

HINTS ON GROWING *CLIVIA*

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Produced by the Clivia Society

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The opinions expressed in this publication do not necessarily reflect the views of the Clivia Society

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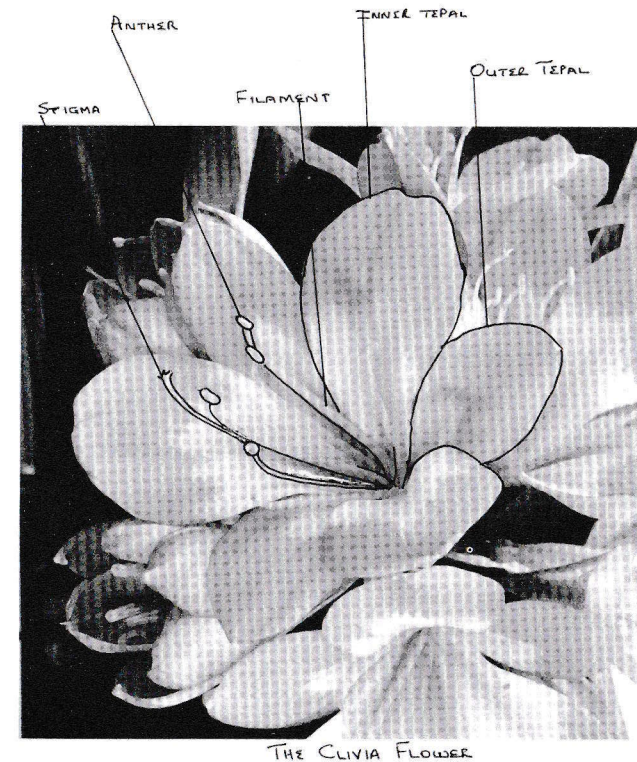
Introduction.

Listed below are guidelines for growing *Clivia*. Most readers will adapt the information and formulate a programme to suit their own growing conditions.

CLIVIA - TERMINOLOGY OF A FLOWER

The flowerhead is called an umbel. The umbel is made up of individual flowers. The stem bearing the umbel is called the scape or peduncle.

This picture shows a flower with six tepals, a single style arm with a three-lobed stigma. Six anthers at the end of the filaments. The anther and the filament make up the stamen



OPTIMUM GROWING MEDIA FOR CLIVIA IN A POT.

Clivia plants in the habitat are often found on rocks and living on the nutrients derived from fallen leaf litter. To ensure an ideal growing environment for your *Clivia*, creating similar conditions as is found in the natural habitat, would be the ideal.

Several factors need to be considered when choosing a suitable growing medium:

1. *Clivia* roots are not designed for growing in a heavy potting medium. The plant may survive but flowering may not be ideal.
2. *Clivia* need a lot of oxygen around their roots. A medium such as clay is unsuitable and may result in root rot. *Clivia* plants do not grow ideally when their roots are always wet. (*C. robusta* is an exception. This plant enjoys swamp and drier conditions.)
3. For the best drainage of a potting medium, use the same medium/potting soil in the whole pot.
4. Adding finer components, such as river sand, the finer particles may influence the drainage of the potting soil and result in more water retained in the potting mix.

The ideal mix for growing *Clivia* in a pot is as follows:

- a. A mixture that does not continue to decompose. (Like compost). A stable mixture is ideal – no further composting which will result in compacting your potting medium.
- b. A mixture that retains water well.
- c. A mixture that allows a good supply of oxygen to the *Clivia* roots, an open medium is better than a heavy clay medium.

- d. A mixture that absorbs your added fertilizer and then releases the fertilizer to the *Clivia* roots.

THE MAIN OPTIONS AVAILABLE FOR GROWING MIXES:

COMPOSTED PINE BARK.

Fresh pine bark is chopped into large chunks and treated with lime, nitrogen and water to start a composting process. For 6 – 12 weeks the bark is 'turned' and the process repeated. The decomposing bark reaches temperatures of 60-70 degrees centigrade, as does a compost heap. At the end of this process the bark is degraded into a stable medium, 'lignin core', which is not break down any further. Bacteria and fungi also help break down the components of the bark.

The result is a black, odourless medium with excellent properties for growing *Clivia*. This composted bark provides good drainage and oxygen supply and holds and releases fertilizer to the roots. The mixture also has no diseases present.

If you check your composted pine bark, the colour should not be reddish or smell of pine. All plants do not grow well in pine bark that has not been fully decomposed.

A range of different bark sizes are available. Mature *Clivia* prefer a coarse growing medium, often marketed as a coarse potting mix. A seedling mix is useful for growing *Clivia* seed.

VERMICULITE.

It is not an ideal medium as it has a variable pH. Vermiculite decomposes into a compact, dense medium with poor drainage and oxygen content.

PERLITE.

It has a very porous and drains well. *Clivia* plants grow well in it, but watering and feeding need to be carefully managed. Add perlite to a mixture if you want to improve the drainage of the mixture.

COIR/COCA PEAT.

Peat holds water well, but it drains poorly. If you want your mixture to hold more water, peat may be added, up to 30 percent of your potting mixture. m.

SPHAGNUM PEAT.

Expensive and not freely available. This product has similar characteristics to the coca peat mentioned above.

MUSHROOM COMPOST.

This product does undergo further decomposition and in a pot may compact the mixture and result in more water retention.

WOODSHAVINGS AND SAWDUST.

Fresh shavings and sawdust are not a suitable medium for growing *Clivia*. These products decompose into smaller particles, resulting in a denser

mixture with less oxygen in the mixture. The organisms that break down the wood products, fungi and bacteria, use up the nitrogen in the mixture and there will not be enough nitrogen available for the roots of the *Clivia*.

BAGASSE.

This is unsuitable as a potting mix, as it decomposes further and results in a mixture with a poor oxygen supply and too much water retention.

SOIL

Soil types vary a lot. Some are very sandy and drain well. Other soils may have too much clay which may compact too much and not drain well. Depending on your soil type, success may be achieved using your own local soil type for growing *Clivia* in a pot.

GARDEN COMPOST.

It is excellent as a mulch. This compost does continue to decompose in a pot and will compact the potting medium.

SUITABLE MIX FOR *CLIVIA* PLANTS IN A POT:

Properly composted pine bark is freely available and an excellent choice for potted *Clivia*.

Clivia require a free draining potting mixture with a good oxygen content around the roots. The potting mixture should be on the acidic side. The best pH is between 5.5 and 6.5.

SUITABLE PLANTING CONDITIONS FOR *CLIVIA* PLANTS IN THE GARDEN:

Clivia plants like a semi-shaded position in the garden. Heavy shade may result in poor flowering conditions for *Clivia*. *Clivia* usually tolerate the early morning sun, but the afternoon sun may result in leaf burn. Be aware that problems may arise with *Clivia* planted under trees. In this position the *Clivia*, depending on the tree type, may have to compete with the tree roots for nutrition and they will not necessarily thrive. If the soil under the trees cannot be mulched or composted, try growing the *Clivia* plants in large pots under the trees.

In the garden the *Clivia* plants are easy to grow. Add enough compost to your garden soil to ensure that the soil drains well. Add 3:1:5 fertilizer to the soil with planting and again in spring and autumn. Further mulching will also help with retention of moisture and the plants will grow well.

SHADEHOUSE PROVISIONS FOR GROWING *CLIVIA*:

Clivia plants do not tolerate direct midday and afternoon sunlight when grown outdoors.

To grow *Clivia* outdoors, in a shade house, use an eighty percent shade cloth to protect the *Clivia* plants from the sun.

FERTILIZING.

This may be in the form of slow release/controlled release fertilizer granules or ordinary garden 3-1-5. After applying the fertilizer, the plants should be watered well. Don't place the fertilizer on or close to the stem of the plant. Fertilizer may be applied during spring and autumn. Foliar feed is also suitable and should be applied as directed. Feeding the *Clivia* plants by

feeding the roots is an easier way to provide nutrition to a plant that has such a good root system. Keeping the N:K ratio (nitrogen to potassium ratio) at 1:1 or 1:2 in the fertilizer used, will ensure good flowering. Too much nitrogen may result in excessive leaf growth and not much flowering. Trace elements are important and are usually included in your fertilizers, if not, they must be provided by applying a suitable trace element product.

GROWING THE SIZE OF YOUR *CLIVIA* COLLECTION BY SEED PRODUCTION

Collecting and storing of pollen.

Ideally pollen should be gathered when it is fluffy and ripe.

Various containers may be used to store your pollen. These include:

1. Small plastic containers with a lid. (Eppendorf tubes). The anthers may be removed and placed in a small plastic container with a tightly fitting lid. The details of the pollen should then be written on the outside of the container. The pollen may also be brushed off with a fine paint brush into these tubes.
2. The pollen or anthers may be stored in very small zip lock bags and labelled.
3. Gel capsules may also be used to store the pollen or anthers.

The pollen containers are then stored in the fridge. The secret is to keep the pollen dry to retain the viability.

Pollination.

Pollination can take place once the pollen is ripe (fluffy). The pollen may be removed with a small paint brush or the whole anther may be removed.

Apply the pollen to the stigma when it is sticky and receptive to pollen. The tips of the stigmatic arms are the sites at which the pollen should be placed. Some hybridizers believe in re-pollinating the stigmas, while others pollinate once only.

The best time to pollinate the stigmas, is in the early morning, before the heat dries out the stigmatic surfaces. A further suitable time is in the late afternoon. Bees are also active at these times. The interaction of the pollen on the stigma is more effective in a warmer environment. A good practice with pollination, is to bring the plants into an enclosed area, where accidental wind pollination will be avoided. If a stigma is reluctant to accept pollen because it is dry, cut the style arm in half, to expose the viable tube in the centre. Paint this with a dilution of sugar water (1 tsp to a cup of water), allow to this to stand for a few minutes and then apply the pollen to the treated style arm.

To prevent the self-pollination of a plant, the anthers may be removed (emasculation) or a cut straw may be used to cover the stigma or stamens. Pollination of the flowers in an umbel may be made with different pollen samples. Good labelling is essential. The pedicel may be marked with a permanent marker to identify the pollen source. Tie-on labels may be used. The pod parent is always written first on the label and the follow with the name of the pollen parent.

Harvesting the seed.

When should the berries be harvested? This question is often asked, as early harvesting may perhaps result in poor germination.

It is not essential to wait until the berries have changed colour fully, from green to orange, for example.

It is quite satisfactory to harvest the seed from May – June (Southern hemisphere) when the berries are found to be slightly soft. Once harvested the berries should be cleaned by removing the outer skin and fleshy layer around the seeds. The membrane around the individual seeds should also be removed. Leaving the membranes on the seed may encourage fungal infection developing. Wash the seeds in soapy water and dry on a clean towel.

If you decide to harvest the berries later in the year, the seed is more difficult to clean.

Fresh seed is the best choice to purchase to ensure good germination. Seeds do dry out with time and their viability decreases.

GERMINATING *CLIVIA* SEED.

There are many ways of germinating *Clivia* seed.

1. One simple method is to fill a seed tray with seedling soil or potting mix. Wet the medium thoroughly, then place the seeds on the medium and press the seeds down lightly. Place the tray of seeds in a large plastic bag and seal the bag.

Store the tray in a warm place. Leave the covered tray for about a month before inspection. Check for moisture content of the medium and look for

the presence of any fungal infection. The more often an inspection takes place, the higher the chances of allowing spores in the air to settle on your seed. Check the trays at least once a month. Some of the roots may not penetrate the seedling soil. If this happens, make a small hole in the mixture and place the root in this hole and lightly compress the soil around the root. Once the little plants are well established, the covering plastic bag should be removed from the trays and the trays of seedlings placed in a warm shady position. Feeding the seedling can start once the seed drops off the seedling. With this method of germination, it is possible to grow the seedlings, if not overcrowded, until large enough to plant into individual pots.

2. Zip lock plastic bags may be used to seal the seeds which are placed between damp absorbent paper. Here the advantage is that the zip lock bags take up very little space and many more seeds may be germinated in a small area.

3. Seeds placed on silica sand in a Tupperware container, kept warm and moist also works well. The moisture content needs to be checked regularly. The sand dries out faster if use is made of heating pads under the container. Whichever system you choose, always ensure that there is sufficient moisture, but not too wet and keep a sharp eye out for fungal infections.

PLANTING OUT SEEDLINGS.

There are as many ideas as there are growers.

Here is a guide: You may adapt the guide to suit yourself.

At 12 to 18 months transfer seedlings to 15cm pots and then when there are 7 – 8 leaves, replot into 20cm pots. It should be possible to flower the plants in the 20cm pots.

WATERING.

What is the ideal amount of water to give and when should you water?

The *Clivia* plant is an evergreen plant that grows faster when the temperatures are higher and stops when the temperatures are too high or too low.

The plant never stops growing completely under normal circumstances in nature. The amount of water to give will depend on your local circumstances. More water in summer and less in winter is a practical approach. If you have a high rainfall, no extra water is necessary. Your potted *Clivia* plants should all have the same potting mix so that the water requirements will be easier to assess and be similar.

Checking the mixture in your pot will give you a good idea of whether watering is required. Water logging is unlikely, if your potting medium drains well.

GROWING THE SIZE OF YOUR *CLIVIA* COLLECTION BY OFFSET REMOVAL

Clivia plants may be divided at any time of the year. The ideal times are probably once the blooming season is over at the end of September and then again in autumn when the weather is cooler and fungal infections are not as common.

To divide a large plant: Remove the plant carefully from the pot. Remove the potting mix from the roots using a stream of water from a hose pipe if necessary. Choose the offsets to be removed. Ensure that each offset to be

removed has adequate roots. Use a clean, sharp knife and remove the offset from the mother plant. Treat the cut surfaces of the mother plant and the offset with Flowers of Sulphur or some other fungicide.

Allow the cut edges to dry out, perhaps overnight before repotting. Sterilize your knife before using it again on the next plant. The blade may be placed in burning methylated spirits or a sterilizing solution to ensure no cross infection. An offset, while still attached to the mother plant, will grow faster. Wait until the offset has at least 9 -10 leaves before removing it from the mother plant.

PESTS AND DISEASES.

The following pests are to be found on *Clivia* in South Africa:

Amaryllis caterpillar or Lily Borer. (*Brithys crini*) This pest causes a lot of damage to the *Clivia* plant. If you fail to notice the larva, the damage to the plants is remarkable. The larva burrows down the leaf into the centre of the plant and may destroy the growing point. This caterpillar is less common in the Cape.

These caterpillars are more active October and April (the warmer months). The moths are grey/white and fly around your plants in the evenings. They lay eggs on the underside of the leaves. Once the eggs hatch and the larvae started feeding, evidence may be seen on the top-side of the leaf. The larvae tunnel down the leaf. At this stage they are easily visible between the upper and lower epidermis of the leaf. Rub the eggs off the underside of the leaves and spray the plants with cypermethrin or deltamethrin. Biological control with *Bacillus thuringiensis* var. *kurstaki*.

Mealy Bugs. This pest is found on plants throughout the country. It is usually associated with overcrowding of plants, with poor air movement between the plants. Hot conditions promote the infestation of mealie bugs. The mealie bug is usually found on the underside of the older leaves, but if the infestation is severe, they may be found anywhere on the plant or pot, often targeting the younger leaves. The treatment here is preferably a systemic insecticide such as imidacloprid. Cypermethrin may also be used with a wetter/sticker solution. Imidacloprid granules may be scattered around the base of the plant. Imidacloprid, on the package insert, is advised to be used as a drench, thus allowing the absorption of the mixture by the roots. Plants may be immersed in a bucket of the imidacloprid mixture or applied to each pot. Read the insert for the mixing instructions. Spraying with this product has been suggested and is easier to apply. Mineral oil may also be used. Ensure that the correct dosage is used.

Scale

Many different types of scale attack *Clivia* leaves. These pests can increase in number at a rapid rate. Look out for the flat white younger scales and physically rub them off or spray with a suitable insecticide. The scale causes an unattractive spot on the leaf where it was attached and may cause rings of lighter green on the *Clivia* leaf. Treat with mercaptothion or cypermethrin. A light oil such as oleum or neem oil may also be used to treat the scale.

Snout Beetles.

This pest seems to be more frequently seen in the Cape. They are about 10 mm in length and muddy brown in colour. The beetles multiply rapidly and

are devastating to the leaves, flowers and berries. The problem can quickly be identified by looking at the leaves and noticing the notched appearance of the leaf edges.

Attempts may be made by catching them at night with a torch light. An easier and more effective method of treatment is to spray with cypermethrin or mercaptothion with an added sticker/spreader.

Thrips

Minute insects with four narrow wings. They feed by rasping the plant leaf surface, leaving small silver blotches. Treat with cypermethrin, imidacloprid or mercaptothion with an added wetter/sticker.

White Fly

Small four - winged insects. The wings and body are covered by a white powder. The larvae suck the sap on the underside of the leaves. Treat with pyriproxyfen or cypermethrin.

Slugs and Snails

These pests feed only under damp conditions. A shiny trail of viscid solution is left by the snails. They like feeding on the younger leaves and substantial damage may be caused to the leaves. Use any suitable snail bait to combat them.

Red Spider

Minute reddish-brown spiders with four pairs of legs. These weave a web on the underside of the leaves. Yellowing of the leaves may result. Treat with bifenthrin or mercaptothion.

Fungal and Bacterial Diseases.

The commonest bacterial infestation is by the bacterium *Erwinia carotovora*. This is fortunately not that common. If a rotten mass is found in the centre of the plant and is foul smelling, it is probably caused by this organism. Scrape out the rotten material. Use dilute bleach to treat the cleaned wound site. Not many anti-bacterial agents are available in the nurseries.

Fungal infections are more common. They are often unsightly. Brown spots appearing on leaves, *Colletotrichum* (anthracnose), may also spread to adjacent plant leaves. Treatment with a systemic antifungal agent is recommended.

Fungi are also responsible for root rot, damping off, seed rot and 'rust' like appearances. Treat with an antifungal agent. An example of a contact fungicide is chlorothalonil 'Bravo' and of a systemic fungicide is triforine 'Funginex'. Copper oxychloride is good for treating soil pathogens such as damping off and root rot. This is applied as a drench.

Viral Diseases.

The appearance of a mosaic pattern on the green leaves may indicate a viral infection is present. Claims are made that this pattern could be attributed to mineral deficiencies. If the pattern persists, dispose of the plant to the municipal bin as a safety precaution.

To ensure the control of diseases and pests, the products used to treat the disease or pest must be given in the correct dosages and should be repeated after 7 to 14 days. Take precautions to ensure your own safety when using these toxic sprays or powders, by using protective clothing, a hat, goggles and a mask.

SUGGESTIONS FOR BREEDING THAT SPECIAL PLANT:

Clivia hybridizers soon realise that the explanation for some flower colour result, can only be understood by a multiple gene pattern of inheritance. No simple law of inheritance is suitable for explaining how some flower colours appear in *Clivia* plants. The variation of flower colours continues to fascinate the collectors and breeders of *Clivia*. With all *Clivia* breeding, the best results are achieved by growing all the seed produced from a cross and then carefully selecting from these plants for further breeding.

Breed Better Yellows.

Excellent yellow *Clivia* are freely available. Most of the yellow *Clivia* flowers may be divided into Groups called 1 and 2. Yellow flowers that do not fall into either Group 1 or Group 2 are also found. If you wish to breed yellow *Clivia*, breed Group 1 yellows with Group 1 yellows and Group 2 with Group 2. If you should breed a Group 1 Yellow with a Group 2 Yellow,

the resulting flowers will be orange. Natal Yellow is considered to belong to Group 2 Yellows and often has a great deal of green in the flower. 'Vico Yellow' on the other hand is a reliable Group 1 Yellow. There are some plants that are compatible with both Group 1 and Group 2 yellows. The offspring are all yellow - called 'Universal Yellows'. It is therefore necessary to know which group your plants belong to, should you want to breed a yellow flowering plant.

When breeding for a desired result, you should select the strongest seedlings from a cross and cross pollinate these when they flower. With the next generation the most robust or strongest seedlings are chosen and then, when flowering, crossed with each other (sibling crosses). This method is called 'line breeding' and continues until the desired results are achieved.

Breed broad leaf yellows.

Here the pod parent, the mother, is chosen with the broad leaf. Use the best you have available. This plant will probably have an orange flower. The pollen parent should be chosen from the best yellow flower pollen you have. The first-generation offspring will all have orange flowers. Cross this generation with each other and some of the progeny will flower yellow. Select the best broad leaf yellows and cross them with one another. Continue to select the best broad leaf yellows and cross them with each other until your goal is reached.

Breed variegated yellows:

Use the best available variegated plant, probably with an orange flower, as the mother (pod parent). Pollinate this plant with your best available yellow pollen. The offspring will all bloom orange. These orange flowering plants

all 'carry' the yellow colour genes from the pollen parent (father). Half the inheritance is from each parent (half orange and half yellow). The orange colour is 'dominant' over the yellow colour and thus all the offspring will be orange. These offspring, when flowering, must be crossed with each other. Some of the offspring will be yellow, variegated plants. Continue crossing the best of these until your desired result is achieved.

CLIVIA ANATOMY

The flowerhead or umbel is called the inflorescence. The stem bearing the umbel is called the scape or peduncle.

The short stems attaching the individual flowers to the scape/peduncle are called pedicels.

The seed capsule is called the ovary and is found below the perianth (the six tepals of the flower). The perianth consists of three inner and three outer perianth members called tepals (inner and outer whorls). Within the perianth, six stamens are found. Each stamen is made up of an anther which bears the pollen and the stalk of the anther, called the filament. The style is found in the centre of the perianth (flower). The stigma with three tiny arms is found at the tip of the style. The style extends down into the flower and ends at the ovary. The stigmatic arms, the style and the ovary make up the pistil. The tips of the stigmatic arms are the points at which the pollination needs to take place.

The ovary is made up of three cavities, each containing eight to ten ovules. Once pollinated and fertilized, each ovule will form a seed. The developing seeds will stimulate the ovary wall to grow and form the succulent fruit.

***Clivia* Fruit and Seed**

The *Clivia* Fruit is a berry which contains the seed.

The Seeds are naked as they do not have a seed-coat.

The seeds are recalcitrant, meaning that they can germinate spontaneously. This germination may occur in the ripe fruit. The seed may be stored for a limited time-period, as they become dehydrated and then will no longer be viable.

The seed consists of a single cotyledon. The cotyledon has the endosperm which encloses the embryo of the seed. The embryo forms the radicle (root) and the plumule (leaf shoot). The tip of the radicle may be identified as a dark spot on the seed. During germination the cotyledon elongates and pushes the radicle and plumule out of the seed. The radicle elongates to become the primary root and immediately produces a collar of root hairs. The primary root does not normally form secondary roots. The primary root has a limited life span and is replaced by adventitious roots.

