



Pot Anthurium cultivation guidelines







Introduction Anthurium

Anthuriums are members of the Arum lily family (*Araceae*). *Anthurium*, the largest genus in the Araceae family, includes the species *Anthurium andreanum* and *Anthurium scherzerianum*. The inflorescence of *Anthurium andreanum* is comprised of a spathe with a straight spadix bearing the flowers. *Anthurium scherzerianum* has a coiled spadix. An inflorescence can develop from each leaf axil. The foliage of *Anthurium scherzerianum* is somewhat more leathery than that of *Anthurium andreanum*. In nature Anthuriums grow in the Andes mountains of Central and South America, where they are to be found in shady locations.



Anthurium scherzerianum



Anthurium andreanum

Plant material

The plant material can be supplied in a variety of forms. In general the smaller the plants, the more attention they will require.



Tissue culture (2-3 cm)

Plugs (6-10 cm)

7 cm. Pots (10-15 cm)

Tissue culture

Plants grown by means of tissue culture are planted in plastic containers by the laboratory. Each container contains 30 or 40 plants. The nutrient medium (comprised of agar, without antibiotics) contains carbon (black) to promote the rooting of the plants. Some countries do not permit the import of tissue-culture plants on a black nutrient medium; it will be self-evident that in such instances Anthura can supply the plants on a white nutrient medium.





Micro cuttings

Micro-cuttings can also be supplied, provided that this is permitted under the phytosanitary regulations. Micro-cuttings are comprised of the tips of tissue-culture plants, and are transported in a plastic container without agar. From a technological perspective these plants are identical to tissue-culture plants, although they are often somewhat larger and sturdier. A great deal of experience in the cultivation of both tissue-culture plants and micro-cuttings is required if they are to be grown with success; hardening them off and raising them are both complex operations. Growers with insufficient experience run a great risk of losing many plants.

<u>Plugs</u>

Plugs are produced by growing two micro-cuttings in a plug of oasis (polyphenol foam) or peat until the plants are about 6 to 8 cm tall. These plants will then be about four months older than those grown by tissue culture. Plants in plugs cannot readily be potted up into the final pot (>14 cm). It is recommended that they are first allowed to grow further in 7-9 cm pots kept in reasonably protected conditions, preferably in a propagating house.

7 cm Pots (10-15 cm)

The plugs are planted in a 7-9 cm pot filled with coarse peat. The plants are then allowed to develop during a three-month period, until they reach a height of 10 to 15 cm. The plants in these 7 cm pots can then be immediately potted up into the final pot.

Almost all plugs and pots are supplied with two plants in each plug or pot. Most varieties are capable of branching from their own, as a result of which the plant will become sufficiently full. Varieties that do not readily branch are sold with three plants per plug or pot. These varieties are often grown in pots larger than 17 cm.

It is not recommended that plants are split; this may cause damage the roots, and it is conducive to mould growth. Suppliers other than Anthura B.V. usually supply one plant per plug, since their varieties usually have more abundant foliage. However experience gained in practice has revealed that double plants usually grow more rapidly than these single plants, independent of the variety, since double plants do not need to devote any energy to branching. Consequently Anthura varieties are often ready two months earlier. Moreover Anthura varieties often exhibit improved flowering properties during the winter months (when there is little light).



Plants that have been potted too deeply (left), properly (centre) and too high (right)

On arrival the young plants must be unpacked and allowed to acclimatize under the cultivation conditions. The plants can be potted up once they have become acclimatized. When potting up the plants it is important to ensure that they are vertical, located in the centre of the pot, and planted at the correct height. The growing point of plants that are planted too deeply are susceptible to disease, whilst plants that are not planted deeply enough will lack sufficient anchorage and consequently be unstable. It is also important to ensure that the growing point is not subjected to excessive pressure when the plant is potted up, since this could otherwise result in deformation of the foliage or permanent injury to the growing point.





The cultivation plan

Once the plants have been potted up it is preferable to set the pots next to each other, since the micro-climate – and consequently the growth – will benefit from as brief as possible a delay before the plants regain contact with each other. The plants must be provided with more space once the pots and/or the soil are no longer clearly visible. In general the plants will need to be separated by an additional 30%, so as to ensure that the leaves regain contact with each other within a period of a few weeks. Depending on the species, the cultivation period and the quantity of light it will be necessary to separate the plants by an additional 30%. Delaying the separation of the plants for too long will result in the poor development of the flowers and plants with a more extended shape. Excessive spacing of the plants will be detrimental to the micro-climate, and consequently to the growth. Bureau IMAC Bleiswijk B.V. is specialized in the preparation of cultivation plans.



A crop that is ready for spacing



A crop that has just been spaced

The following tables contain schedules for *Anthurium andreanum* and *Anthurium scherzerianum* in various pot sizes, inclusive of the number of weeks for each phase and the number of plants per square metre. These figures should be regarded as indicative, since they are influenced by factors such as the assortment, the size of the plant material, the season, and the desired quality.

Schedule for Anthurium andreanum						
	Duration of cultivatiion in weeks			Plants per m ²		
Pot size	14 cm	17 cm	21 cm*	14 cm	17 cm	21 cm*
Phase 1	8	10	6	49	34	49
Phase 2	10	10	12	24	21	27
Phase 3	18	22	25	14	11	21
Phase 4	-	-	14	-	-	8
Total	36	42	57			

* Phases 1 and 2 in a 14 cm pot (more than 2 plants per pot), Phases 3 and 4 in a 21 cm pot.

Schedule for Anthurium scherzerianum

Du	ration of cu	ltivation in weeks	Plants	per m ²
Pot size	10 cm	12 cm	10 cm	12 cm
Phase 1	12	15	100	69
Phase 2	16	19	45	23
Total	28	34		
The subst	rato			





In view of Anthuriums' primarily epiphytic growth preference is given to the use of a porous substrate. When selecting the substrate it is important to ensure for the presence of coarse particles for the drainage and fine particles for the retention and distribution of the water and the nutrients. In general, preference is given to a substrate containing 50-60% coarse particles and 40-50% fine particles (no dust). The coarse particles can be comprised of materials such as Irish peat, bark, or crushed granules. The fine particles can be comprised of perlite, peat litter, or fine bark. Ultimately the substrate will need to consist of 50% solids, 25% water, and 25% air. The substrate may not contain an excessive amount of dust, since this will otherwise result in the collapse of the structure at the base of the pot. In view of the long cultivation period it is also important to ensure that the substrate does not break down excessively rapidly. In addition to the substrate used in the pot, the drainage of the pot is also of importance. Subsequent to watering water may not remain in the lower region of the pot for an excessive period of time. In general pots of a size of between 14-17 cm are used; 14 cm pots are used for compact plants with a rapid development of the flowers, whilst 17 cm pots are more suitable for the somewhat larger species and plants requiring a longer cultivation period prior to becoming ready to flower.





Pot for cultivation on ground floors

Pot for cultivation on ebb/flow floors



Various components for a good substrate: perlite (left), fine bark (top, middle), Irish turf (bottom, middle), coconut fibre (top, right), coarse particles of peat (bottom, right)

Anthuriums are grown both on the ground and in tables/containers. The choice of the cultivation method will depend on the rate of turnover, the automation of the operation, and the required working height. It is important to ensure that the plants are provided with appropriate drainage, and that water can be supplied to the crown of the plants.



Anthurium on aluminium cultivation containers Anthurium on ebb/flow concrete floors



The irrigation system





Anthuriums can be given water either from above or below the plant. The top layer of the substrate may become very dry when plants receive water solely from below the pot during longer cultivation periods. Moreover the plants will assume a somewhat dull appearance due to the drier top layer and dust on the foliage. These problems can be avoided by watering the plants at intervals of 4-6 weeks, with water supplied either by sprinkler lines or spray booms.

The water must be free of chemical and visible contamination; moreover the water may not contain an amount of elements such as sodium and chlorine in excess of 100 mg/l, and may not contain an excessive amount of bicarbonate. In the absence of supplies of good-quality water it will be necessary to make use of reverse-osmosis water. The quantity of water required by the plants depends on the climate, the substrate, and the age of the crop. The irrigation system must be capable of supplying between 5-12 litres of water per m².

Fertilizers

Anthurium cultivation usually employs straight ammonium nitrate fertilisers using a Dosatron[®] or a system with mixing tanks. General advice based on the use of mixing tanks for the fertilizer is enclosed with these guidelines. The needs may vary from variety to variety; Bureau IMAC Bleiswijk B.V. can be requested to provide customised advice for the relevant variety, as well as for recommendations based on the use of compound fertilizers.

Caution should be exercised with manganese and boron trace elements, since Anthurium absorbs only very small amounts of these elements, which may consequently accumulate in the substrate. Higher concentrations readily cause tip-burn. Substrate containing a basic fertilizer is usually purchased with a content of 2-3 kg/m³ Dolokal and 0.5-0.75 kg/m³ NPK mix per m³ peat. This should result in a pH of the substrate of about 5.5, and an EC of 0.5 mS/cm. The EC of the nutrient solution should lie within the range between 800 and 1300 μ S/cm when the plants are watered from above, and between 1200-1800 μ S/cm when the plants are watered from above with a lower EC or a wetting agent is required when the plants are watered from above with a solution with an EC in excess of 1.0. The pH may fluctuate between 5.2 and 6.2.

 CO_2 enrichment at levels between 600 and 800 during the day is required for Anthuriums. Levels in excess of 1000 ppm should be avoided, since this can result in damage to the flowers.

System: Mixing tank; 1,000 litre tanks. Water supply: 100% rainwater; scheme code A. 0.0.0

Nitrate of lime $Ca(NO_3)_2$ 19.0% Ca, 15.5% N 61.0 kg Ammonium Nitrate (liquid) NH_4NO_3 18% N (9.0% NO3 and 9.0% NH₄) 0.0 kg Nitric acid 38% HNO_3 8.4% N, 6.0 mol H_3O^+ per kg 0.0 l Potassium nitrate KNO_3 38.2% K, 13.0% N 6.7 kg Iron chelate 3% (DTPA) 2.7 kg

A - solution, a concentration of 100 times





B - solution, a concentration of 100 times

Phosphoric acid 59%	H ₃ PO₄ 26.8% P, 8.6 mol H ₃ O⁺ per kg	0.0
Potassium nitrate	KNO ₃ 38.2% K, 13.0% N	12.3 kg
Potassium dihydrate phosphate	KH ₂ PO ₄ 28.2% K, 22.3 % P	20.4 kg
Potassium sulphate	K ₂ SO ₄ 44.8% K, 17.0 % S	15.0 kg
Epsom salt	MgSO ₄ 9.9% Mg, 13.0 S	20.0 kg
Manganese sulphate	MnSO ₄ 32.5 % Mn	50 g
Borax	Na ₂ B ₄ O ₇ 11.3% B	95.0 g
Zinc sulphate	ZnSO₄ 22.7% Zn	90.0 g
Copper sulphate	CuSO ₄ 25.5% Cu	19.0 g
Sodium molybdate	Na ₂ MoO ₄ 39.6% Mo	19.0 g

The climate

<u>Temperature</u>

Anthuriums are tropical plants, and consequently temperatures lower than 15° and above 30° should be avoided. For an appropriate growth e ndeavours should be made to maintain an average temperature of $19-21^{\circ}$.

Relative humidity

An excessively low relative humidity will reduce the rate of photosynthesis, whilst an excessively high relative humidity will increase the risk of problems with moulds. However these problems are rare. Nevertheless it is important that more moisture is present at higher light intensities. Countries with a climate possessing a high relative humidity may make use of higher daytime temperatures and light intensities. Endeavours should be made to maintain the relative humidity in the range between 60 and 80%. In situations in which the relative humidity is too low – and certainly in combination with higher temperatures – it is in important to install systems that will increase the relative humidity, such as systems that do not wet the crop (for example, high-pressure humidification in the upper regions of the glasshouse, sprinkler lines under the pots, path/fan systems, etc.).



Moveable screen for optimum light level



Shade hall in the tropics





Light intensity

A light intensity at the level of the plants between 18,000-25,000 lux (250-300 Watt) may be employed with Anthurium and reanum, and 12,000-18,000 lux (200-275 Watt) with Anthurium scherzerianum. Excessive light intensities will often result in pale foliage and flowers, whilst it is also possible that the plant will become burnt. Inadequate light intensities result in stretched and poor quality plants, with a lower production of flowers. At a maximum of 1400 Watt/m² on sunny days a shading percentage of 80% will be required, which can be achieved by the use of chalk and/or screens. For cultivation in tropical countries a screening net offering about 75% shading is required. Preference is given to the use of two nets, i.e. a fixed net providing 60% shading and a second movable net offering 50% shading. The movable net can be closed during dry periods and at the middle of the day, thereby avoiding peaks in the light intensity. The use of plastic screens is recommended when the plants are grown in regions with a great deal of rain, since this will result in a drier crop and a reduced incidence of disease (bacteria and moulds). An additional benefit offered in these conditions is the reduced degree of the leaching of nutrients from the substrate; as a result the nutrient concentration in the pots will remain optimal, in turn ensuring for a more rapid growth. So as to provide for a constant temperature and to ensure a good circulation of the air it is recommended that the gutter height should be between 3-4 metres above the plants.

For the purposes of subsequent thorough analyses of any cultivation problems that may occur it is important that suitable records be made of the most important climatic parameters, such as the light intensity, temperature, and relative humidity. These measurements should be made using a climate computer or hand-held meters; records should be kept of the minimum and maximum daily values.

Diseases and pests

A variety of diseases and pests can, to a greater or lesser extent, cause damage to Anthuriums.

Animal pests:

Thrips, the burrowing nematode (*Radopholus similis*), aphids, whitefly, mites, slugs and snails, and scale insects and mealy bugs.

Thrips and aphids constitute the most important pests affecting Anthurium. These insects can be controlled by spraying the plants with pesticides such as:

- Thrips Vertimec (a.i. abamectine 18 g/l) 70-100 cc per 100 litre water Mesurol (a.i. methiocarb 500 g/l) 100 cc per 100 litre water Violin (a.i. fipronil 80%) 3 g per 100 litre water
- Aphids Admire (a.i. imidacloprid 70%) 10 g per 100 litre water Pirimor (a.i. pirimicarb 50%) 50 g per 100 litre water

Moulds:

Fusarium, Colletotrichum, Pythium and Phytophthora

Bacterial diseases:

One of the diseases causing the greatest loss of Anthuriums is the bacteria *Xanthomonas axonopodas pv. dieffenbachia*, although *Pseudomonas solanacearum (I)* can also result in a considerable reduction of the crop. Infection with bacteria occurs from the exterior of the plant, and consequently preventive phytosanitary measures constitute the best remedy. Use should be made of material with Elite® certification, which is tested for its intrinsic quality by the Netherlands Inspection Service for Horticulture (NAK-Tuinbouw).

Caution should be exercised with respect to phytotoxicity; not all chemical agents can be used on Anthuriums without causing damage. You can contact Bureau IMAC Bleiswijk B.V. for information about adequate pest-control agents. Damage is known to occur when using pesticides such as Orthene, Dichloorvos and Parathion. Any new pesticide agent should be tested on a few plants prior to large-scale use.





It is also necessary to take account of the slow response of the plants when making an assessment of the effectiveness of a treatment (the response time can be as much as 10 weeks).

Sale

The plants are ready for sale once the flowers/foliage have developed to a sufficient extent and there is an adequate number of flowers on the plants. With many Anthurium species the older flowers do not die away immediately, but instead remain on the plant for many months. Although the older flowers have a different colour from the younger flowers, this is perceived as a feature offering an additional attraction. When the plant is made ready for sale any damaged leaves are removed and the plant is wrapped in a sleeve. Any foliage or flowers that are stained with lime or are dusty can be cleaned using a proprietary leaf spray. It is important that the temperature does not fall below 15℃ durin g transport.



Plants ready for transport to the market



A special pot for added value

Conclusion

We hope that these brief cultivation guidelines will have given you an insight into the cultivation of Anthurium pot plants. Although their cultivation is a specialized operation, it is certainly feasible provided that a number of conditions are met. Growers who fulfil these conditions will be rewarded with a beautiful plant that can readily be kept in a good condition, and which deserves an excellent place in the market. You are welcome to contact us should you have any additional questions, or require a further explanation of any issues.



In November 2002 our cultivation guide **'In pursuit of excellence'** was published in both the Dutch and English language (140 pages). This well illustrated guide describes in a very structured way the most important aspects of the Anthurium pot plant culture. It includes drawings, tables and pictures.

The guide will help growers answer very difficult questions regarding the culture and more important help avoid unnecessary mistakes, so that the grower can achieve a successful culture. Since the guide deals with both economic and technical aspects, the book can be considered the first complete guide regarding the Anthurium pot plant culture.

You can order the book now at Anthura!

Anthura B.V. and Bureau IMAC Bleiswijk B.V. cannot accept any liability whatsoever for any damage that may be caused to the crop by following the advice in these guidelines. Moreover in view of the fact that many factors are both outside of our influence and our control we are unable to guarantee specific results.





Introduction Anthura B.V.

Anthura B.V. is the world market leader for planting material of Anthurium for pot plant and cut flower culture with greenhouses covering 14 hectares. Besides Anthurium we specialise in the breeding, selection and propagation of Phalaenopsis for pot plant and cut flower culture. Bromeliad completes our current product assortment, and we are happy to offer growers abroad planting material from Corn. Bak B.V. From a growers perspective all of these products are compatible and in many countries are cultivated next to each other. At the establishments in the Netherlands (Bleiswijk) are 180 workers employed and at the establishment in Germany (Borken-Burlo) are 55 workers employed.

It is important that before you begin planting you are thoroughly acquainted with the various husbandry methods we recommend here. This will enable you to make a good start and allow your crop to realise its full potentials. Additional information can be sought through our visiting representatives and agents as well as from the independent consultant agency Bureau IMAC Bleiswijk B.V. Alternatively you can contact the Anthura Sales department.

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Introduction Bureau IMAC Bleiswijk B.V.

IMAC consultants are well educated individuals equipped with a great deal of practical experience gathered at home and abroad and dedicated to your success and ultimately to our own. Consequently there is a great deal of information exchange between our respective organisations upon which growers may call.

Because of our small-scaled mode of operation and a good consultative structure within our walls we keep each other well informed about the developments in the various cultures. Owing to the unique co-operation with Anthura a broad exchange of knowledge takes place between both companies without affecting the independence of IMAC. The activities of IMAC are not limited to the Netherlands only. Many foreign growers make use of the services of our consultation agency. Because of this international character the IMAC consultant is able more than anybody else to get the most out of your cultivation under your specific circumstances.

Activities of IMAC services world-wide include: advice on cultivation and management, support of study groups, fertilisation analysis and advice, studies in the fields of plant disease, business economics, plant evaluation and pot plant planning.

For more information, without obligation, you can contact the consultants at Bureau IMAC Bleiswijk B.V.

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