

Cultivation Guide



Anthurium Cut flowers



Anthura[®]
unlimited in varieties

Introduction to Anthurium

Anthurium is the largest genus of the arum family, Araceae. A common feature of Araceae is the typical beaker-shaped inflorescence or arum, which consists of a bract and the spadix, on which the flowers are situated. Anthurium is an 'evergreen' that can produce flowers throughout the year. Both the flowers and the leaves of the crop are harvested.

Anthuriums originate in the Andes region of Central and South America, where the plants grow in a shady, humid environment. There are over 100 different types of flowers with highly diverse dimensions, shapes and colours.



Carisma®

Plant material

The plant material can be supplied in several ways. As a general rule, the smaller the plants, the more attention they require.

Pluggen

Plugs are made by growing one micro-cutting in a peat plug until the young plants reach a height of 8 to 12 cm. At this point, the young plants are approximately four months older than the tissue culture. Plugs cannot be planted directly in a growing bed or a final pot. It is better to continue growing the plugs in a 9 cm pot under protected conditions, preferably in a cultivating greenhouse. After approximately six months, the plants can be planted in the growing bed.

9 cm pots (20-25 cm)

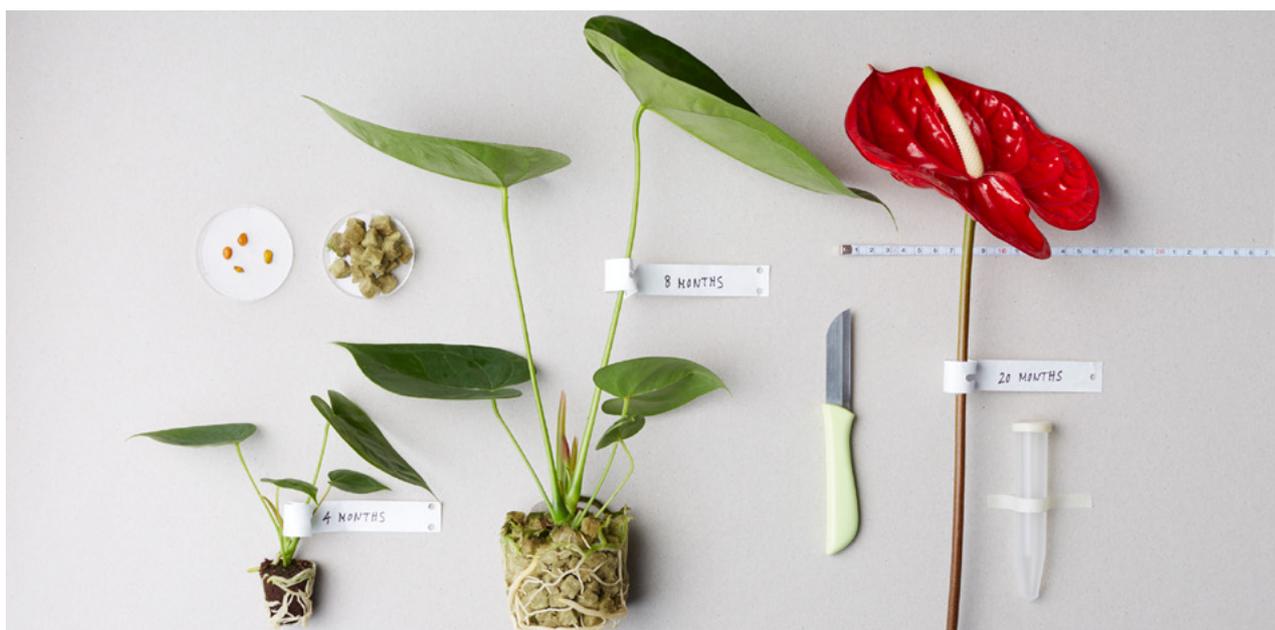
The plugs are planted in a 9 cm pot, filled with cubes of medium rock wool. Subsequently, the plugs are grown into plants of 20-

25 cm over four months. These plants can be processed in the beds directly or the final pot.

All plugs and pots are supplied with one plant per plug or pot, unlike Anthurium pot plants. With one plant per plug or pot, they have more space during propagation and are more uniform, which results in high quality and better production. Moreover, the cutting of leaves is easier, because the plants grow regularly and all plants stand separately.

Cultivation plan

The young plants should be unpacked immediately upon arrival so they can acclimate under cultivation conditions. They can then be planted. It is important that the plants are planted deep enough so that they enter the medium with already formed aerial roots. Therefore you need a depth of 12 to 17 cm (for plants in a 9 cm pot). However, it is important not to plant



10-15 cm plant, 20-25 cm plant and a flower ready for sale (from left to right)

the plants too deep, as then it could start stretching excessively. Too shallow is not good either, because then the plant will slowly grow out of its medium and quickly topple over. A good guideline is that the aerial roots just enter the medium, the growing point still being able to catch light. Be careful: the plugs cannot be planted yet, they should first be cultivated.

The planting density depends on the varieties. In the Anthura brochure you will find a column with the recommended number of plants per gross square metre. Four rows are always planted in a bed of 1.20 metres, and the distance between plants rows varies between 10 and 20 cm. The exact planting distance is calculated on the basis of the total surface of the greenhouse and the number of beds. We look forward to calculating the precise planting distance for you.

Because of its predominant epiphytic growth habit, the Anthurium grows best on an airy substrate. The cultivation of Anthurium takes a minimum of five to six years, so it is

important that the substrate has a stable structure. Above all, the substrate needs to offer enough space for root growth and the storage of oxygen. The growing medium can be divided into inert and non-inert media. The inert medium hardly changes, but sometimes retains slightly less water and fertilisers. The non-inert medium is often more widely available and cheaper, but changes over time. We very much prefer inert media like rock wool, oasis and perlite. Yet the plants can also be cultivated in non-inert media. Peat and coconut bark are the best options.

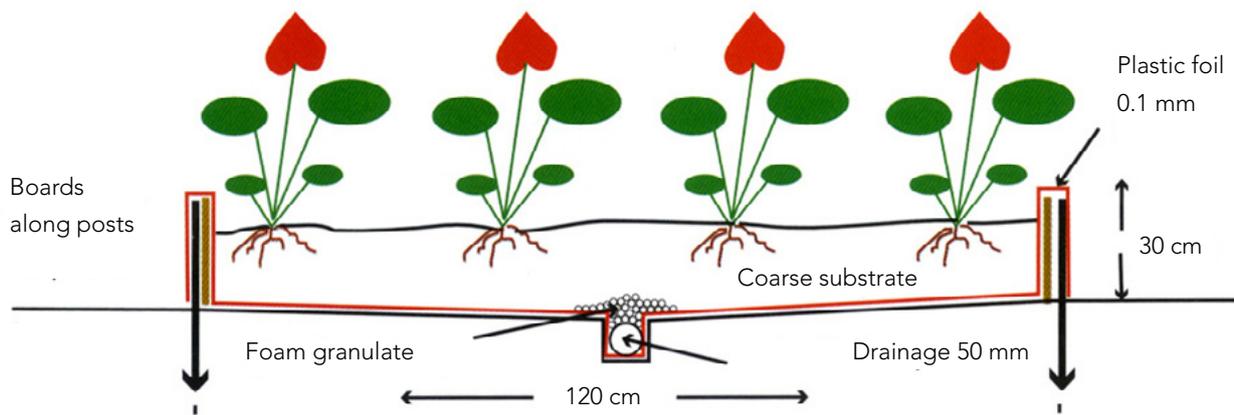
Anthuriums are grown in soil as well as in beds, pots or gutters. Preference is given to cultivation systems that are separate from the soil. In addition, cultivation on gutters is recommended. This cultivation method uses a smaller substrate volume and the water supply is better. In pot cultivation, the dripper is usually the weak link. Irrigation is never optimum as the number of plants in a pot varies. With the cultivation methods mentioned above, the substrate is separated from the soil, which helps to prevent diseases and pests from the soil reaching and affecting



The ideal planting depth



Rock wool cubes of 2 x 2 x 2 cm

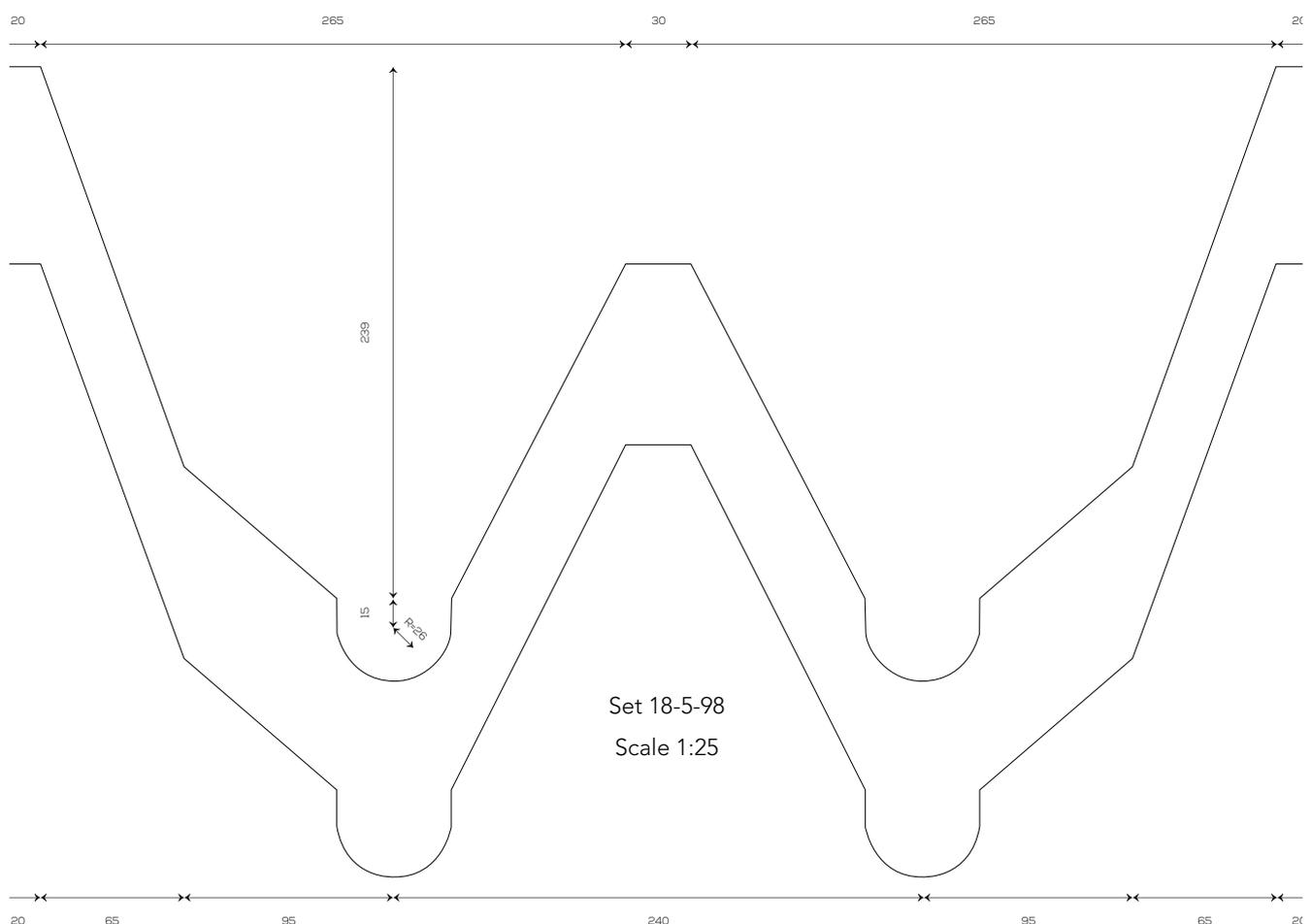


A growing bed for Anthuriums; there are numerous possible systems

the roots of the plants. The fall has to be judged carefully for this type of cultivation so the water distribution remains optimal over the entire bed, while the drain water is drained away.

also lead to an overly wet substrate. Keep to a fall of at least 0.05 percent (= 5 cm per 100 meter). When a greater incline is required, extra measures need to be taken with respect to the irrigation system.

Too sharp a fall can cause drying out at the head of the bed and results in a wet substrate at the lowest point. Moreover, the irrigation system will empty at the lowest point, which will



W-gutter schematic representation



Optimal drain collection system in which obstruction cannot occur and controls can be carried out easily

Irrigation system

It is important for all cultivation systems and substrates that a suitable irrigation system is installed. Our preference is for a system with both irrigation pipes (two pipes per bed, with 360° nozzles with a 60 cm nozzle distance, releasing 40-60 litres per hour per nozzle) and a drip system (20-25 cm dropping point distance: 1-2 litres per hour per dropping point). By preference you should use lockable nozzles/drippers.



High greenhouse with oasis as substrate and 180° nozzles

The cultivation system (or only the drain hose) is installed the length of the bed below the slope. When the cultivation only uses one irrigation pipe system, cork damage can occur in the flowers in the first six months of cultivation.

Water

Water must be free of chemicals and visible contamination diseases. Elements like sodium and chlorine must remain below the 4 mmole/litre level and the bicarbonate (HCO_3) may not be too high either (<6 mmole/l). In the absence of optimum water,



Growing bed with lava stone and 360° nozzles

water partially treated by osmosis must be used.

The water consumption of the cultivation depends on the climate, the substrate and the age of the crop. To a great extent, the relative humidity in the greenhouse determines



Cork damage in the flower



Combination of two rain and four drip systems

outlet water parameters					
sodium (Na ⁺)		Chlorine (Cl ⁻)		bicarbonate (HCO ₃ ⁻)	
mmol/l	mg per ltr / ppm	mmol/l	mg per ltr / ppm	mmol/l	mg per ltr / ppm
< 4,0	< 92	< 4,0	< 142	< 6,0	< 366

Table of outlet water parameters

water consumption. The system has to be suitable for a release of 3-5 litres per m² per day in situations where no suitable humidification system is present. If the optimal relative humidity (RH) is maintained, the maximum water consumption amounts to 2-3 litres per m² per day. This amount must be given over three to five hours.

Fertilisation

In Anthurium cultivations, single fertilisers are mainly used via a Dosatron® or A and B container system. Below you will find general advice on the basis of an A and B container composition. The requirements can differ according to the type. Bureau IMAC Bleiswijk B.V. can prepare tailor-made advice. You can also ask for advice on the basis of mixed fertilizers.

When the outlet water contains nutritional elements, the nutrition scheme has to be corrected. Bicarbonate (HCO₃) has to be neutralised with acid (phosphoric acid or nitric acid) in order to achieve the correct pH. The pH of the feedwater should amount to approximately 5.5-6.0 and the EC to 1.2 mS/cm in the summer and 1.5 mS/cm in the winter.

Climate

Temperature

Anthurium is a subtropical plant. Temperatures below 15°C and above 30°C have to be avoided as much as possible. Night temperatures of 15°C are usually not directly harmful

mmol/ltr	ppm / mg ltr	umol/ltr	ppm / mg ltr
7	NO3-N 98,00	20	Fe tot. 1,12
1,4	SO4 134,40	2	Mn 0,11
1	H2PO4 97,00	4,5	Zn 0,2925
0,34	NH4 6,13	20	B 0,22
4	K 156,41	0,8	Cu 0,0512
2	Ca 80,16	0,8	Mo 0,0768
1,2	Mg 29,17		

Nutritional elements target values

for the plant, but do have a negative impact on production. This also applies to a maximum temperature above 30°C. At temperatures above 30°C, production can be maintained by maintaining higher humidity. For good growth, an average of 22-23.5°C per 24 hours must be maintained.

Humidity

At excessive humidity, the photosynthesis will be lower. Prolonged excessive humidity increases the risk of problems with fungi and reduces the quality of the final product. It is important that more moisture is present at higher light levels. In countries with high humidity, a higher day temperature and a higher light level can be allowed. Humidity values between 60% and 80% should be pursued. In the case of humidity lower than 65% in the greenhouse, certainly in combination with higher temperatures, it is important that systems are installed to increase the humidity. We recommend choosing systems that do not wet the crop (high pressure humidification above in the greenhouse, irrigation pipe below the cultivation system, pad/fan systems etc.). It is important that clean water, like rain or osmosis-treated water, is used for the humidification.

Tank volume	1000 litre	Solution 100 times concentrated	
Solution A (Tank A)			
Calcium Nitrate	43,0 kg.	Ca(NO ₃) ₂	18,8% Ca 1,1% N-NH ₄ 14,4% N-NO ₃
Potassium Nitrate	13,0 kg.	KNO ₃	38,4% K 13,7% N-NO ₃
Micro-elements			
Manganese sulphate	34,0 gram	MnSO ₄	33% Mn
Zinc sulphate	130,0 gram	ZnSO ₄	23% Zn
Borax	191,0 gram	Na ₂ B ₄ O ₇	11% B
Copper sulphate	20,0 gram	CuSO ₄	26% Cu
Sodium molybdate	20,0 gram	Na ₂ MoO ₄	40% Mo
Iron chelate	2,8 ltr. or 3,7 kg.	Fe-DTPA	3% Fe
Solution B (Tank B)			
Mono Potassium Phosphate	13,6 kg.	KH ₂ PO ₄	28,5% K 22,7% P
Potassium Nitrate	13,1 kg.	KNO ₃	38,4% K 13,7% N-NO ₃
Potassium Sulphate	4,0 kg.	K ₂ SO ₄	41,5% K 18,0% S
Magnesium Sulphate	29,0 kg.	MgSO ₄	9,9% Mg 13,0% S

Fertilisation scheme

climate parameters cut anthurium					
	desired			Damage threshold	
	day	night	24 hrs period/sum		
light	300 $\mu\text{mol}/\text{m}^2/\text{s}$ / 15-20klux	-	9 mol/m^2	> 450 μmol *	-
temperature	22-25°C	19-20°C	22,0-23,5°C	>30°C**	< 15°C
Moisture deficit (MD)	6 gr/m^3 / 80%	> 2 gr/m^3 / <95%	-	> 8 gr/m^3 / <65%***	-

* at MD max. 8 gr/m^3

** at MD max. 8 gr/m^3

*** depending on of light/energy level/moisture level

**** depending on light/energy level

Climate parameters

When this is not the case, the crop and flowers will become contaminated with lime or algae infestations.

Light level

At the level of the crop, in the case of Anthurium andreanum, approximately 300 $\mu\text{mol}/\text{m}^2/\text{s}$ par light (20-25 klux) should be maintained. In the event of too much light, the leaf and flower colour bleach and burning can occur. A lack of light results in an overly-stretched and qualitatively lightweight plant, with a lower flower production. At maximum values of 1400 Watt/m^2 (around the equator) on clear days, a screening percentage of 80% is necessary. This can be achieved by using chalk on the cover and/or the use of screens.

In tropical countries, a shade net of approximately 75% screening is required. It is better to use two shade nets, i.e. a fixed screen of 60% and a second movable screen of 40%. This movable screen can be closed during sunny periods and in the middle of the day to avoid high peaks of light irradiation. At locations with a lot of rain, we recommend using a plastic screen. The crop stays dryer, as a result of which it suffers fewer diseases (bacteria and fungi). Another advantage is that the fertilisers leach less easily, as a result of which the nutritional situation remains optimal and the plant grows faster.

In order to make an accurate analysis of subsequent cultivation



Schaduwhal in de tropen

problems, it is important to record the main climate data such as light, temperature and relative humidity. Use a climate computer or hand meter and note down the minimum and maximum values every day.

Crop maintenance

As Anthurium grows according to the principle of leaf-flower-leaf-flower, it is necessary to carry out crop maintenance on the leaves. This can be done in different ways.



Lack of light incidence as a consequence of a traditional system

Traditional

Too much leaf often leads to curved stems and damaged flower buds. Regular leaf cutting is necessary to keep the crop open and to achieve a higher production of smooth flowers. The more plants per square metre, the more often and more leaves should be cut. In general, the plant must keep at least 2-3 leaves. Leaf cutting is carried out every 4-6 weeks. This varies per variety and depends on the plant density. The different cultivation strategies depend on the variety and its location.

Half-leaf system

This system starts with halving the new leaves 4-6 months after planting the young plants. The advantage of this system is that the crop architecture improves considerably. Thanks to the half-leaf system, more light falls on the crop and the production



Half-leaf system

and quality improve. Depending on the variety and the size of the leaf, the plants will have 4-8 half-leaves before the old lower leaves have to be removed. Leaf tearing is done every 10-14 days.

Young leaf-breaking system

This system starts with young leaf-breaking, after first building the optimal plant by means of the half-leaf system. The advantage of young leaf-breaking is that the production and quality increase and the need for labour decreases (less leaf cutting). Production can increase by 10%-25% depending on the cultivar, and the flower size can be 0.5-1.5 cm larger. The plant does not have to put any energy into the formation of leaves. Young leaf-breaking cannot be carried out continuously. After breaking off 2-4 leaves (4-10 months), they need to be replaced. The new leaf stands higher above the old leaves, as a result of which the light incidence in the bed improves strongly (optimal crop architecture). Young leaf-breaking should take place every week. When it is done for too long, the flower quality can diminish (less calcium uptake), the flower stem can become too short and the plant photosynthesis can decrease (noticeable by old/yellow leaves).



Young leaf-breaking crop with flowers standing above the crop



On the left, traditional cultivation; on the right, with young leaf-breaking

Diseases and pests

In Anthurium, relatively few diseases and pests occur naturally. Yet some of them can cause damage to the cultivation to a greater or lesser degree.

Animal pests:

Trips, aphids, white fly, spider mite and snails.

Trips and spider mite are the main pests in Anthurium.

Fungi:

Fusarium, Colletotrichum, Pythium, Phytophthora and Calenectria.

Bacterial diseases:

One of the diseases which causes the most losses in Anthurium cultivations is the bacterium *Xanthomonas axonopodas* pv. *Dieffenbachiae*, but the bacterium *Pseudomonas solanacearum* can also lead to considerable production decline. Bacterial diseases come from outside, including *Ralstonia*. The best control entails taking preventive phytosanitary measures. Buy Elite® certified material. This material is tested by NAK-Tuinbouw for internal quality (www.naktuinbouw.nl).

Watch out for phytotoxicity; not all pesticides can be applied without causing damage in Anthurium. For suitable control measures you can contact Bureau IMAC Bleiswijk BV. Orthene, Dichlorvos and Parathion are known to cause damage after their use. Anthurium is also sensitive to fadeouts and many other additives (sealants, amongst others). Before applying a new pesticide, the product must be tested on a few plants. Be aware of the slow reaction of the crop when making an assessment (which can be up to 10 weeks).



Anthurium flowers in a box

Sale

The flowers are ready to be cut when the spadix has ripened for three-quarters of its length. Ripening implies the discoloration of the spadix and the appearance of small dots on the opened flowers of the spadix. Readiness for cutting can also be determined by touching the flower stem directly below the flower; it must be hard and solid. Particular care is needed when cutting Anthurium flowers as they are easily damaged.

Conclusion

We hope that after reading this short cultivation guide you have gained some insight into the Anthurium cut flower cultivation. This specialist cultivation is simple to perform, provided that certain conditions are met. If you fulfil these conditions, the result will be beautiful, long-lasting flowers, which deserve a good place on the market. If you have any questions or queries, please be sure to contact us.



Anthurium leaves can also be sold, depending on the variety

Bureau IMAC Bleiswijk B.V

Bureau IMAC provides comprehensive cultivation advice, guidance for study groups, fertiliser research and advice, plant pathology research, advise as a result of analyses, and pot plant planning.

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