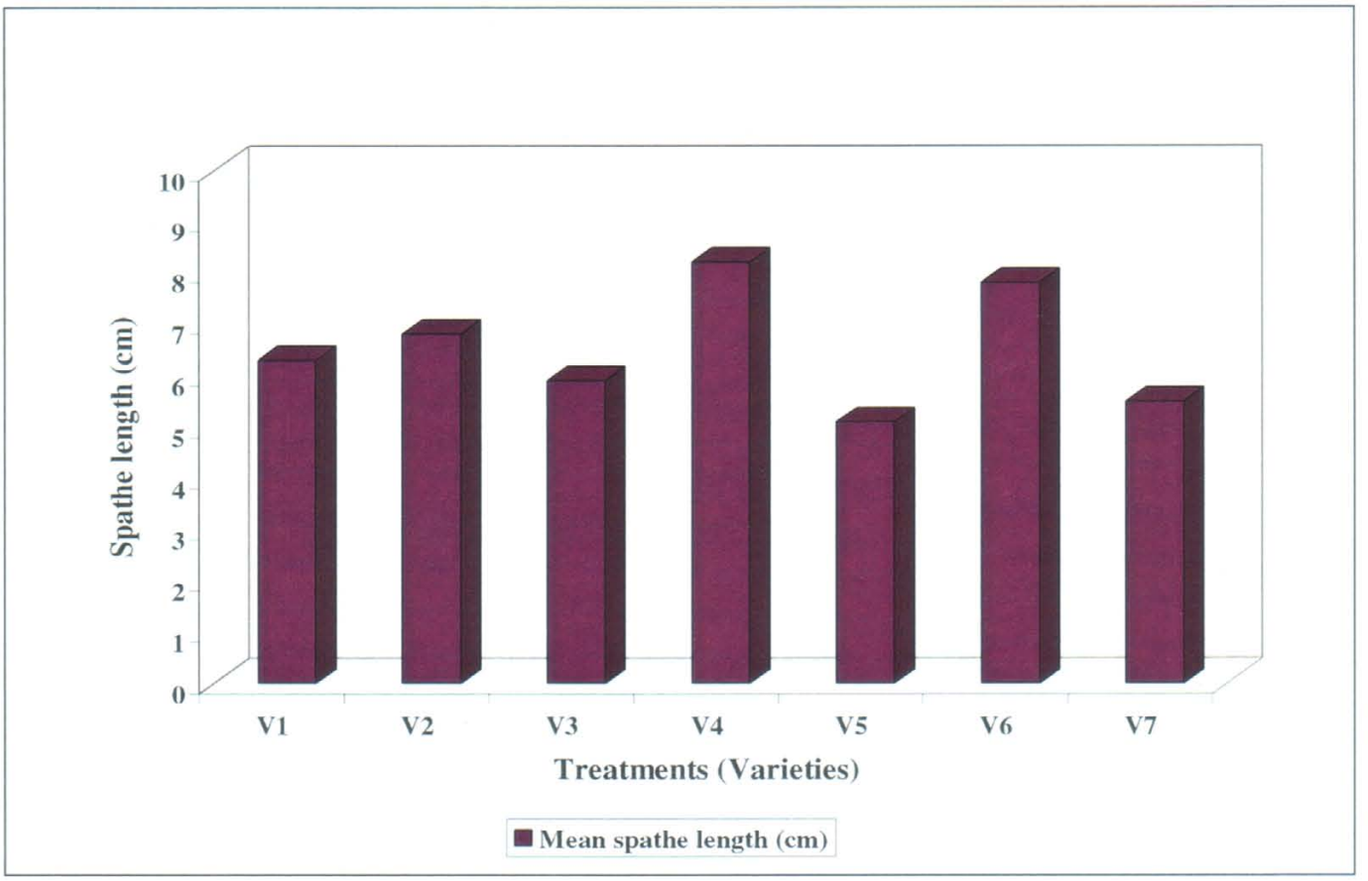


Table 8 : Spathe width (cm).

Sr. No.	Name of the variety	Mean
1	Aymara (V1)	6.5
2	Elan (V2)	7.0
3	Grace (V3)	6.2
4	Esmeraldy (V4)	7.5
5	Emperor (V5)	5.8
6	Flame (V6)	6.8
7	Jewel (V7)	6.0
General Mean		6.54
SE±		0.130
CD @ 5%		0.379
CV%		4.474
F ratio		*

* Denotes Significance at 5% level of significance

Figure 8: Spathe width (cm)

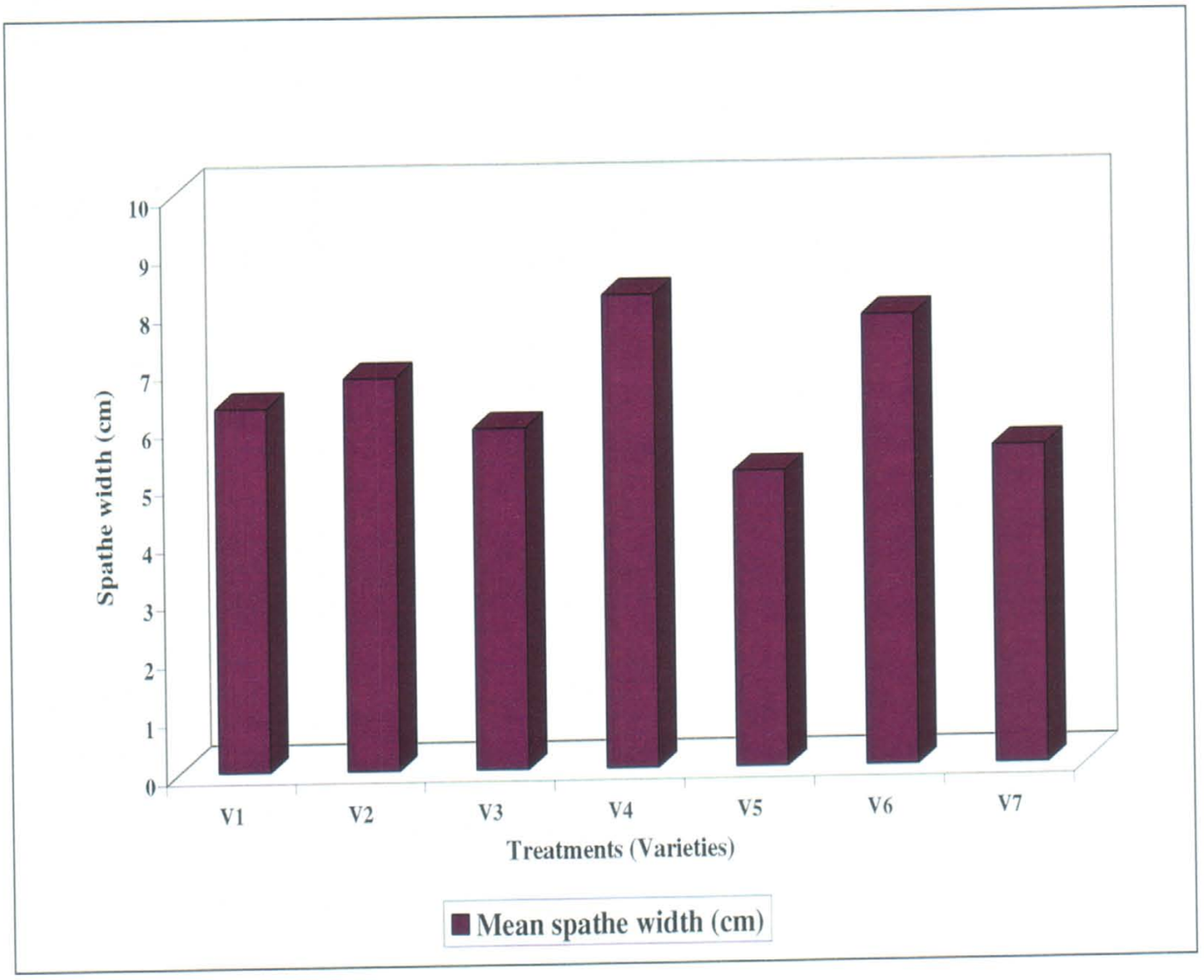
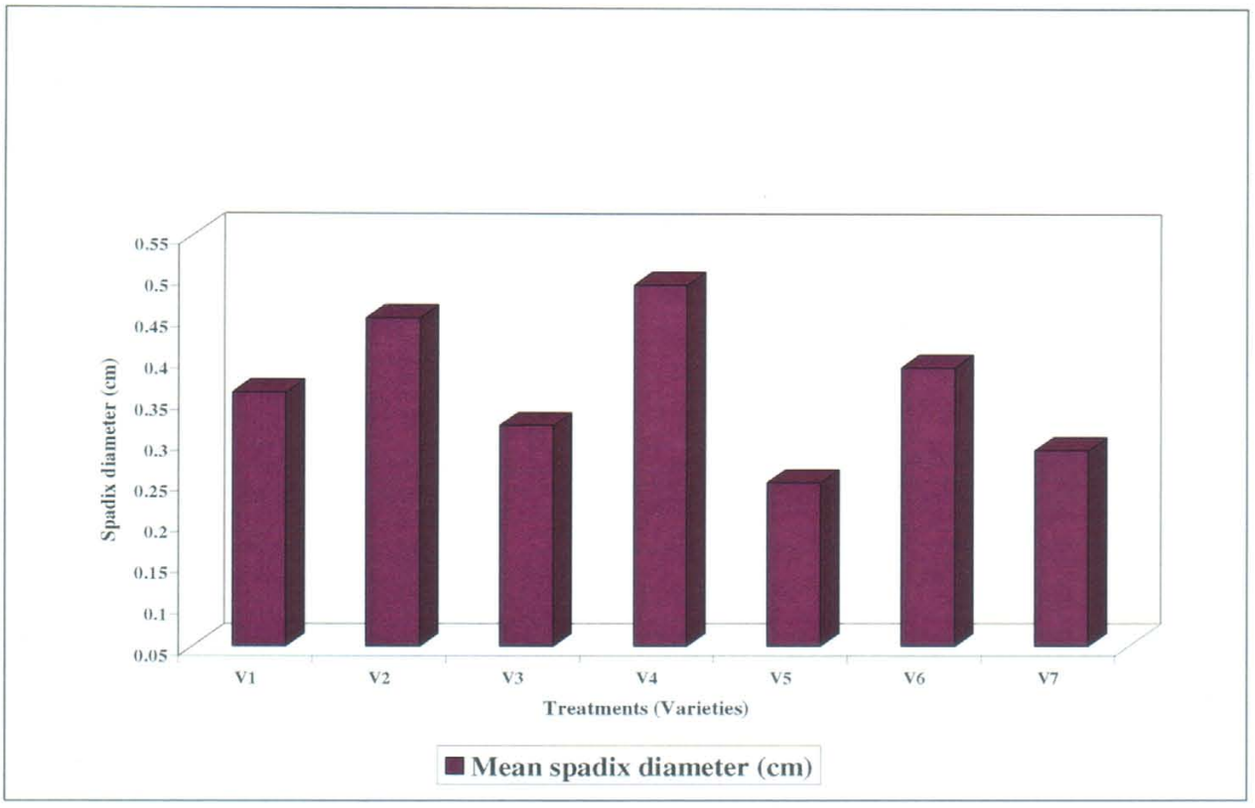


Table 9 : Spadix diameter (cm).

Sr. No.	Name of the variety	Mean
1	Aymara (V1)	0.36
2	Elan (V2)	0.45
3	Grace (V3)	0.32
4	Esmeraldy (V4)	0.49
5	Emperor (V5)	0.25
6	Flame (V6)	0.39
7	Jewel (V7)	0.29
General Mean		0.36
SE±		0.027
CD @ 5%		4.992
CV%		10.58
F ratio		*

* Denotes Significance at 5% level of significance

Figure 9: Spadix diameter (cm)



4.1.9 Keeping quality of flowers

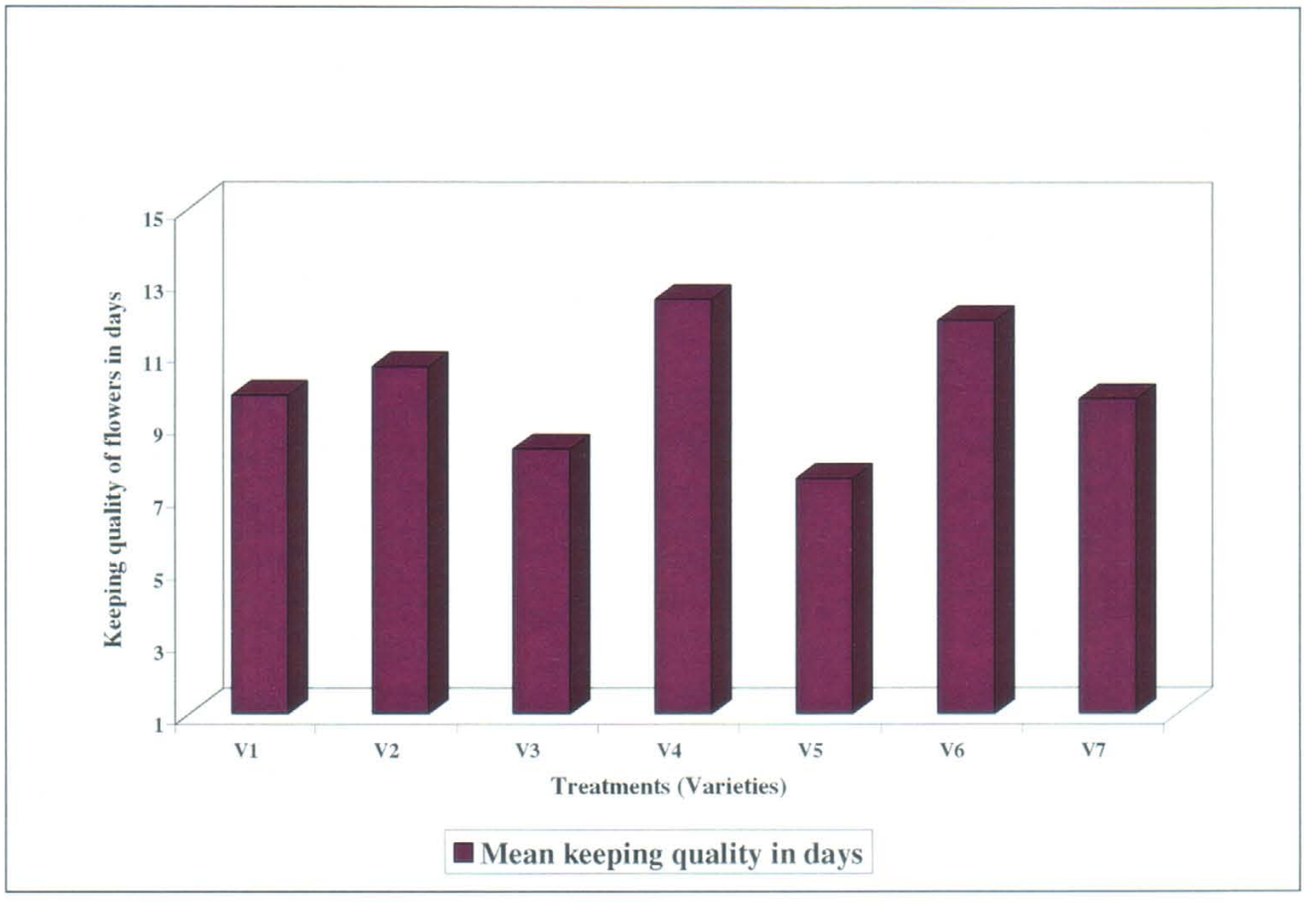
The results in Table 10 and Figure 10 revealed that Esmeraldy (V4) had significantly superior post harvest life and keeping quality than other varieties. It was followed by Flame (V6) and had a vase life of 11.9 days. Most of the other varieties has less vase life than these two varieties. The lowest vase life of 7.48 days was observed in Emperor (V5). The vase life was gradually increased in V3, V7, V1 and V2. The data reveals that in all the varieties the vase life was more than a week and they had significant difference amongst them.

Table 10 : Keeping quality of flowers in days.

Sr. No.	Name of the variety	Mean
1	Aymara (V1)	9.8
2	Elan (V2)	10.6
3	Grace (V3)	8.3
4	Esmeraldy (V4)	12.5
5	Emperor (V5)	7.48
6	Flame (V6)	11.9
7	Jewel (V7)	9.7
General Mean		10.04
SE±		0.096
CD @ 5%		0.279
CV%		2.152
F ratio		*

* Denotes Significance at 5% level of significance

Figure 10: Keeping quality of flowers in days



DISCUSSION

5. DISCUSSION

The investigation entitled "Performance of different anthurium (*Anthurium andreanum* L.) cultivars under polyhouse was carried out at Modibaug, College of Agriculture, Pune – 5 during 2005-06. The results presented in previous chapter are discussed in the chapter under suitable heads.

5.1 Days required for appearance of first new leaf

The number of days required for appearance of first new leaf after planting was significantly influenced by different varieties. Esmeraldy (V4) required significantly less number of days (4.20), which was followed by Flame (4.60). The maximum number of days to initiate new leaf were required in Emperor (7.00). Rests of the varieties were also shown emergence of new leaf between 5.00-5.4 days. The variation in number of days required for appearance of new leaf after planting was due to inherent capacity of individual variety to produce the leaves. Kamemoto and Nakasone (1963) also evaluated 113 cultivars and found 13 cultivars suitable for commercial production. Leeuwen (1984), Gelder *et al.* (1984), Arndt (1991) also conducted studies on various varieties of anthurium and found variation in growth of the anthurium. Chen *et al.* (1999), also reported emergence of new leaves during 5 months period and it was ranged from 1.2 to 5.4 under low light and 2.2 to 4.8 under high light depending upon the cultivars. Leonardo and Quitos (2005) identified cv. Nitta as a best performer variety amongst nine different cultivars.

5.2 Number of leaves per plant per year

The number of leaves produced by plant were significantly influenced due to varieties. The cultivar Esmeraldy (V4) produced maximum number of leaves 7.5 per plant per year. It was followed by Flame (7.1), Elan (6.9), Aymara (6.7). The number of leaves were gradually decreased in Grace (V3), Jewel (V7) and Emperor (V5). Vierig (1990) reported that medium sized plants were observed under polyhouse. Hennny (1999) also found big size leaves in a hybrid between 'Southern Blush' and 'Lady Jane'. Srinivas (2006) conducted studies to evaluate the performance of anthurium varieties and reported 7.31 leaves in cv. Hondura. The character is influenced by genetic constitution of varieties and physiological parameters of the plants. Leonardo and Quitos (2005) found that growth of plant in terms of canopy was influenced due to varieties and fertigation. Henny and Hamilton (1992) also reported difference in number of leaves due to GA3. Hetman (1981) reported performance of varieties grown on high peat + Sphagnum peat + perlite gave better number of leaves per plant. Singh (2003) and Srinivas (2006) also reported the variation in number of leaves among different varieties. The production of leaves is individual character governed by variety and prevailing conditions.

5.3 Days required for appearance of first first new flower

The results presented in Table number 3 indicated that earliest flowering (160.3) was reported in cv. Esmeraldy (V4) and was followed by Flame (V6) (162.5) days. The number of days required

for appearance of new flower was gradually increased in V2 (164.9), V1 (174.5), V3 (176.4), V7 (180.6) and V5 (193.6). The difference in days required for appearance of first new flower was due to the genetic capability of the varieties to generate first new flower. Arndt (1991) reported uniform and early flowering in cv. Arabella. Henley and Robinson (1994) studied twenty one cultivars and reported different vegetative and floral characters after 38 weeks. Singh (2003) reported variation in performance of vegetative and floral characters in anthuium under 75 per cent shade net at Andaman. They have assessed nineteen varieties and reported the variation in varieties. Henny and Hamilton (1992) conducted an experiment by using GA3 in different varieties of anthurium and found stimulus in the flowering. Borrelli (2001) reported that growing anthurium in optimum conditions and fertigation produce flowers after seven months.

5.4. Number of flowers per plant per year

It was evident from results that number of flowers per plant per year was significantly affected in different varieties. This is the yield contributing character of the crop. Amongst various varieties Esmeraldy (V4) found to be the best among all varieties with production of 5.7 flowers. It was followed by Flame (V6), producing 5.6 flowers. The minimum number of flowers were recorded in Emperor (3.7). There was gradual increase in yield of plants in terms of flowers *viz.* V7 (4.0), V3 (4.3), V1 (4.7) and V2 (5.0). The varieties V1-V2, V2-V6, and V4-V6 were found to be at par with each other. Nakasone (1963), Steen and Holsteyn (1975), Aswath *et al.* Hetman

(1981), Leeuwen (1984), Gelder et *al.* (1984), Arndt (1991), Henley and Robinson (1984) conducted research on various varieties of anthurium and reported significant difference among varieties. The yield potential of variety is the genetic character, therefore the performance of individual variety differed. Pawar (2000) reported better flower production in cv. Tropical Red under polyhouse condition. Praneetha *et al.* (2002) evaluated eight anthurium varieties and recorded highest number of flowers per plant per year in cvs. AA-3 and Lady Jane. Singh *et al.* (2003) also found better performance in cv. Honey and Wrinkled Orange. Talia-Mac *et al.* (2003) evaluated six cultivars of anthurium and reported that Terra was the most productive with 9.4 flowers. Wang-Yin-Tung and Wang (1999) reported better yield in cv. Pink Aristocrat with (>20 flowers) and 2 flowers Royal Red. All these workers reported difference in the yield in varieties due to the genetic, morphlogical and floral characters. Leonardo and Quitos (2005) observed that RCM-12 produced 6.4 flowers per plant per year and reported the effect was due to fertilization with micronutrients. Henny and Hemilton (1992) found effect on yield of flowers due to quality of light and GA3. Jawaharlal *et al.* (2001) obtained highest number of flowers by growing anthurium in cocopeat. Leffring (1975) reported that growth and average production of anthurium was increased due to light from 5.00 to 12.00 flowers per plant. Simon *et al.* (2000) recorded the highest yield of anthurium in the media of coconut husk and coconut fibrebast. The yield of flower depends upon overall performance of the variety. As Esmeraldy (V4) showed better vegetative growth, the mobilization of food material was superior in this variety. As a result,

the yield was more. Besides the genetic potential the growth of the plant also contributed in achieving flower production. A trial on anthurium varietal performance was conducted at TNAU, Cimbatore. In trial cv. Mini recorded highest flower yield (11.8). (Anonymous 2004).

5.5 Stalk length (cm)

This character was influenced by performance of different varieties. The stalk length of flower is qualitative character of variety. The stalk length recorded in Esmeraldy (32.00 cm) was significantly superior over all other varieties. The lowest stalk length was reported in Emperor (25.30 cm). The Flame had stalk length of 30.50 cm. The other varieties *viz.* Jewel (V7), Grace (V3), Aymara (V1) and Elan (V2) had gradual increase in the stalk length but were inferior than other three varieties. The length of the stalk is qualitative as well as growth character of the plant. Esmeraldy out performed in all respects, naturally, the stalk length in this variety was superior. The vegetative growth in this variety was also better which contributed in production of longer stalk length of the flower. Nakasone (1963), Steen and Holsteyn (1975), Aswath *et al.* (1977), Leeuwen (1984), these workers studied different varieties of anthurium and reported differences in the floral character due to varieties and genetic potential. Praneetha *et al.* (2002) also found that stalk length and quality of the flower was a varietal character governed by genetic constitution of variety. Srinivas (2006) reported stalk length of 35.44 cm in cv. Hondura. Similarly, Singh *et al.* (2003) reported stalk length of 22.4 cms in cv. Honey. This performances of the varieties indicated

superiority over other varieties due to their individual capacity. They also noticed that the effect was to genetic, vegetative and flower quality of individual variety. Srinivas (2006) found morphological differences among anthurium varieties and maximum plant height was observed in cv. Hondura. This was attributed due to inherent genetic character associated with the variety. In a trial at TNAU Coimbatore, cv. Tiffinny recoreded highest stalk length of 56.87 cm.

5.6 Spathe length (cm)

The results revealed that spathe length of flowers was significantly affected in different varieties. The longer spathe length of 8.2 cm was found in Esmeraldy (V4). It was followed by Flame (V6) with spathe length of 7.8 cm. There was a gradual decrease in spathe length in varieties Elan (V2), Aymara (V1), Grace (V3) and Jewel (V7). The lowest spathe length was reported in Emperor (5.1). Srinivas *et al.* (2006) reported maximum spathe lengthy of 7.81 cm in cv. Senator. This variety had a better performance among four other varieties. The variation in floral character was attributed due to genetic make up of the variety. Henny (1999) reported various characters of the interspecific hybrids of anthurium. F1 hybrid of Anthurium × Red Hot had spathe length of 6.00 to 7.00 cm, this was the effect of variety and growth attributes of the plant. Leonardo and Quitos (2005) had reported better spathe area in cv. Anue-nue (309 cm sq.). The effect was due to fertilization and micro nutrients.

5.7 Spathe diameter/width (cm)

It was clear from the results presented in Table number 7 that spathe diameter/width of the flower was influenced in different varieties. Amongst seven varieties tested, Esmeraldy (V4) with a spathe width of 7.5 cm was found to be the best in this character. It was followed by Elan (7.00), whereas minimum spathe width of 5.8 cm was noticed in Emperor (V5). Rest of the varieties *viz.* Jewel (V7), Grace (V3), Aymara (V1) and Flame (V6) had spathe width in increasing order but less than Esmeraldy. The variation in this character was due to vegetative and genetic differences among the varieties. Srinivas *et al.* (2006) also reported the same results with spathe width of 6.75 cm in cv. Senator and 5.38 cm in cv. Tropical. He also mentioned the differences due to genetic characters of the variety. Leonardo and Quitos (2005) reported better spathe area due to fertilization and micronutrients. Henny (1999) observed spathe width of 4.00 to 5.00 cm in F1-Hybrid Anthurium × Red Hot. The effect was due to varieties. Talia-Mac *et al.* (2003) reported better mean spathe width in cv. Queen whereas it was least in cv. Sante. All these workers are in agreement with the results obtained in this investigation. In investigation at TNAU, Coimbatore maximum flower diameter of 11.87 was recorded by cv. Rosalin.

5.8 Spadix diameter (cm)

The diameter of the spadix was significantly influenced by different varieties. The maximum spadix diameter of o.49 was recorded in Esmeraldy (V4) whereas minimum (0.25) was recorded in Emperor. The Elan (V2) was found to be second better variety among

all other varieties. There was a decrease in spathe diameter in varieties *viz.* Flame (V6), Aymara (V1), Grace (V3) and Jewel (V7). The diameter of spadix, is growth character as well as qualitative aspects of the flower. Growth and the floral character of the cultivar is invariably the varietal character. It was reported by many workers that genetic attribution of variety causes the floral character of the variety. Here also among the seven varieties tested, Esmeraldy (V4) exhibited excellent results. Similar findings were also reported by Singh *et al.* (2003), Henny (1999), Leonardo and Quitos (2005), Srinivas (2006). They have supported these findings in their investigation.

5.9 Keeping quality of the flower

The post harvest studies of flower with regard to keeping quality of flowers indicated that vase life of Esmeraldy (V4) was superior in all other varieties. It was followed by Flame (V6), where as it was minimum in Emperor (V5). Rest of the varieties had less keeping quality than Esmerady and Flame but superior over Emperor. The keeping quality of flower is total effect of floral as well as vegetative character of flower. The cultivar showing best vegetative growth and flower quality gave maximum vase life. The stalk diameter, stalk length, quality of spathe and spadix contributed towards better vase life towards Esmeraldy. Praneetha *et al.* (2002), reported better vase life in cv. AA-2. Singh *et al.* (2006) also reported superior vase life in cv. Honey. These findings are in confirmation of the present investigation. Paull (1991) reported better post harvest life due to optimum fertilizers and season.

SUMMARY AND CONCLUSION

6 SUMMARY AND CONCLUSIONS

Floriculture comprises production and marketing of cut flowers, potted plants, bedding plants, plantlets, foliage and dried flowers is experiencing a rapid change worldwide. Enhance appreciation for aesthetic values paved the way for building up of floriculture sector as an integral segment of the trade. Consequently cut flower production increased and with effective transportation system as well as innovations in production and marketing, flower industry expanded and the trade got the boost with increasing expandable income. India has a great tradition of growing flowers and use of flowers. The industry established itself in the national and international markets after initial struggle.

Maharashtra stands fifth in respect to area under floriculture in the country. In Maharashtra mostly traditional crops are grown, but recently many private companies and progressive farmers in the state have started export oriented cultivation of flower crops. The most commonly grown crops are rose, carnation, gerbera, gladiolus and to the little extent anthrium. Anthurium is one of the important cut flower grown and is gaining popularity in both domestic as well as international market. Though the crop is having vast potential, its cultivation in Maharashtra is still at nascent stage due to unavailability of technical know-how, information regarding nutritional apects, growing media, screening of varieties for export etc. Considering scope and potential of anthurium in world trade market, the present study entitled "Performance of different anthurium (*Anthurium*

andreanum L.) cultivars under polyhouse condition" was undertaken to identify promising varieties under low cost polyhouse condition, to test the feasibility and the floral characters.

6.1 Vegetative characters

The days required for appearance of first new leaf were found less in variety 'Esmeraldy' (4.20) followed by Flame (4.6) and Elan (4.8). The significantly higher number of days were required by variety 'Emperor' (7.00).

The highest number of leaves per plant per year were recorded by variety 'Esmeraldy' (7.5) followed by variety 'Flame' (7.1). Variety 'Emperor' recorded least number of leaves (6.1) amongst rest of the varieties.

6.2 Floral character

Appearance of first new flower was observed in variety 'Esmeraldy' (160.4) followed by Flame (162.5) giving the superiority over the rest of the varieties. Emperor was found to be late among all other varieties (193.6 days).

6.3 Qualitative characters

Longer stalk length was observed in variety 'Esmeraldy' (32.00 cm). The lowest stalk length was observed in variety 'Emperor' (25.30). Esmeraldy also gave better spathe length (8.2 cm) followed by Flame (7.8 cm) and Elan (6.8 cm). Emperor had lowest spathe length (5.1 cm).

Variety 'Esmeraldy' (7.5 cm), 'Elan' (7.00 cm) and variety 'Flame' (6.8 cm) were top most for their spathe width. . The smaller size spathe was observed in variety 'Emperor' (5.8 cm).

Similar trend was found in spadix diameter. Significantly superior spadix diameter (0.49 cm) was noted in Esmeraldy. Variety 'Emperor' recorded the lowest spadix diameter (0.25 cm).

Vase life of flowers is one of the important factor. Better vase life (12.5 days) was observed in variety 'Esmeraldy' and was followed by variety 'Flame' (11.9 days). The minimum vase life was observed in variety 'Emperor' (7.48 days) in plain water.

6.4 Quantitative characters

Significantly more number of flowers (5.7) was produced by cv. Esmeraldy, it was followed by cv. 'Flame' (5.2).

6.5 Conclusion

The findings of the present investigation can be concluded that different varieties under test were significantly varied in their vegetative, floral, yield and post-harvest characters. Among the seven varieties tested, Esmeraldy was performed the best and gave better growth, yield and vase life. This variety took minimum days (4.2) for appearance of first new leaf after planting, maximum numbers of leaves per plant per year (7.5), least number of days required for appearance of first flower (160.4), highest yield per plant per year (5.7), longer stalk length a spathe length (32.00 cm) and (8.2 cm) respectively, spathe width and spadix diameter of (7.5 cm) and (0.49 cm) respectively and the vase life (12.5 days). It was followed by

Flame and Elan. Based on study of one year it seems that, cv. Esmeraldy, Flame and Elan performed better among seven varieties under test. The results need to be confirmed.

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7. LITERATURE CITED

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APPENDIX

8. APPENDIX

Weather parameter of Pune 2005-06

Met Week	T maxi. (C)	T min. (C)	RH-1 (%)	RH-2 (%)	Rain (mm)	R Days (d)	W S (kmph)	Epan (mm/d)	BSS (h)
1	29.8	14.0	92.00	41.00	0.00	0.00	3.20	3.20	7.10
2	30.10	9.50	95.00	30.00	0.00	0.00	3.10	3.60	9.10
3	29.00	8.60	93.00	28.00	0.00	0.00	3.50	3.60	9.10
4	31.20	12.40	94.00	31.00	0.00	0.00	3.60	3.70	8.80
5	26.00	11.70	92.00	44.00	10.00	1.00	4.30	3.20	7.40
6	32.00	12.50	88.00	26.00	0.00	0.00	4.20	4.70	10.00
7	33.60	12.10	83.00	25.00	0.00	0.00	4.20	5.20	10.50
8.	31.40	10.10	85.00	23.00	0.00	0.00	5.00	5.50	10.50
9	35.10	16.00	79.00	22.00	0.00	0.00	3.90	5.80	9.10
10	33.20	14.80	82.00	28.00	0.40	0.00	4.80	5.50	7.90
11	35.10	13.30	74.00	17.00	0.00	0.00	3.50	6.40	10.00
12	35.70	15.90	67.00	19.00	0.00	0.00	5.20	7.70	9.40
13	36.50	15.60	64.00	15.00	0.00	0.00	5.60	9.80	8.10
14	38.20	20.70	66.00	21.00	0.00	0.00	10.30	9.20	8.20
15	37.10	18.40	62.00	23.00	20.70	1.00	5.00	7.70	8.40
16	38.50	20.30	66.00	18.00	0.30	0.00	4.90	7.50	9.70
17	31.40	19.50	74.00	25.00	15.70	2.00	4.20	6.70	7.70
18	35.90	20.80	73.00	30.00	9.90	1.00	5.70	7.60	10.00
19	36.50	21.50	70.00	29.00	0.00	0.00	8.10	7.90	11.00
20	38.60	20.40	56.00	22.00	0.00	0.00	7.80	10.20	11.60
21	39.70	23.90	60.00	23.00	0.00	0.00	7.80	10.60	11.00
22	35.80	23.40	75.00	41.00	22.50	2.00	8.10	8.90	10.80
23	36.40	23.90	74.00	35.00	0.00	0.00	10.50	8.90	10.80
24	35.10	23.00	79.00	46.00	62.70	3.00	6.80	4.40	5.80
25	31.10	22.80	81.00	65.00	30.20	3.00	7.30	6.80	7.00
26	27.20	22.30	87.00	88.00	224.30	6.00	9.90	2.40	0.30
27	27.20	23.40	87.00	76.00	90.00	4.00	17.90	2.40	1.90
28	29.20	22.90	85.00	66.00	1.20	0.00	10.20	4.10	4.40
29	30.70	33.80	85.00	66.00	19.60	3.00	6.00	2.90	5.10
30	26.60	22.10	92.00	84.00	172.60	7.00	9.30	2.20	1.20
31	25.30	21.90	92.00	86.00	173.30	7.00	8.90	1.90	0.80
32	26.90	21.80	89.00	76.00	29.40	4.00	9.30	2.50	2.40
33	27.30	21.60	93.00	80.00	29.30	4.00	7.20	2.70	3.20
34	27.70	20.40	90.00	73.00	21.10	3.00	6.90	3.20	4.50
35	29.80	20.90	88.00	84.00	28.00	2.00	4.80	3.40	6.80
36	30.80	22.50	95.00	72.00	117.90	6.00	2.90	2.40	3.40
37	27.20	21.90	90.00	82.00	36.20	5.00	6.00	1.90	0.60
38	27.30	21.60	88.00	81.00	38.80	5.00	9.00	2.80	2.90
39	27.90	19.90	90.00	65.00	88.10	2.00	5.80	3.10	5.70
40	30.30	20.10	90.00	57.00	33.70	2.00	2.30	3.00	5.40
41	32.00	18.50	87.00	48.00	0.30	0.00	2.40	4.20	7.20
42	30.00	20.30	94.00	55.00	48.10	1.00	2.70	2.90	5.10
43	30.40	18.10	92.00	43.00	13.90	1.00	2.10	3.40	8.20
44	30.60	13.70	92.00	31.00	0.00	0.00	1.40	3.90	8.10
45	29.40	11.30	89.00	32.00	0.00	0.00	1.70	4.10	9.60
46	30.50	9.70	88.00	27.00	0.00	0.00	1.60	4.10	9.60
47	30.60	10.20	86.00	27.00	0.00	0.00	2.10	4.50	9.80
48	30.20	13.80	88.00	34.00	0.00	0.00	1.80	3.90	7.50
49	30.60	14.10	92.00	38.00	0.00	0.00	1.70	4.10	7.90
50	29.60	9.20	94.00	27.00	0.00	0.00	1.70	3.00	8.70
51	29.60	8.20	95.00	26.00	0.00	0.00	1.70	3.50	9.00
52	28.90	8.70	94.00	33.00	0.00	0.00	1.40	2.90	8.50

VITA

9. VITA

ANITA RUDRAKSHA SHETYE
A candidate for the degree
of
MASTER OF SCIENCE (AGRICULTURE)
IN
HORTICULTURE
2007

TITLE OF THESIS : **Performance of different anthurium (*Anthurium andreanum* L.) cultivars under polyhouse.**

MAJOR FIELD : **HORTICULTURE**

BIOGRAPHICAL INFORMATION:

PERSONAL : Born at Ratnagiri on 16th May, 1982. Daughter of Shri. Rudraksha S. Shetye and Sou. Geeta R. Shetye.

EDUCATIONAL QUALIFICATION :

- Passed SSC in 1998 from Rajapur High school Rajapur with 71.80%
- Passed HSC from Navajeevan Junior College, Rajapur with 74.00%.
- Completed B. Sc. (Hort.) in 2004 from College of Agriculture, Dr. B.S.K.K.V, Dapoli with 82.50%.

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