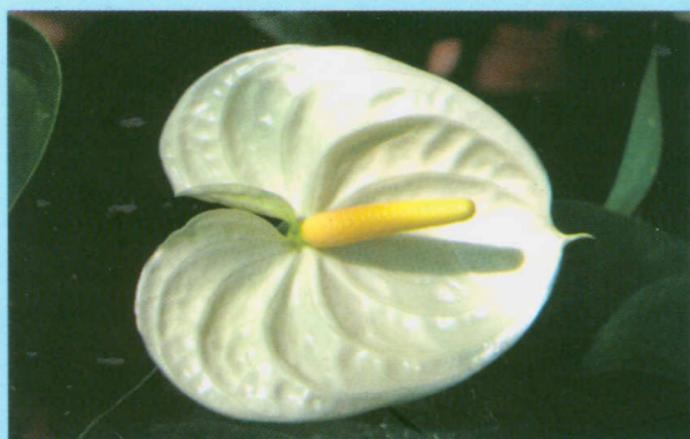


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# Anthurium Cultivation under Naturally Ventilated Polyhouse for Cut Flower Production



**ICAR RESEARCH COMPLEX FOR GOA,**  
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)  
OLD GOA - 403 402, GOA, INDIA

## Introduction:

**A**nthurium is one of the beautiful cut flowers cultivated mostly in tropical humid climate and hence it has good scope for cultivation in Goa. It is the largest and probably the most complex genus of arum family. The word anthurium is derived from the Greek words "*Anthos*" and "*Oura*" which means, "*Bloom*" and "*Tail*" respectively. The genus Anthurium belongs to the complex family of Araceae. This family has eight sub family among them anthurium belongs to *pothoideae*.

Anthurium occupies important position in cut flower trade on account of its beauty. It is grown for its attractive flowers as well as foliage. It is an evergreen tropical herbaceous plant. The most popular and economically important species are *Anthurium andreanum* and *A scherzerianum* which possess attractive long lasting inflorescence.



→ Spathe

→ Spadix

Anthurium cultivation has been catching up in India especially in the Western Ghats and the North Eastern region. A number of farmers and coffee planters of Western

Ghats of Karnataka and Kerala have adopted anthurium cultivation as a hobby which got transformed in to a commercial enterprise. It is ranked eleventh in the global cut flower trade next only to orchids among the tropical flowers. The preference for colours in global as well as domestic markets for anthurium flowers indicates that the red coloured varieties are the most favoured with 45 per cent share followed by pink and white coloured types.

## Climate and growing medium:

Anthurium is a tropical plant which flourishes well under humid and moderate temperature condition. Consequently temperatures lower than 15°C and above 35°C should be avoided. In case the temperature is higher than 35°C, the production can be achieved by maintaining higher relative humidity. An excessive low relative humidity will reduce the rate of photosynthesis while an excessive high humidity will increase the risk of pest and diseases. The optimum relative humidity of 60-80% is maintained for economic production.

Anthurium is a shade loving plant hence proper provision of light and shade is very important. An optimum light intensity of 18,000-25,000 Lux is maintained for good flower production. For cultivation in tropical climate, shade nets with 75% shading is used. Preference is given to use two nets i.e a fixed net providing 60% shade and a second movable net with 25%, hence movable net can be closed during dry periods and at the middle of the day thereby avoiding the peak light intensity.

Anthuriums require a highly organic well aerated medium with good water retention. However, the secret of success for commercial cultivation is to have good drainage in the medium used. An ideal medium for pots or ground planting should have the following properties:

- Good water holding capacity
- High porosity
- Good aeration
- Low salt concentration
- Must provide good anchorage
- Should have optimum pH (5.0) and EC (0.6 m.mhos/cm<sup>2</sup>)
- Should have good structure and texture

In many areas coconut husk and cocopeat have become the most popular media for anthurium cultivation. India has a rich wealth of coconut plantations hence its by products can be exploited for anthurium cultivation

## Varieties:



Ivory

There are many varieties in anthurium with different colours like dark red, orange, white, pink and bicolour (Two colours on the spathe). Varieties of Holland are well known as private companies from this country have developed many varieties. Tissue cultured plants

of these varieties are available in India. Some of the varieties viz., Ivory (White), Chichas (Maroon), Aymara (Pink) and Jewel (Red with green) from M/s KF Bioplants Pvt. Ltd., Pune can perform well in Goa.



Chichas



Aymara



Flame



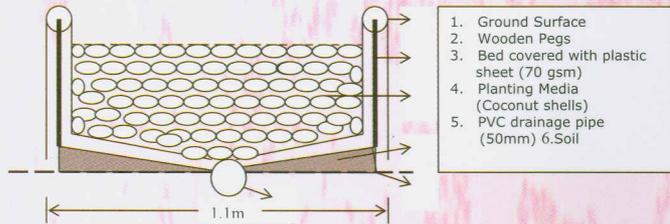
Jewel

## Bed preparation for planting:

The longitudinal beds of 0.9 to 1.1 m width and length depending on the polyhouse are prepared but the length should not be more than 30 metres. There should be 30-45cm gap between two beds for easy cultural operations and harvesting. The growing bed should have slight slope for proper drainage to drain off the excess water. A perforated PVC pipe is fixed in the centre of the bed which has slight 'V' shape at the bottom by which excess water is collected in the bed and drained out. The drain water can also be collected

in a tank and recycled where ever possible. But proper treatment of drained water for pH and EC apart from control of bacteria and fungus are essential. The outer most part of bed is raised in order to collect the excess water in the pipe. For making proper bed, wooden pegs of 70 cm height with a hole at one side are used at every 2 feet interval so that pegs are inserted in to the ground to get at least 45 cm height above ground for bed making. The wooden pegs are joined together with G.I wire and plastic sheet preferably silpaulin is covered on the bed and drainage pipes are placed over in the centre of the bed by keeping the perforation on top (see plate 1).

### Bed Construction:



**Plate 1a and 1b:** Schematic diagram showing the cross section of bed (top) and Bed preparation using wooden pegs (down).

### Planting:

Once the beds are ready for planting then the media has to be added to the bed. Before adding the coconut husk growing media should be washed thoroughly and sterilized with chemicals. Pesticides like Chloropyrifos or Methomyl @ 1.5ml/litre of water

along with Carbendazim @ 1g/lit of water is prepared. The media should be washed with water twice or thrice and then dipped in the



**Plate 2:** Coconut husk in bed



**Plate 3:** Planting of tissue culture plants in the bed

above prepared solution (i.e 150 ml of chemical in 100 lit of water) for 1 minute and then spread inside the bed uniformly for planting. The plants are always planted in 4:3 proportion ( in 1.1m bed) and 3:2 proportion ( in 0.9m bed ) and the row to row distance is 30 cm whereas the plant to plant distance is 45 cm.

The planting is done diagonally. While planting coconut shells may be added for good support. The plants should not be planted very deep or very high above the substrate. Care should be taken so that the roots do not get damaged while planting.

### Planting density and after care:

The optimum spacing for commercial cultivation of anthurium is 45 x 30cm which accommodates around 4400 plants in 560m<sup>2</sup> polyhouse (20m x 28m). Once the planting is completed, the irrigation schedule has to be followed without any fertilizer for at least 12-15 days.

The top shade nets should be spread completely to avoid high light intensity. When the plants have started producing roots after a month, the intensity of light may be increased to a certain extent. During this period, it has to be ensured that the growing medium is sufficiently wet.

### Fertigation:

Unlike field crops where plants are normally grown in soil, anthurium is grown on coconut husk and fertilizers are applied daily through sprinkler irrigation. Since coconut husk just provides support to plants, required nutrients as well as good quality water has to be necessarily supplied to the plants at appropriate time throughout the growing period.

Fertilizers are given daily through sprinkler irrigation system only. Fertigate the plants daily twice, first in the morning and second in the noon. The quantity of fertigation water should be @ 5lit /m<sup>2</sup> area of bed. The pH and EC of fertigation solution should be checked before watering. The ideal pH and EC would be 5.7-6.2 and 1.2-1.3 respectively.

### Water quality requirement for anthurium:

Water quality	EC (m.mol/L)	Sodium (m.mol/L)	Chloride (m.mol/L)	Bicarbonate (m.mol/L)	Calcium (m.mol/L)
Good	<0.5	<1.0	<1.0	<0.5	<1.0
Acceptable	0.5-1.0	1.0-3.0	1.0-3.0	0.5-1.0	1.0-2.0
Poor	>1.0	>3.0	>3.0	>1.0	>2.0

### Fertigation doses:

The following is the standard fertilizer dose recommended for varieties of M/s KF Bioplants Pvt. Ltd., Pune in combination with good quality filtered water. It results in feeding solution with an EC level of about 1.25 and pH 5.75-5.80 after a dilution of 100 times.

## Standard fertilizer solutions for the anthurium

(Concentration 100 times in 50 liters of water)

A-tank (Stock solution)		
S.No.	Fertilizer grade/nutrient	Quantity in 50 liters of water
1.	Calcium nitrate (15.5:0:0:18.8 of NPK and Ca)	1.62 kg
2.	Ammonium nitrate	400 g
3.	Potassium nitrate (13:0:45)	700 g
4.	Iron chelate 3%	140 g
B-tank (Stock solution)		
S.No.	Fertilizer grade/nutrient	Quantity in 50 liters of water
1.	Potassium nitrate (13:0:45)	550 g
2.	Mono potassium phosphate (0:52:34)	680 g
3.	Potassium sulphate (0:0:50)	360 g
4.	Magnesium sulphate	1.12 kg
5.	Borax	10 g
6.	Zinc sulphate	4.3 g
7.	Copper sulphate	0.56 g
8.	Sodium molybdate	0.56 g

The above stock solution is prepared separately in 'A' and 'B' tanks. Twenty liters each of stock solution from 'A' and 'B' tank is added to tank 'C'. These 20 liters of each of A and B stock solutions are diluted to 100 times in tank 'C' with good quality plain water. Hence, the tank 'C' should have a total capacity of 2000 liters so as to get the dilution of 100 times from A and B stock solutions. The final solution must have the required pH and EC which is mentioned in the foregoing paragraph.

## Important cultural operations:

### Pruning of leaves:

The flower of anthurium originates in the axil of the new leaf and hence the older leaves needs to be pruned as they grow at the expense of the production of new flowers. An anthurium plant has to be thus pruned to retain adequate number of leaves, without any adverse effect on the flower production and quality.

In general, the more plants per square meter, the more leaves that must be cut more frequently. Also the position of the leaves influences the numbers of leaves per plant. Horizontal leaves are less economic than vertical ones. Generally 4 to 5 well grown healthy leaves should be retained per plant at any given time. Anthurium leaves can also be sold and it adds to the income of the grower.

### Removal of suckers:

Most anthurium plants naturally produce small suckers at the base of the plant. The sucker formations lead to a over crowded crop. It is a good idea to remove the suckers at an early stage. One removes suckers by pulling them out by hand. Never use a knife or scissors

### Addition of coconut husk:

As the anthurium plant grows, it put forth roots and they need to be covered for further growth of the plant. After every 8-10 months additional coconut husks are required to cover the roots. This media should be properly sterilized as mentioned earlier. It is an important operation since plant growth and flower production depends on this medium.

## Pest and diseases:

### Pests:

**Spider mites:** Attacks on lower surface of leaf. They suck sap and cause severe mottling and wilting of affected leaves. Bronzing of upper and lower surfaces of leaf. Controlled by Kelthane @ 1ml/ L or Vertimec @ 0.4ml/L at least 1-2 sprays early in the morning

**Caterpillars:** Makes large holes on the tender leaves. Spray with Lannate @ 1ml/L

**Thrips:** Brown stripes on flowers and leaves. Severe damage especially on young leaves. Vertimec @ 0.4ml/L

**Snails:** They eat root tips, damages flowers and buds. Spray metaldehyde with mixture of chick feed by which snails are attracted which can be collected in the morning and killed.



### Diseases:

**Bacterial blight:** This is a most devastating diseases of anthurium. The symptoms are mostly found on leaves and flowers and appear as water soaked spots with brown centre and yellow

outer edges. Blight damage spreads quickly and kills the plant. Good hygiene and removal of suspected plant parts has to be carried out. Spray streptomycin @ 1g/liter at every 8-10 days interval for 6-8 times

**Root rot:** When the growing condition is not proper, root rot is seen. Leaves turn yellow at the edges and hangs. Roots look brown. Drenching with Aliette @ 1.5g/liter at least 2 times in a 12-15 days interval



### Harvesting:

Anthurium flowers are harvested when the spathe completely unfurls and the spadix is well developed. Development of true flowers on the spadix is also used as a criterion for harvesting the blooms. When one third of the true flowers on the spadix mature, change of colour can be observed that moves from base to tip of spadix and that is the right stage for harvesting of flowers.

**Plate 4:** Flowering in anthurium under naturally ventilated polyhouse

Flowers are ready for harvesting after 8-10 months of planting. Average

yield is 5-7 flowers per plant per year for initial two years and 10-12 flowers per plant per year from 3<sup>rd</sup> year onwards. Leaves of anthurium can also be sold at a reasonable price.

## Packing:

Flowers are harvested with long (50-60cm) stalks. Harvested flowers are kept in water immediately to prevent wilting. For long distance transport, a piece of water soaked cotton is placed at the cut end with rubber band. Appropriate size polypropylene or polyethylene bag is used to cover the spathe and spadix of each flower to prevent bruising of spathe. Open end of the bag is stapled.

Flowers are graded as Extra large, Large, Medium, Small and Mini sizes. Flowers are packed in card board boxes measuring 60 cm (L) x 30 cm (W) x 22cm (H) keeping flower spathes on both sides to utilize the space (See Plate.5).



**Plate 5:** Packaging of anthurium flowers for long distance transport

## Yield and returns (100 m<sup>2</sup> /year)

Year	Flowers/ plant /year	Flower yield	Flower yield per 100m <sup>2</sup>	Selling price (Rs)	Returns per year
2 <sup>nd</sup>	5	35	3500	10	35,000
3 <sup>rd</sup>	6	42	4200	10	42,000
4 <sup>th</sup>	8	56	5600	10	56,000

### Prepared by

Dr. M.Thangam, Senior Scientist (Hort.)  
 Dr. S. Priya Devi, Scientist (Hort.)  
 Dr. S. A. Safeena, Scientist (Hort.)  
 Dr. A. R.Desai, Senior Scientist (Hort.)  
 Dr. V. Arunachalam, Principal Scientist (Hort.)  
 Dr. M. J. Gupta, Scientist (Agri. Structures and Process Engg.)  
 Dr.N.P.Singh, Director

### Published by

**Dr. N. P. Singh**

Director, ICAR Research Complex for Goa  
 Ela, Old Goa- 403 402

**E-mail:** director@icargoa.res.in

**Telephone:** 0832- 2284678/679, 2285381

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