



Cattleya

Introduction:

The following is a guideline for growing orchids of the *Cattleya* alliance. *Cattleya* and relatives are native to Central and South American rainforests and are low to high altitude, warm cultured (with some notable exception as *Cattleya dowiana*, some *maxima*, some *rupicolous Laelia*) or lithotropic (grow on rock outcrops) orchids. *Cattleya* generally have a pseudobulb with either a singular thick leaf (unifoliate) or two leaves (bifoliate) protruding from the bulb. Flowers are singular or clustered, large, bright and often scented. Unifoliate *Cattleya* have thick leaves used for water storage as well as the bulbs therefore these plants can go considerable amounts of time without water. Although there are many types within this alliance including cool, intermediate and warm types, the guideline below gives a good idea of the methods in which to grow these brilliant orchids. Following below will allow you to grow the hybrids, and many popular species. Some notable differences will be mentioned such as *Laelia anceps*, as they are popular on their own.



Pot Type:

Cattleya require a good amount of air. Any pot type can be used, however for the effect of air movement or allowing the pots to dry better between irrigations, in humid conditions terracotta pots or net type pots with side holes can be beneficial. Cultivated *Cattleya* and *Laelia* are generally grown in plastic pots with good drainage holes. In all cases media should be able to dry out substantially between irrigations. With Orchiata re-potting should not occur unless plants have started to outgrow their pots.

Pot size used:

Depending on the method of purchase of young plants, different potting methods may be used. From flask, plants may be potted out into community pots or 2 inch pots until they can be hardened off. This time is crucial as it is important that disease does not cause mortality.

Plants however can be grown via division and therefore divided and planted straight into 3-4 inch pots. For divisions at least 3 pseudobulbs should be kept to ensure strong re-growth. It must be noted that the timing to divide is essential, and many varieties have been lost because the plants have been divided at the wrong time.

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Depending on the end use of the plants e.g. for final sale of flowering plants or cut flower, the pot type may differ:

1. Potting from flask: Community pot or 2 inch pot (5cm)
2. Second vegetative growth: potting into 3 – 4 inch pots (7-10cm)
3. Final potting and/or flower initiation for full plant sale, in the Minicatts group: 5 -6 inch (12cm)
4. For standard 'corsage flower' *cattleya*, and for cut flower production a potting will occur from 6 inch into 8.5inch (21cm pot).

Plants from flask are at their most vulnerable and must be cared for to encourage strong root growth which will create strong plants later on. As well they do not differ from their mature counterparts, and even seedlings out of flask will not root if the growth cycle is not at the proper stage for rooting.

Grades to use:

Initial Planting:

For initial planting from flask direct into community pots or 2 inch pots, a variety of media can be used. Classic or Power Orchiata can be used, it is essential however that if Coir or Sphagnum is used that the plants are allowed to dry out well between each watering. If Orchiata is used plants will be able to dry out sufficiently and become easier to manage. Coir and Sphagnum will become old and waterlogged after a while, eventually killing the roots at a later stage.

Second potting:

For younger plants being transferred from 2inch and/or community pots into 3 -4 inch pots, Power Orchiata should be used. All media from the previous potting should be removed and fresh media should take its place, especially if Sphagnum moss or Coir was used initially. Mixing Coir or Sphagnum with bark for *Cattleya* will increase the moisture holding and may potentially cause problems for plant management. It can, in specific conditions, solve problems by allowing a stronger capillary action to take place and dry the roots. See Time and requirements at re-potting for more explanations to keep *Cattleya* root well and alive.

Third and/or final potting:

Cattleya, especially when mature, require high amounts of air around the roots. As they are generally epiphytic plants, the need for air and good drying spells are important for growth. For potting into larger pots 5-6 inch in the third potting or into 8 inch (21cm) pots for cut flower production, a larger grade bark nugget such as Power+ or Super Orchiata will provide good amounts of air around the roots. Drying time will be reduced and watering can be easily managed. Salts are less likely to build up and slow release fertilisers can still be used in cut flower plants. Cut flower growers will also find that the larger nugget bark will reduce future re-potting requirements as the material will last longer.

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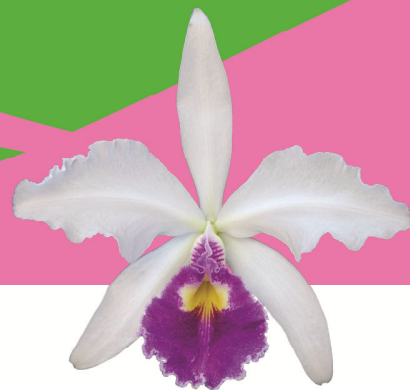
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The following are the *approximate* amounts of Orchiata grades required at re-potting:

Pot Size	Grade to use	Litres of media required (approximate)	Approx grams/pot (40% moisture)	#40L bags per 1000 pots
Community pot	Classic or Power	-	various	various
2 inch (5cm)	Classic or Power	0.060 – 0.100	30 – 60g	1.5 – 2.5
3-4inch (9-10cm)	Power	0.250 – 0.550	125-200g	6.25 – 13.75
5-6 inch (12-15cm)	Power+	1.0	400 - 450g	18.25 - 25
8.5 inch (21cm)	Power+ or Super	3.0	1000g	75

Time and requirements at re-potting:

First of all, it is essential to understand what keeps and what kills *Cattleya* roots. Damage from change of media will kill the roots. Aerial roots being repotted in the media will as well die in most instances.

The roots survive when the Orchiata is 'dark' but the root outer layer appears whitish few hours to a day after watering maximum. If the outer layer is consistently green it means too much water, the root tips will stop growing, and the roots themselves will start to die. Therefore the Orchiata must be 'humid' but not up to the point of wetting the root. With this fragile equilibrium the plant will be at its maximal growth speed.

Time at re-potting will depend on the growth of the plants. Generally *Cattleya* are re-potted when they have outgrown their pot which they are currently in. This may be 3 -4 months for smaller pots or 12 – 18 months for larger pots. *Cattleya* do not like to be over potted and plants which are in too much media may struggle to dry out properly leading to root disease. Re-potting should also occur just before periods of new root growth. For the first few weeks after re-potting plants should be kept dryer than usual to help protect the roots, the exception is if there are new live root tips, the plant must be grown as normal. A light misting can be applied after re-potting to help the plants along. Broken roots will rot in the pot, so preventive trimming of any broken roots are strongly recommended. Whilst Phalaenopsis can take up water and nutrients with partially broken roots, *cattleya* roots will be useless, then die and decompose. The decaying material in the pot can in turn acidify it and promote whole plant rot.

At re-potting all old media should be removed. Do not try to forcefully remove the chips of media on the roots, as it will damage them. *Cattleya* do well in media which is fresh. Also any dead roots or dead/diseased bulbs should be removed with sterile utensils to prevent further disease from developing. If re-potting goes well then root development should be seen shortly after with new shots soon to follow. Usually the older bulbs and growth will be placed in contact with the pot side, the new growth will be placed towards the middle of the pot.

Spacing's at planting:

There are four aspects which can aid plant growth by the plant spacing's: humidity, disease, light and moisture. All four aspects are linked: when plants are placed too close together the humidity will be increased and air movement is reduced. This leads to increased drying time of the media and a warmer microclimate. These conditions ultimately lead to pests and diseases such as

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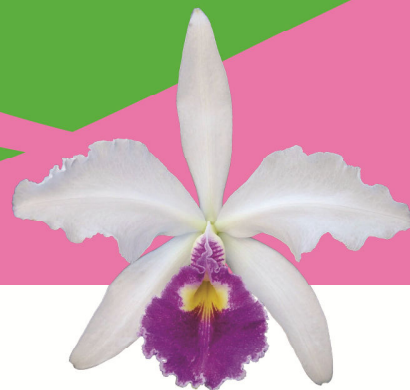
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fungus gnats and root rot. Leaves are also likely to overlap as they grow ultimately competing for light.

Cattleya require good air movement, therefore spacing between pots are very important especially in times of high humidity. When plants are small pots and trays can be close together however when potting into larger pots; 3 -4 inch and above, spacing's need to be increased to allow good air movement. For cut flower production plants are very large and spacing can be modified if there is artificial air circulation.

The following table is approximate plants per m2 of bench space:

Pot Size	Plants/m2	Spaces between pots	Time in pot
2 inch	200 – 300	-	3-4 months
3 inch-4 inch	70-100	2cm	6-12 months
4 inch	60 - 70	4- 5cm	6 – 12 months
5-6 inch (flower initiation)	25-30	8 – 10cm	6 -12 months (or less for flowering)
8.5inch	7.5	10cm	2-3 years
Total time until flowering:			18 – 24 months

Humidity & Air:

Generally *Cattleya* do not like high humidity. Humidity of 50-60% is recommended in winter and humidity of up to 80% can be provided in summer as long as there is very good air circulation to prevent disease. A light misting can be applied at morning and night to help to provide humidity if required when watering is not taking place. *Cattleya* like higher night time humidity, with lower daytime levels. Attention must be paid that too high humidity will spoil the flowers.

Temperature:

Temperature requirements can vary with the differing *Cattleya* types. There are a great many however they can be split into three categories: cool, intermediate, and warm species. In all cases young plants prefer a 5-7°C degree difference in temperatures and need to be kept slightly warmer than their mature counterparts. More mature plants can tolerate a 7-10°C degree difference in temperature:

The following table indicates the requirements for each type:

Type	Winter Temperature		Summer temperature	
	Day	Night	Day	Night
Cool	10-15°C	7-10°C	15-18°C	7-15°C
Intermediate	18-20°C	12-15°C	18-25°C	15-18°C
Warm	21-25°C	18-20°C	21-29°C	18-20°C

Warm *Cattleya* can tolerate up to 35°C if humidity is high and air movement is ample. It is important to remember that, due to the light requirement, the actual temperature of the leaf can

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be much higher than the air temperature. As a result it is wise to touch the leaves during the peak illumination time to check the temperature. A meter can of course be used for that purpose. Temperatures of over 40°C degrees will result in stunted growth and over 45-46°C degrees there will be considerable damage. The damage will be seen days or weeks after it actually occurred. The plants need to take up enough water, so they can cool down themselves due to the evaporation that occurs.

In winter it is important that in time of very cool temperatures humidity is dropped so the plants are much drier and air circulation is high.

Light:

Light is an extremely important aspect for *Cattleya* as the light levels initiate flower bud formation. They prefer bright but indirect or dappled light to mimic rainforests 585-1000 micromol.m².s⁻¹ (3000 – 5000fc). During growth periods leaves should have a medium green colour as this will indicate correct light levels. During summer 35% shade can be given but *Cattleya* can tolerate reasonably high light levels. In winter no shade is required as long as air movement and humidity is reasonable. Be careful not to apply water on sunny days as sun spotting can occur on wet leaves. Very dark green leaves indicates the light level is too low and yellow leaves or leaves abscising can be due to the light level being too high. Some species require specific conditions, such as *Laelia anceps* or the rupicolous *Laelias*, with extremely high light levels. *Schomburgkia* has some members that have similar requirements, as do some of the Brazilian *Cattleya*. The very high light levels required by those species must be balanced by proper ventilation, and in fact one of the secrets of Rupicolous *Laelia* culture is a balance between very high light levels and temperatures.

Light requirements for flower bud initiation

There are differences again in species here depending on their natural occurrence. Some *Cattleya* are long day plants (flower after a period of days at lengths of 16hrs) while others are short day plants (flower only after a period of days at 9hrs). Different *Cattleya* species will require these specific needs before flower initiation occurs. *C. labiata*, *C. mossiae*, *C. percivaliana* and *C. trianaei* are short-day plants where a winter short day period is required before flower initiation will occur whereas *C. gaskelliana* requires a period of long days.

There is also indication in many species that a cold dry spell along with the shorter days might help to initiate flowering. *C. mossiae* is one of those species. Artificial bud formation can be achieved by falsely reducing day length (covering plants) and dropping temperature to provide blooms all year round.

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Fertiliser:

Cattleya and its relatives are heavy feeders when they are in active growth. During dormancy, however, fertilizer levels should be reduced, but not completely suppressed.

Feeding properly is important, and when a growth is completely matured, the grower may wish to get a second growth for that year provided light and temperature conditions are sufficient. A nitrogen boost once the growth is finished can result in a disaster, as new growth will form a much smaller and weaker growth due to light levels or temperatures not being optimal. The new growth could also block the blooming of the previous fully matured growth. In such cases the grower is best advised to make only as many growths per year as he can do whilst being sure they will have proper conditions.

There are differences in what growers might prefer however a balanced fertiliser of 20-20-20 NPK +trace elements is used at 0.5g/L when the new growths appear, to be raised to 1g/L when the new roots emerge. When the growth is tall enough, a 10-20-30 or similar fertilizer must be used at 1g/L, as *Cattleya* need to have enough potassium in order to mature strong bulbs. Fertilizer must be applied at every watering when the plant has optimum light levels. If few cloudy days are expected, the fertilizer can be omitted until conditions improve. In suboptimal conditions, the level can be decreased to 0.5g/L.

Media will need to be checked often for EC build up and flushing to take place if EC levels get above 1.2mS/cm.

If liquid feed is applied separately, applications should be at least every two weeks during periods of high growth and reduced to once a month during low growth. When growth has matured and blooming is about to occur, nitrogen rates can be reduced and potash increased to help create strong blooms.

For longer term potted plants, controlled release fertilisers can be used at re-potting (e.g.4.5gm/pot at re-potting of a 20-20-20+TE 100 – 180day fertiliser). This can help reduce the liquid feed requirements and reduce labour/costs in industrial pot plant production. The fertilizer should be applied when the new growth emerge, only once per year, as it will provide too much nutrient during dormancy, possibly initiating the previously mentioned 'secondary weak growth'.

Magnesium is an important component to prevent old growth defoliation, and can be applied every other month, at 1g/L, instead of the standard feeding.

Irrigation:

Irrigation strategies need to be controlled to ensure *Cattleya* are drying out fully before re-watering. In cultivation systems, young plants in full growth are irrigated under automated systems while smaller growers and cut flower/blooming productions may be hand watered to prevent getting water on the blooms.

Very wet roots in warmer conditions appear to prevent proper oxygen uptake by the roots. Some growers are using sprinklers several times per day for *Cattleya*, keeping the roots permanently wet, but with high oxygen content water at all times. It is generally not recommended as when

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irrigation is stopped for a few hours root tip death and plant damage will occur. The reason is that the *Cattleya* roots need oxygen and CO₂ as well as water in cycles.

Cattleya need to have a dry period in between watering and therefore larger grades of Orchiata help to ensure the wet-dry cycle. When irrigating, the media should be fully wet but before the next irrigation cycle the media should be allowed to dry out so that most of the roots in the pot are dry. This can easily be seen, especially in clear pots by checking the root colour. Greenish or slightly translucent means the roots are still wet, and white roots are 'dry'.

During summer irrigation may occur every 3-7 days depending on climate conditions. Smaller pots will require more frequent watering, while larger pots may require longer drying times. If humidity needs to be increased in morning or evening, misting can be applied which will not affect the roots. During winter irrigations may be reduced to once a month. Some *Cattleya* may also require a 6-10 week rest period without water or nutrients during winter to help mature the bulbs. In all cases plants must dry thoroughly during the cooler months to prevent disease.

Testing:

Testing of Media:

Every 4 – 5 weeks the media of the different pots should be tested to ensure salt build up is regulated. Salts will eventually build up on some bark due to the exchanges sites; with Orchiata, flushing is not generally required however if fertiliser is being applied at each irrigation a regular EC and pH check must be made.

To check pH, use the pour through technique:

Using a medium – moist pot, place a clean collection container underneath the pot and then apply clean fertiliser free irrigation water evenly to the top of the pot (the amount will depend on pot size – 4 inch approx 250ml for bark). Collect the runoff (enough for testing – 40ml) and then test.

Media itself can also be tested with a 1:1.5 v/v extraction technique and the extract tested although this takes more time and is not practical in many greenhouse situations.

In many cases the best indicator that testing is required is root tip death. If the root tips are alive and growing in the media, it is very unlikely that there are any pH or EC problems.

Water Quality:

This is another aspect which must be checked. Water can affect the plant growth by diseases present, lack of calcium and magnesium and build up of bicarbonates in the irrigation lines. If water is sterilised prior to use through UV light etc then disease will not be a problem however if water is sourced from wells or local water, then testing must be carried out 2 – 3 times a year for water borne diseases. Water is a common dispersal agent for many diseases which affect orchids. Water should also be tested for the Ca and Mg content as well as the hardness. If Ca and Mg are not present in the water then these must be applied at some point in the fertiliser solution. If the water is hard and contains high amounts of bicarbonate then lime scale may build up in irrigation lines, and white marks may occur on leaves of the orchids. This can be corrected by applying an acid such as Phosphoric Acid to the application water.

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Troubleshooting:

Beneficial organisms:

Orchiata is not a sterilised media; it is in fact packed with natural beneficial organisms which will aid against pathogenic species. In some cases fungal growth may appear. If this is a concern then take good photographs of the fungi and send for ID or send media to a local laboratory for ID. In most cases it may mean that the media is not being allowed to dry out sufficiently therefore reduce irrigation rates. It is very important for *Cattleya* that the media is able to become dry before re-watering; if this does not occur then root death may become apparent. In fact many *Cattleya* are not able to extend their roots if they are kept permanently wet. It is a serious issue for some of the species in the Laelia, such as *purpurata*, *tenebrosa*, *Cattleya dowiana*, which will have extensive root death if kept too wet, followed by plant loss. *Cattleya* are not able to restart new roots from the older growth, so they need to be kept alive until the new growth is able to make roots. In some species without old live roots it is simply impossible.

Algal growth and fungus gnats:

These can sometimes be seen on the tops of pots. Gnats can cause pitting on the leaves of orchids although they only feed on fungi. These are both indications that the media is too wet, although algal growth can occur after a while but is not of a concern as long as the root tips are alive and elongating. As previously mentioned by increasing times between irrigations to allow the media to dry out will reduce this issue.

White build up on media:

This is usually lime scale and is caused by the bicarbonates in the water. Check water pH and add acidifying agents if pH is too high.

Discolouration of leaves:

This can be caused by many things e.g. too little light can lead to dark green leaves as well as soft growth which can collapse. High light levels lead to yellowing and leaf spotting. Manganese and Zinc deficiencies can induce deep white old leaves, whereas Magnesium deficiency will defoliate the older bulbs all of a sudden. Magnesium deficiency can be mistaken for bacterial rot as the old leaves become yellow, then watery and collapse extremely quickly when they reach this point. The same symptoms will appear on recently matured leaves as a result of calcium deficiency. They are not diseases but strongly debilitating for the plant and can in turn induce real pathogen problems.

Virus and disease management:

Cattleya and their relatives are also subject to virus as the flowers are a sought after commodity petal stripe can occur through viral transmission and poor climatic conditions. When division or mericlones are taken ensure that the stock is virus free. When purchasing from another source make sure they are virus certified and never assume that mericlones are virus free. Many growers do not have any concern about virus as long as plants or flowers can be produced, which is a mistake. Virused *Cattleya* will usually exhibit strong symptoms in their blooms as soon as the conditions are less than optimal. Flower lifespan will be greatly reduced and in some varieties the plants will be weak and die after a few years. SL Falcon as an example was lost to a virus decades ago and many other varieties disappeared due to virus as the plants were too weak to continue growing for an extended period of time. Cut flower varieties were especially

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susceptible and many dinner plate *Cattleya* varieties have been lost for a long time. It is important to buy virus test strips and test the plants. If they are isolated from each other and no insects are present, it is recommended to check twice per year to guarantee the given plant is virus-free.

Fusarium is a slow-killing disease that affects more and more *cattleya* recently. It shows up as black streaks and rots on the rhizome; this does not progress very quickly when the plants are kept on the dry side. If they are kept wet, fusarium can eventually kill the new growth pretty fast. It is best to discard any plants that show symptoms of rhizome growth.

Cattleya are also susceptible to many pests including scale, mite and slug/snail damage due to the succulent leaves. Ensure your greenhouse is clean and there are no places for these creatures to come from.

Calcium Deficiency:

Another common problem especially since growers have been using of RO water, is calcium deficiency. It shows up as a chlorosis then necrosis of the tip of the emerging leaf. As a preventative it is good to spray heavily the plants with Calcium chloride at 1g/L every two weeks. Calcium nitrate should not be substituted as the nitrate will either be taken up by the plant or used by microorganisms and what would be left soon would be only insoluble calcium at a high pH which will result in local micronutrient deficiencies.

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