Cultivation Guidelines Phalaenopsis Pot Plant

Introduction

This growing manual describes in short the growing of Phalaenopsis potplants.
Of course this concise handbook is not all-embracing and the cultivation is subject to new insights and techniques. For more detailed information about the possibilities of this cultivation you can contact Anthura B.V. For all your growth related questions the consultants of Bureau IMAC Bleiswijk B.V. are pleased to help you.

In case you are not familiar with the products of Anthura B.V. and the services of Bureau IMAC Bleiswijk B.V., please consult the enclosed introduction of both companies.

Introduction Phalaenopsis

Phalaenopsis belongs to the largest family in the plant kingdom, the Orchids (Orchididae). These plants exhibit a monopodal form of growth (no lateral shoots), whereby the main stem continues to grow throughout the year and only one spray of flowers can develop from each leaf axil. Phalaenopsis hasfleshy distichous leaves.
In nature Phalaenopsis can be found throughout the entire tropical Asian region; in the wild the plants grow at daytime temperatures of 28-35℃ and night-time temperatures of 20-24℃, with a fairly high relative humidity. Phalaenopsis also prefers shaded conditions.
Phalaenopsis is able to absorb nutrients through the roots and the leaves. The roots also serve to anchor the plant.

Per leaf axil one flower can arise

Roots also serve for anchoring

Plant material

Anthura B.V. supplies the plants in flasks and/or nursery trays. Special conditions are required for the cultivation of plants in flasks. The benefits offered by the use of plants in nursery trays as compared to plants in flasks are a reduced loss of plants during cultivation, and a reduction in the cultivation period by 5-7 months. The plants in the nursery trays can be re-potted once they have grown 2-3 good leaves (leaf span 10-14 cm). The plants in the nursery trays must be sorted prior to potting. The plant supplier is unable to sort the plants in the nursery trays, and consequently for the time being this operation must be performed by the grower.

In general the plants are sorted into two grades, i.e. bigger plants and smaller plants. Small plants often require a 3-4 month longer cultivation period; small plants that are separated at the beginning of the cultivation can be kept together and will exhibit an improved growth

Young plants 5-8 cm in flasks

Young plants 10-14 cm in nursery tray

(increased control, and the absence of competition from larger plants). Replanting the small plants in the nursery trays often results in retarded growth and extra work and is therefor not recommended.

On arrival the young plants must be unpacked and allowed to acclimatize under the cultivation conditions of the nursery of the grower. The plants can be potted up once they have become acclimatized after a few weeks. The plants are held in position in empty pots, and the substrate is then poured in around them.

Manually potting of the young plants

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 will be unstable.
It is also important to ensure that the growing point of the youngplant is not subjected to excessive squeezing when the plant is potted up, since this could otherwise result in deformation of the foliage or permanent damage to the growing point.

The cultivation plan

Once the plants have been potted up the smaller species and the smaller grades are set next to each other. The larger species and grades may be placed immediately in squares. The micro-climate – and consequently the growth – will benefit from as brief as possible a delay

before the plants regain contact with each other. Proper timing of spacing of the pots is of importance if the development of a poor shape with long and small leaves is to be avoided. Moreover, smaller plants that are covered by others will not continue to grow, in turn resulting in less uniform lots.

Phalaenopsis cultivation involves three phases: growing, cooling, and finishing. Plants are transferred from the growing phase to the cooling phase once they have 3-4 leaves with a minimum length of 20 cm, when the plants will be of a size sufficient to encourage a uniform induction of flowering on storage at lower temperatures. Cooling can usually be effected at any time of the year, subject to the provision that the required temperature drop can be attained. A shorter cooling period results in less uniform flowering. An appropriate induction of flowering is achieved by cooling for 5-6 weeks with a temperature drop of approx. 6 ℃.

The lower temperatures and the higher light intensities required for the development of suitable sprays often results in the foliage acquiring a reddish hue. This is not a problem when this hue develops during the cooling period; subsequent to cooling the plants continue to the finishing phase, where they will be exposed to slightly higher temperatures so as to enable the flower to develop and the foliage to return to its original colour. Cooling and finishing may be effected in one and the same area; however in view of the use of mechanical cooling it is often more economical to use a smaller room. Moreover a slightly higher temperature over 24-hour periods can be achieved in a separate finishing room, which is beneficial to the time required for completion. Bureau IMAC Bleiswijk B.V. is specialized in the preparation of cultivation plans.

Modern greenhouse with cooling and outside screen

Plants big enough for cooling

Growing in West Europe mostly takes place in a separate area, taking up about 48% of total space requirements. Cooling and finishing can take place in the same area. This will take up about 52% of the total space requirements. However, preferably, there should be two separate areas. The cooling department requires about 16% of the total space requirements.

Example of spacing distances and weeks for Phalaenopsis:

	Operation	Pot size	Plants per m^2	Weeks
1st Phase - pricking out from beakers	Pricking out	crate/tray	344	20-30
1st Phase - growing	Potting up	12 cm	63	22-27
2nd Phase - cooling	Spacing	12 cm	37	6
3rd Phase - finishing		12 cm	37	10-12

The total duration of the cultivation in 12 cm pots is on average 50 weeks.

The substrate

When selecting the substrate it is important to ensure for the presence of coarse particles for the drainage and fine particles (not dust) for the retention and distribution of the water and the nutrients. The substrate may not contain an excessive amount of dust, since this will otherwise result in too much compactness of the structure at the base of the pot. A mixture commonly used in the Netherlands is comprised of bark (12-16 mm) and 2-3 kg/m^3 sphagnum moss. Coconut fibres and chunks are also frequently used. However coconut fibres suffer from the disadvantage that that the top layer of the substrate dries out extremely quickly; moreover the support inserted in the pot to support the flowers will be less stable. 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.

Care should be taken to ensure that the substrate is kept fully moist during the first month, and that the top layer does not become too dry. Large fluctuations in the moisture content of the substrate during the first weeks will be difficult to correct later during the cultivation.

Substrate has to be coarse


Sphagnum also a suitable substrate

The irrigation system

Since Phalaenopsis receives a ureum-rich fertilisation and is grown in a very porous substrate it is important to supply the water to the crown using either 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 m^2 per hour.

In general 12-cm pots are used for the cultivation. Phalaenopsis is grown both on the ground and on benches. 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.

Fertilizers

Phalaenopsis cultivation can employ either compound fertilizers, a system with separate mixing tanks for the fertilizers, or straight ammonium nitrate fertilisers. General advice based on the use of separate mixing tanks for the fertilizer is enclosed with these guidelines. The requirements is variety dependant; Bureau IMAC Bleiswijk B.V. can be requested to provide customised advice for the relevant variety.

When using a basic fertilizer on the substrate it is important to ensure that the fertilizer contains Dolokal (< 3-4 kg/m^3) and PG mix.
The pH may fluctuate between 5.2 and 6.2. The EC of the nutrient solution should lie within the range between 0.8 and 1.2 mS/cm; a subsequent rinsing is not required. Caution should be exercised with an excessive application of nitrogen in the form of ammonia and ureum, since this can result in an excessively luxuriant foliage.
In view of the low needs for CO_2 Phalaenopsis does not need supplementary CO_2.

System: Mixing tank; 1,000 litre tanks

Water supply: 100% rainwater

A - solution, a concentration of 100 times

Nitrate of lime	$Ca(NO_3)_2$ 19.0% Ca, 15.5% N	28.0 kg
Ammonium Nitrate (liquid)	NH_4NO_3 18% N (9.0% NO3 and 9.0% NH_4)	23.0 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	0.0 kg
Iron chelate 3%	(DTPA)	3.0 kg

B - solution, a concentration of 100 times

Phosphoric acid 59%	H_3PO_4 26.8% P, 8.6 mol H_3O^+ per kg	0.0 l
Potassium nitrate	KNO_3 38.2% K, 13.0% N	20.0 kg
Potassium dihydrate phosphate	KH_2PO_4 28.2% K, 22.3 % P	21.0 kg
Potassium sulphate	K_2SO_4 44.8% K, 17.0 % S	0.0 kg
Epsom salt	$MgSO_4$ 9.9% Mg, 13.0 S	10.0 kg
Manganese sulphate	$MnSO_4$ 32.5 % Mn	55 g
Borax	$Na_2B_4O_7$ 11.3% B	100 g
Zinc sulphate	$ZnSO_4$ 22.7% Zn	55 g
Copper sulphate	$CuSO_4$ 25.5% Cu	50 g
Sodium molybdate	Na_2MoO_4 39.6% Mo	25 g
Urea	$CO(NH_2)_2$	10.0 kg

Premature flowering

Most flowering is induced at the required time by means of the use of the cooling period. However in some instances the plants begin to flower spontaneously, i.e. 'premature flowering'. When this occurs with plants that have a sufficient size already then it is best to proceed to the cooling or finishing of the plants; the lower temperatures will result in the growth of more flowers on the sprays. However the premature flowers will need to be removed if the plant is still too small. If this is done quickly/immediately the spray will be still be soft, and can be pinched off; however when the spray is a little older it will need to be cut away. If the lowest bud on the spray is not cut away it may develop at a later period of time; in general these lateral shoots are of a poor quality.

An uniform spiking

Premature flowering

The climate

Temperature

The Phalaenopsis is a tropical plant, and consequently temperatures lower than 15℃ and above 32℃ should be avoided. For an appropriate gr owth endeavours should be made to maintain an average temperature of 26-27℃ during t he growing phase and 19-21℃ during the finishing phase. During the cooling phase the temperature must be maintained between 18-20℃. A temperature of 18℃ is particularly nece ssary in the event that the induction of budding needs to be enhanced in conditions of inadequate light or high daytime temperatures.

Light intensity

The provision of sufficient light during the cultivation is of importance to the development of suitable foliage and roots. Excessive light intensities will result in burning of the foliage. Inadequate light intensities result in straggly and poor quality plants, with an inadequate spray and insufficient root development. At a maximum of 1400 Watt/m^2 on sunny days a shading percentage of 80-85% will be required, which can be achieved by the use of whitewash and/or screens. For cultivation in tropical countries a screening net offering 85-90% shading is required. Preference is given to the use of two nets, i.e. a fixed net providing 65% shading and a second movable net offering 65% shading. The movable net can be closed during sunny 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 heavy rainfall, 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. The following light intensities at the level of the plants can be employed for the various phases of the cultivation:

Growing	5,000	-	8,000 lux
Cooling	7,000	-	9,000 lux
Finishing	8,000	-	12,000 lux

In countries in which the light intensity is more constant throughout the year 20% more light may be permitted, provided that the light is diffuse. However it is important to ensure for a higher relative humidity at higher light intensities.

Registrate climate conditions by hand or by climate computer

A greenhouse with artificial lighting and movable screens

Relative humidity

Although Phalaenopsis can protect themselves reasonably well from the effects of an excessively low relative humidity, their growth will nevertheless benefit from a relative humidity that is not too low. However a high relative humidity in combination with high temperatures increases the risk of bacterial diseases. 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 region of the glasshouse, sprinkler lines under the pots, pad/fan systems, etc.)

Higher day-time temperatures and light intensities are permissible when the plants are grown in countries with a high relative humidity. 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

Appropriate hygienic measures in combination with the weekly removal of diseased plants prevents the spread of most pest and diseases . Infection with bacteria, in particular, occurs as a result of water splashing on the plants, or during handling; these diseases cannot be controlled using chemical agents. A summary of the most important diseases and infestations is given below.

Bacterial diseases

Pseudomonas cattleyae is the most important bacterial disease inflicting Phalaenopsis. The disease can be recognized from the characteristic brown patches on the leaves, which have a oily heart or spot and are surrounded by a yellow rim. An infection with *Pseudomonas* begins as a small dark pit in the leaf. The spread of the disease can be countered to some extent by an adjustment of the amount of nitrogen, hygienic measures (the removal of diseased plants) and the maintenance of a constant relative humidity. Chemicals have no effect on the disease. Good and healthy planting material will prevent problems with bacterial diseases.

Moulds

Root problems
Large fluctuations in the moisture content or the EC can cause damage to the roots, thereby enabling moulds to attack the tissue. The quality of the roots when the plant is potted up is also of important to an appropriate growth. In the event of problems with the roots the EC should be maintained at a sufficiently low level; the moisture content of the substrate should also be reduced temporarily.
Botrytis
Petal blight *(Botrytis)* is manifested in the form of a large number of small spots on the flowers; it is caused by the plants remaining wet for too long a period of time, or by an excessively high relative humidity.

Viral diseases

On occasion Phalaenopsis may exhibit a poorer growth as a result of viral infections, with symptoms such as smaller flowers and the retarded development into a full-grown plant; however some species are virtually unaffected. Viral diseases often become apparent in or subsequent to the cooling phase, since the plants will have been subjected to slight stress during this period of the cultivation. Loss of plants due to viral diseases can also occur with lots exhibiting a poor growth. Viruses can on occasion be tolerated in Phalaenopsis, since the disease is not highly infectious as long as no flowers are cut off. In severe instances the removal of the diseased plants is the only remedy. Buying healthy plant material prevents these viral problems.

Pests

Phalaenopsis can suffer from pests of a variety of organisms that can, to a greater or lesser extent, cause damage to the plants.
Slugs and snails
Slugs and snails chew round holes in the young parts of the plant, and a large number of plants can suffer damage within a few days. Small slugs and snails can also chew away the tips of roots, causing damage resemblant of sciarid larvae. Slug pellets in the pots and the floor offer an effective means of controlling slugs and snails.

Mites
The red spider mite causes a slight deformation and silvery discolouration of the leaves. This mite is more localized, and can be controlled solely by pesticides such as Vertimec (a.i. abamectine 18 g/l), 25-30 cc per 100 litre water.
Sciaridae (fungus gnats)
Large numbers of sciarid larvae attack the root tips; large numbers of larvae of the fungus gnats are particularly likely to be found in the last plants of big lots. The preventive deployment of the *Hypoaspis* predatory mite (100-150/m^2) is often sufficient to prevent infestation.

Abnormalities because of climatic circumstances

Bud loss
Buds may become detached from the sprays during the finishing phase if the temperature is excessively high in relationship to the light intensity. Bud loss can also occur if the roots or the plant as a whole are of a poor quality, or if the plant has not been hardened off in the appropriate manner prior to delivery.

Cooling or transport spots
Plants transferred from the growing phase to the cooling phase may develop sunken spots on the foliage. These spots are caused by the death of some or all of the cells. These cooling or transport spots may also develop as a result of stress and an excess of light on moving the plant.

Caution should be exercised with respect to phytotoxicity; not all chemical agents can be used on Phalaenopsis without causing damage. You can contact Bureau IMAC Bleiswijk B.V. for adequate pest-control measures. 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.


Staked plants ready to be sleeved


Plants ready for the consumer

Sale

The spikes of Phalaenopsis are braced using support sticks to carry the flowers. The supports are placed at the time that the lowest bud on the spray begins to swell (to the size of a marble), since thereafter the spray will not grow any longer. Moreover it then becomes possible to estimate the number of flowers that will develop on the spray. The support must not project beyond the spray, and it must be inserted close to the plant so as to ensure that the spray is sufficiently braced.
A wide variety of grades are customarily employed for Phalaenopsis. In addition to colour, the plants are also graded according to spray length, number of buds, branching, and numbers of sprays per plant. The number of sprays per plant is the most important of these criteria, followed by branching and the number of flowers per spray. The price increases with the number of sprays and buds.
The plants are ready for sale once the flowers are sufficiently developed. During the darker periods of the year the trade requires 4-5 flowers per spray to have opened on delivery; during the other periods 2-3 open flowers is more than sufficient. When the plant is made ready for sale any damaged leaves are removed and, if required, the plant is wrapped in a sleeve. It is important that the temperature does not fall below 18℃ during transport.

Sleeved plants ready for transport


A nice result, Anthura "Gold"

Conclusion

We hope that these brief cultivation guidelines will have given you an insight into the cultivation of Phalaenopsis pot plants. This specialized cultivation 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.

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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