Cymbidium

Introduction:

The following is guideline for growing *Cymbidiums* in Orchiata. It is aimed at helping the grower to ensure that any areas of concern have some guidance. It is important however to remember that growing and climate conditions will differ from greenhouse to greenhouse and country to country. The guide speaks of *Cymbidiums* in general although it is well known that there are both heat and non heat tolerant varieties as well as terrestrial and epiphytic. From experience different *Cymbidiums* will generally grow in similar conditions although specific varieties will need extra care.

Pot Types:

Cymbidiums are grown in a variety of plastic pot sizes. Pots are usually black or dark in colour as most specie's roots are not actively photosynthesising like those of *Phalaenopsis* for example. Healthy roots are indicated by large bright white tips and cream colour roots. *Cymbidium* roots must have plenty of room to penetrate and grow; they do prefer humidity within the root zone and prefer ample water. It is nearly impossible to overwater Cymbidium in active growth as long as the pH and EC are correct.

Pot sizes used:

Depending on the end use of the *Cymbidium* they may be grown over a few different systems. Two year *Cymbidiums* are taken out of community pots and grown over 24 months to full flowering. Here they are force flowered and the plants may be smaller to those of other systems. This is a high production method:

1. Community pot from flask (with 5 – 150 plants present), plugs or individual 6cm pots
2. 9cm pot – first vegetative growth
3. 12 cm pot – second vegetative growth
4. 16/18 cm pot final potting and flower initiation – sale

For three year *Cymbidiums* and *Cymbidiums* grown for cut flowers the growing schedule may incorporate more pot sizes:

1. 6/7 cm pot between community pot and 9cm pot
2. 15/16 cm pot – which may either be incorporated between 12 and 18cm or as a final potting stage itself.

In all cases the idea is to get a stable root structure within each of the growth sections and to have a healthy plant which can sustain 4 flower spikes before sale. Frequent repotting will increase the labour cost but can improve the growth speed tremendously.

Grades to Use:

Cymbidiums being terrestrial orchids grow best in either straight bark products, hydroponics set ups or Coir but this needs a constant feeding schedule. Rockwool has been used on an industrial scale especially for cut flowers but is difficult to properly use due to its high pH after a period of time.

Orchiata grades used depend on climate as well as the size of the plant. With Coir mixtures they are typically used in some climates to increase the moisture content of the potting medium, however caution must be taken with salt levels and micronutrient deficiencies. Coir tends to favour Pythium in the warmer climates requiring a steady fungicide schedule.

Initial planting – Community pot:
Plants from flask are very fragile and there is high potential for plant mortality at this time. It is recommended to use straight Orchiata at this stage as it is easier to control the substrate moisture and salt levels. Young *Cymbidiums* grow best in the finer Orchiata Precision or a mixture of Precision with Classic (50:50)Orchiata. Ensure the media is moist prior to potting out as this assists the plant recovery.

Secondary Potting:
For young plants coming out of community pots into either 6/7cm or 9 cm pots, a fine to medium grade such as Classic Orchiata alone is the best. This grade allows a good amount of humidity to remain in the pot, good root to media contact as well as moisture retention. Slow release granules sit well on the media which will allow good control if such feeding schedule is used. Mixing Orchiata with other media will only shorten its lifespan and is not required. In dry conditions, NZ Sphagnum moss can be blended with Orchiata but it is something we do not recommend.

Third potting – approx 18 months:
This includes 12cm and or 15/16cm pots. Classic or Power Orchiata are now the most popular grade for pots ranging from 12cm and above. The particle allows the media to dry out sufficiently allowing better control of irrigation especially in the winter months. This also helps to combat against disease with pots being able to dry out. It is difficult to choose exactly the grade simply by hearsay however Classic will be more successful in hot weather or drier humidity conditions, due to its ability to retain and supply more water. Power is recommended in humid conditions, but in fact, when the watering and feeding are adjusted little difference is to be expected in the growth quality. Classic may require less water which must be considered in areas where good water is scarce or difficult to produce.

Coir can also be mixed to a 50% portion; again the chip needs to be a similar size to that of the Orchiata nuggets to ensure air spaces are not filled up. Moisture levels will also be increased so irrigation may need to be reduced. Larger plants are more tolerable to the salt levels of the coir however it is still important to either wash or buffer the Coir media first. Some varieties however

will respond adversely to even the tiniest amount of coir in the potting mix producing stunted yellow leaves.

Final Potting:
This includes planting into 15/16cm and 18cm pots for flower growth and sale. Power or Power+ Orchiata should be used as the plants are in the media for a longer length of time a larger particle is beneficial for many reasons. To help control moisture, allow root growth, control pH and EC better as well as having a media which last longer before breaking down. Both grades will interact with slow release granules to provide a perfect nutrient environment for the plant.

For cut flower production again Power or Power+ Orchiata are recommended as plants may not be re-potted for some time and the particle size will last >5 years in the pot. It will also be resistant to salt build up and change of pH due to a lower surface area.

Summary:
In all cases Orchiata used in the pots previous to re-potting can be reused for *Cymbidiums*. Note that controlled release fertiliser granules will need to be reapplied. Mixtures with coir should be removed to ensure salt build up is not an issue especially in younger plants. In older plants and final potting the media can be reused as long as the EC levels are suitable and there is no sign of disease.

A good practice is to look at the root type. Cymbidium pumilum hybrids, or thin rooted cymbidium will do better in the smaller grades, where hybrids of Cymbidium tigrinum, or fat rooted Cymbidium lowianum will prefer the bigger grades. It is important that the potting mix supplies enough water and enough porosity for the roots to colonize the pot unobstructed. One of the earlier problems with coir based potting mixes was the fact that when enough roots are produced in the pot, the pressure applied by the roots to the blocked potting mix would be damaging to the roots.

The following are the approximate amounts which will be required at re-potting:

Pot Size	Grade(s) used	Previous media retained (L)	Previous media removed (L)	Approx grams/ pot (40% moisture)	#40L bags per 1000 pots
Community Pot	Precision	Various	Various	-	various
2.5 inch (6/7cm)	Precision/ Classic	0.125	0.250	100 – 125g	6.25
3.5 inch (9/10cm)	Classic	0.250	0.550	180 – 200g	13.75
5 inch (12cm)	Classic or Power	0.150 – 0.250	0.750	280 – 300g	18.15
6 inch (15/16cm)	Power	0.200 – 0.300	1.050	320 – 420g	
7 inch (18cm)	Power or Power+	0.200 – 0.350	2.00	450 – 550g	

Time at Repotting:

Time at each repotting is generally linked to growth stages as well as the occupancy of the pot. When plants gain a new shoot or the roots are being restricted the plant requires repotting into a larger pot. Community pots and small root trainers will have plants in for just 2 – 3 months as they are hardened off or transitioned to other greenhouses. *Cymbidiums* will generally stay in medium sized pots such as 9cm or 12cm pots for approximately 6 months to allow them to build roots and develop shoots. Reducing the amount of potting will help to reduce plant shock. Plants will remain in larger sized pots for more than 12 months to allow flowering.

During repotting remove any dead tissue such as dead or damaged roots as these have the potential to harbour disease in the future. Be careful repotting when new roots are emerging from the growth. Older roots can be trimmed up to 10-15 cm from the base of the bulbs; leaving them untouched and broken will only encourage rot. Use sterile utensils to carry out such work.

Plant spacing:
Within community pots from flask, plants can be planted reasonably close together (2 – 4 cm apart) as the main purpose here is to harden the plants off and grow at least one strong root.

Small to medium sized pots such as 6/7cm and 9cm pots can be placed side by side as plants are still generally small. Growers will fill trays and get the maximum amount of plants per m2 depending on the bench set up. Having plants close together will increase humidity so irrigations may need to be less. Also continue to check for disease as plants so close are more prone to disease and insect spread. Slugs and snails especially like this type of set up. This will equate to around 60 - 100 pots per m2 of bench space.

For larger pots such as 12cm, 15/16cm and 18cm plants are much larger and leaves may droop in some species. Larger plants require good air movement around the leaf and flowers to prevent disease and encourage good growth. Therefore a pot space should be placed between each pot so that there are offset gaps between the plants. This may mean only 10-20 plants per m2 however growth and management will be encouraged. When used for cut flowers the spacing can be increased as pot sizes may also increase in size.

Pot Size	Plants/m2	Spaces between pots	Time in pot
Community pot	Variable	-	2-3 months
2.5 inch (6/7cm)	125	-	2-3 months
3.5 inch (9cm)	100	1cm	6 months
5 inch (12cm)	50 - 60	1cm	6 months
6 inch (15/16cm)	20 - 30	1 pot space	6-12+ months
7 inch (18cm)	10 -20	1 pot space	12 months
Total time			26-38 months

Temperature and Humidity:

Cymbidiums require a moderate humidity level. Plants should be kept at humidity levels of 40%-60% most of the time however they can tolerate humidity levels of 60 – 80% in times of high light which will help to also reduce temperature levels. Humidity should also be reduced to 40-60% at flowering, and air movement should be continuous to prevent *Botrytis* from spotting the flowers.

Temperature is the most critical factor in blooming *Cymbidiums* of either type. During regular growth *Cymbidiums* should be subjected to day temperatures of 25-28°C and night temperatures of 15-18°C. During summer temperatures should not exceed 30°C to reduce temperature a light misting as well as shading can be applied.

Some varieties can respond well to very high temperature and illumination, however many may not enter dormancy and produce many new growths on immature forming growth. This would be considered to be a major problem and the whole production can be set back by as much as 2 years.

Upwards of 50% shading may be required in the summer and 20% shading in the winter.
For flower initiation, a cooling period needs to occur. For 2-4 months depending on variety day temperatures should not be higher than 20 – 25°C and night temperatures should be approximately 8 – 12°C. *Cymbidiums* can withstand cooler temperatures and light frosts although this may affect the quality of the plant. Severe frosts up to -8°C are not a problem as long as the plant is slightly dehydrated and the sugar content of the leaves and bulbs is not too high. It is a commonplace in China or Vietnam where many varieties are grown, mostly hybrids of Cymbidium lowianum, tracyanum and even eburneum. Once flowering has occurred temperatures may be set at days of maximum 25-28°C and nights 15-18°C again. Once flower spikes appear flowers become susceptible to temperature again and too higher temperatures can cause flower abortions. Warmer tolerant varieties can withstand up to 28°C however less heat tolerant varieties (most cymbidiums) require a very steady temperature during this period with day temperatures 18-25°C and nights 10-18°C depending on variety. Consistency is the most important factor here. There are however hybrids recently made by New Horizon Orchids that are able to withstand 35+°C in full bloom. The grower must never buy a big batch of any specific variety as a rule as some varieties will not tolerate higher temperatures or cooler temperatures or lower humidity, so a test phase is required to commercially grow any Cymbidium variety.

Light Levels:

Cymbidiums can withstand relatively high light levels compared to other types of orchids. The leaves show distinctive colours when they are receiving either too little or too much light. Dark green lush foliage indicates low light levels whereas pale and potentially scorched leaves which are drooping indicate too higher light levels.

During early growth light levels can reach 500-800 micromol/m2/s1 – this may require 50% shading especially in summer months. Regular growth should see levels of 800 – 1000 micromols.m2.s1 which are relatively high light levels – 30% shading during summer. At flowering light levels should be 100 – 1500 micromols.m2.s1 with very little shading required depending on the variety, flower colour and temperature. Some varieties of *Cymbidium* may need lower light levels as striations in colour may occur through the light levels.

Shading is often carried out by a section of shade cloth which can manually or mechanically be pulled over the benches containing the orchids.
It must be noted that in some production areas of China, Vietnam and even Korea, the plants are grown in the open sky with full sun at higher elevations. The leaves do not become hot but the intensity of the light is extreme. They are heavily fed and produce absolutely massive plants with massive flower spikes. Leaf scorching is not as much a factor related to the light than a bad combination of too higher temperature and added light that allows the leaf temperature to pass a critical stage.

Fertiliser regimes and Irrigation strategies:
Fertilisation of *Cymbidiums* occurs by two means: Control release granular application or Liquid feed applied to the roots. Control released is very popular in Japan or Korea where regular feeding is favoured in Europe and the USA.

A proper schedule is a high Nitrogen when the growth starts until the leaves have expanded fully, switching to high Potassium when the leaves are nearly mature. The important points are to obtain the biggest, strongest possible bulbs short of burning the leaves or roots by using high levels fertilizer.

Some growers combine a standard 20-20-20 fertilizer controlled release type and add on top a various NPK fertilizer according to the growth stage. As an example they will supply ca. 100ppm of each N and K with a slow release and use a liquid feed with 0-100 ppm N and 100-0 ppm K to make any combination from 100-200ppm N and 100-200ppm K.

Controlled release granules e.g. Nutricote & Osmocote:
These are used in *Cymbidium* growing as the length of time plants are in the pots can be longer than other types. Six months until re-potting is a perfect length of time for a 180 day release granule. Too long and a release fertiliser may have an adverse effect and eventually induce a new growth flush whilst the previous growth is not yet finished. This new growth flush will block the flowering.

Control release fertilisers help reduce labour and allow maintenance and management to be easier. pH and EC checks still need to be made and extra fertiliser applied if required such as dolomite, mostly to control the pH, and additional calcium and magnesium. Adding hard tap water to the water is another option to keep the pH at a proper level with the slow release fertilizer, as these fertilisers tend to lower the pH.

Generally with control release fertilisers, new granules are applied at time of each re-potting with a specific length granule applied for that potting schedule. You can also apply the granules when the new growth is approximately 10 cm tall for the standard size Cymbidium.

A set amount is applied for each pot size e.g. 4.5g applied around the top of a 9cm pot, 10 g for a 12cm pot. Extra granules may be reapplied to pots which are grown for longer. Temperature and moisture dictate the fertiliser release which allows the nutrients to be available when the plants are actively growing. The release depends on the brand, some being released by an osmotic process (water, having a lower salts concentration will pick up fertiliser from inside the

granules), some by heat, some by simple humidity and some will have an additional release phenomenon by bacteria attacking the coating.

It must be noted that one granule does not contain all the elements, there are granules with simple components, and various granules are blended together to ensure the suitable NPK/trace elements as described on the package. As a result, it is best to re-blend the granules, to ensure that the slightly bigger particles are not on top of the bag, and the smaller ones on the bottom, which would induce an uneven feeding.

Using controlled release allows irrigation to occur when the plants require water; pH of the water with a full controlled release feeding schedule is generally fed at 6.5 pH with an EC <0.3mS/cm.

Liquid Feed:
Equal parts NPK are applied using either a compound, readymade fertiliser blend or a unique tank set up where growers use a complete fertiliser mix which constitutes equal parts NPK e.g. 18:18:18 plus eventually Ca & Mg and trace elements. Often flushing is carried out prior to feeding to allow salts to be removed and to wet the surface to allow nutrients to stick.

pH of the nutrient solution should be approximately 5.5 and an EC of 0.8-1.2mS/cm. Extra calcium and magnesium can also be applied here as magnesium is essential for *Cymbidium* growth. These are recommended as pulse feeding and can be alternated with a standard NPK/Oligo elements package. Calcium should be supplemented as a 50/50 mixture of calcium nitrate and chloride, plain calcium nitrate will increase the pH dramatically.

Peters Professional All rounder with an NPK of 20 – 20 – 20 is also a general fertiliser which can be used as a compound fertiliser. One plain standard composition is straight 20-20-20, and monthly 5 parts 20-20-20, 1 part Ca(NO3)2, 1 part CaCl2, and 1 part MgSO4.

It is essential to use a fertiliser that has at least 1/3 of its nitrogen as either ammonium or urea. Plain nitrate fertilisers are a disaster for Cymbidium and can increase the time to maturity by 1-2 years. Some hybrids will produce yellow leaves and extremely small bulbs. Cymbidium being heavy feeders and fed on an all nitrate nitrogen fertiliser will pick it up quickly, creating a huge increase of pH. One popular hobbyist fertilizer, MSU, is made only of nitrate and can result increased pH in one day after watering to 8.2, which would lock most of the nutrients and induce an extreme deficiency.

Application can be by either overhead irrigation or by hand application, the fertigation water must penetrate well into the pots as roots are from top to the bottom of the pots.

Irrigation:

Cymbidiums do like ample amounts of water and must be irrigated regularly. It is impossible to overwater a Cymbidium during its growth. In fact frequent irrigation can be beneficial as it supplies nitrogen on a constant basis, where sparse irrigation or sparse feeding will induce peaks of nitrogen resulting in greatly slowed down growth.

For pots fertilised with CR granules, irrigation can occur when the plants require it. Apply a good amount to saturate the pots. When the top of the pot starts to turn a lighter colour it is time to water again. All pots must drain well and not have pooled water in the base. During summer months (hot dry conditions) irrigation may be every day to keep pots moist and to increase humidity to keep the temperature down. During winter months irrigation may be dropped back to 7 – 10 days. Pots must be allowed to dry sufficiently but not dry out completely. During days of high light irrigation should be kept to mornings and evenings to prevent burning of leaves.

Fertiliser must be applied at every watering. During winter time many growers use a high potassium phosphate/potassium nitrate blend, to supply mostly potassium. Some excellent growers use potassium chloride as the only 'fertilizer' during dormancy.

Pots can be checked for irrigation requirements by lifting or weighing a pot; over time knowledge will build up of the weight of a dry pot requiring irrigation. Do not let pots dry out completely as it creates cracks in the roots that are a perfect entry point for various diseases.

Testing of Media:

Every 4 – 5 weeks the media of the different pots should be tested to ensure salt is not building up. Salts will eventually build up on bark and coir due to the exchanges sites; with Orchiata, flushing is not required for each irrigation. Flushing is best done with fertiliser. For Controlled release fertilisers flushing may not be required at all and testing can be carried out every 8 weeks.

The proper way to carry flushing is to water until the pot is wet, then approximately an hour later water heavily with fertilizer. Using pure water to 'flush' will result in deficiencies and various problems.

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. A desirable EC is 0.8-1.2mS/cm. 1.2 – 1.5mS/cm is getting high while >1.5mS/cm requires a flushing cycle. pH can also be tested and the in-feed solution corrected to change this. Increase the ammonium, chloride, sulphate and phosphorus contents of the fertiliser to decrease the pH, and increase the nitrate to increase the pH, as a general rule.

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.

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 diseases 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. Using a simple paper filter such as the pre filters for reverse osmosis systems is enough to prevent most diseases from entering the system.
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 in 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. Nitric acid is often recommended, however as it will be taken up by the plants as a nitrogen source, the resulting pH correction will be compensated by the plant and eventually result in a pH higher than the previously corrected pH.

Troubleshooting:
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. Some fungus bloom in Orchiata then will disappear forever, and many, whilst unsightly, are not a concern for plant growth.

Orchiata also contains dolomite to help prevent magnesium deficiency and keep pH stable. However over time especially in long term *Cymbidiums* calcium and magnesium will be displaced and the pH will drop. Dolomite as well as calcium and magnesium fertilisers can easily be applied to correct this. Magnesium deficiency is a common deficiency in *Cymbidiums* with the notable whitening of the tips of the leaves. Another common deficiency is iron, which will result in whitish growth. Pure white growth with tiny brown spots is a sure sign of either manganese or copper deficiency in *Cymbidium*. Root stunting can be due to a zinc deficiency. A good practice is to use Mancozeb twice a year and a copper hydroxide compound such as Kocide twice a year to prevent the deficiencies or low levels of some trace elements. Kocide for *Cymbidium* must be applied with a blend of calcium carbonate and at very low rates. We recommend 4 grams of Kocide + 8 grams of calcium carbonate ultrafine powder for 10 litres of water. It is well below the manufacturer's recommended concentration and the calcium carbonate is added to avoid a pH drop that can cause a copper fast absorption, followed up by a phytotoxic effect.

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. Increase times between irrigations and allow the media to dry out.

White build-up on media: this is usually lime scale and is cause 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. cooler temperatures lead to dark lush leaves while too much light leads to whitened or yellowing leaves.

Roots should also look healthy when repotting. If roots look brown and/or burnt, check EC – especially in mixtures containing coir. Salt build up can be a common cause of tip burn in *Cymbidiums*.

Fusarium in recent years has become a real problem in *Cymbidium*. It can be recognised by black depressions in the bulb or roots, sometimes yellow slow progressing rot that will kill some growth much faster if the humidity level increases.

When deflasking seedlings, sometimes an entire batch dies after becoming simply sludge. Whilst sometimes it can be due to phytium, it is as well due to the tissue culture media and flasks. It is recommend to use Ridomil drench at 2g/10 litres straight after deflasking.
To try to palliate that problem the seedlings can be dried slightly after being deflasked, but not too much. It is due to an extremely high content of sugars and methanol in the tissue, in a phenomenon called 'anerobic respiration', where the plants are surviving on simple alcohols they manufacture, and sugars. It is a very difficult condition to correct and is mostly due to the laboratory that did the flasks in the first place.