



**“Monica Conquest” Kevin Walters 2002**

## **Contents:**

<b>Page 2</b>	<b>Clivia – Terminology of a Clivia flower</b>
<b>Page 3</b>	<b>Importance of Records in plant breeding</b>
<b>Page 4</b>	<b>Growing Media (soil) for Clivia</b>
<b>Page 4</b>	<b>Optimum growing media for Clivia in a Pot</b>
<b>Page 4</b>	<b>Main options available for growing soil mixes</b>
<b>Page 5</b>	<b>Suitable mix for Clivia plants in a Pot</b>
<b>Page 5</b>	<b>Suitable planting conditions for Clivia Plants in the Garden</b>
<b>Page 5</b>	<b>Shade house provisions for Growing Clivia</b>
<b>Page 6</b>	<b>Fertilizing Clivia</b>
<b>Page 7</b>	<b>Growing the size of your Clivia collection by Seed production</b>
<b>Page 7</b>	<b>Collecting and storing of Pollen</b>
<b>Page 7</b>	<b>Self Pollinating a Plant</b>
<b>Page 8</b>	<b>Storing Pollen</b>
<b>Page 9</b>	<b>Cross Pollinating your Plants</b>
<b>Page 10</b>	<b>Harvesting the Seed</b>
<b>Page 11</b>	<b>Clivias, the first 12 months from seed to seedling</b>
<b>Page 17</b>	<b>Germinating Clivia Seed</b>
<b>Page 18</b>	<b>Pigmented and Unpigmented Seedlings</b>
<b>Page 20</b>	<b>Pests and Diseases</b>
<b>Page 23</b>	<b>Suggestions for breeding that Special Clivia</b>
<b>Page 27</b>	<b>Clivia Species</b>

## Clivia – Terminology of a Clivia flower

It is essential that we all use the same terminology especially when it comes to plant descriptions for registration or at shows when plants and plant parts are compared. Note: **Afrikaans terms appear in brackets.**

### The reproductive system

The branch system bearing the flowers in *Clivia* is called an inflorescence (bloeiwyse). In *Clivia* the type of inflorescence is classified as an **umbel** (skerm). It consists of an elongated, leafless branch, called the **scape** or **peduncle** (bloeisteel) (Fig. 1, sc.), which comes from one of the leaf axils and stretches up to the point where the flowers are borne, all more or less at the same level on an extremely condensed **axis**. Each flower is attached to the inflorescence axis by means of a flower stalk, called the **pedicel** (blomsteel) (Fig. 1, pc). Then follows the **ovary** (vrugbegin-sel) of the flower (Fig. 1, ov), situated below the **perianth** (periant) (Fig. 1, per). The perianth consists of three outer and three inner perianth members, called **tepals** (perigoonblare). Inside the perianth, are the six **stamens** (meeldrade), each consisting of an **anther** (helmknop), containing the pollen and a **filament** (helmdraad), which is the stalk of the anther. The **stigma** (stempel) and **style** (styl), situated at the flower centre, are attached to the ovary and together the three parts form the **pistil** (stamper). The ovary in *Clivia* has three cavities or **locules** (vrughokke), each containing about eight to ten **ovules** (saadknoppe). After pollination and fertilization, each fertilized ovule will form a **seed**, and the developing seeds will stimulate the ovary wall to grow and become the succulent part of the **fruit** (vrug) (Fig 1, fr). The *Clivia* fruit is called a **berry** (besvrug of bessie), containing one to 15 seeds depending on how many of the ovules inside the ovary have been fertilised. Some of the fertilised ovules

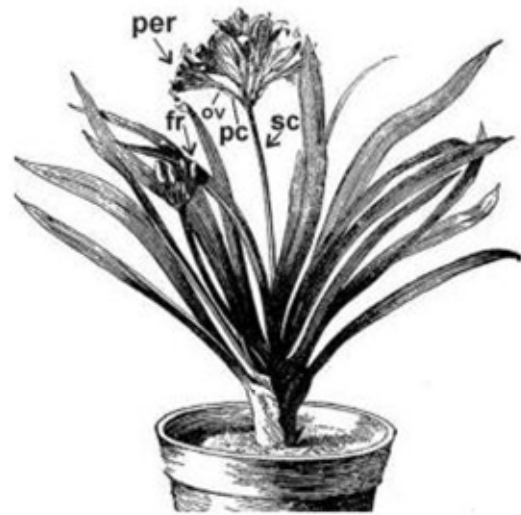


Fig 1

(now called young seeds) may also abort at an early stage, thus reducing the number of seeds per berry. The membranous layer covering each seed is part of the inner layer of the fruit wall or **endocarp**. The fruit wall (derived from the ovary wall), consists of three layers, namely the outer, pigmented **exocarp** (eksokarp), the fleshy **mesocarp** (mesokarp) and the inner, membranous **endocarp** (endokarp). The suffix “carp” refers to fruit.

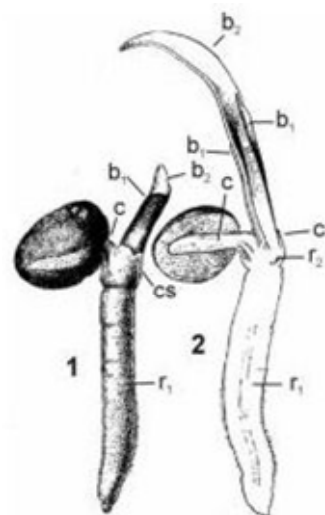


Fig 2

Please note that the *Clivia* fruit is not a pod or seed pod as so often seen in the literature. Pods are the fruit of peas, beans and other leguminous plants and the *Clivia* is surely not a legume. The *Clivia* fruit is

also not a seed, since the seeds are contained inside the fruit which is classified as a berry. In future, please use

the names given in bold in the above paragraph.

### The Vegetative Parts

The vegetative plant starts with the germinating seed. *Clivia* seeds are naked since they do not have a seed coat. They are also **recalcitrant** (onortodoks), which means that they can germinate spontaneously, even in the ripe fruit; they can only be stored for a limited period of time and will die if desiccated beyond a certain point. The seed consist of the **endosperm** (kiemwit) enclosing the **embryo** (embrio) consisting of one cotyledon (c in the figure), a **plumule** (pluimpie) and a **radicle** (kiemwortel of radikula). The whole embryo is embedded in the endosperm and the tip of the radicle can be observed as a dark spot on the one end of the mature seed. During germination the cotyledon elongates to about 0,5 to 1 cm, thus pushing the plumule and radicle out of the seed, whilst the radicle starts to elongate to become the **primary root** (primêre wortel). The primary root immediately produces a collar of **root hairs** (wortelhare) behind the root tip and continues to do so as the root grows. The primary root (r1 in the figure) normally does not form **secondary roots** (sywortels). It has a limited life span and is soon followed by **adventitious roots** (bywortels) originating from the first and later nodes (r2 in the figure).

The junction of the plumule or **apical bud** (apikale groeiknop) and the primary root forms the first **node** (knoop) of the stem where the cotyledon with its cotyledonary **sheath** (saadlobskede) (cs in the figure) is attached. The cotyledon acts as a **haustorium**, (suigorgaan) responsible for absorbing nutrients from the endosperm. The first vegetative leaf (b1 in the figure), produced by the **apical meristem** (apickale meristeam) of the plumule, consists of a **sheath** (blaarskede) with a

very small **lamina** (blaarskyf). In orange and red *Clivias* the sheath of the first leaf is pigmented.

Figure 2 shows a young **seedling** (kiemplant) of *Clivia miniata* (1) as well as a longitudinal section of a slightly older seedling (2). The figure was copied from R Wettstein (1935). Handbuch der Systematischen Botanik.

### The importance of records in plant breeding

The words “I’ll remember” do not work in plant breeding. Plants grow, your spouse moves them around (especially into the house when they flower), they are repotted, and your collection grows exponentially until every conceivable space is filled with plants. The only way you can keep track of the plants in your collection is by using labels and records. Some write on pots, others on plastic tags, but whatever method you choose make sure that the gardener, dog, cat or infant cannot remove them.

Labels allow you to keep track of crosses, selected clones and even your pollen stash. You should have a label on every flower you have crossed, each batch of seedlings planted, every pollen container, and in each and every pot where you have a plant growing. You cannot trace your breeding line back to the parents if you do not keep these records.

The best thing with records and labels is that they allow you to make deductions about a specific plant’s breeding behaviour, which in turn could be exploited in future hybridisations, especially when dealing with recessive genes. Inexplicable features not present in the parents, or even grandparents, will become clearer. New mutations can be

traced back to their origin. Records will allow you to achieve your breeding goals faster and more efficiently, while preventing you from selling that expensive clone you bought years ago.

### **Growing Media (soil) for Clivia**

#### *Optimum growing media for Clivia in a Pot*

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

#### *Main options available for growing soil 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 to 12 weeks the bark is 'turned' and the process repeated. The decomposing bark reaches temperatures of 60/70°C, as does a compost heap. At the end of the process the bark is degraded into a stable medium which will 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 composed.

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 is 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/Coco 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.

#### **Sphagnum Moss/Peat**

Expensive and not freely available. This product has similar characteristics to the coco peas mentioned above.

#### **Mushroom Compost**

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

#### *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.

#### *Shade house 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.

Light, a factor easily forgotten by gardeners, plays an important role in plant growth, development and flowering. Many of the genes encoding flower pigmentation are under light-sensitive “switches” called promoters. All Clivia growers have seen a flower in the crown of the plant that appears white or yellow when it emerges. If the leaves are forced out of the way, these umbels would usually grow towards the light and the flowers would develop their true colour.

Though Clivias can be regarded as understory plants, they still need light in photosynthesis. Plants can, however, easily survive under very low light conditions and Clivias generally cultivated in South Africa under up to 80% shade cloth. In the forest plants can even receive full sunlight. How is this possible, you

may ask? The answer lies in light patches. Breezes in the top canopy blow leaf blades momentarily out of the way and the sun has the opportunity to shine through. In this brief moment, full sunlight finds its way through to the leaf blades of the understorey plants.

Clivias seem to prefer lighter areas in the forest, near ledges or cliff edges, under high forest trees with no or little undergrowth or even on rock screes that provide openings in the forest. In these environments, there is sufficient light for lichens to grow on Clivia leaves.

In cultivation plants are usually grown in shade houses (60-80%) where weather permits, or in heated greenhouses or indoors, where it doesn't. Black shade cloth is preferred to green, but higher percentages of white cloth may also be used. If light levels are too low, plants produce darker green leaves, while leaf scorching occurs with too little protection. Surviving in low light conditions makes this genus highly successful as indoor houseplants. Clivias are highly adaptable and can grow under a wide variety of tree species. They do very well under high trees that allow some early morning or late afternoon light to reach them but can also grow in that very dark corner of the garden where all else fails to survive. Clivia *Miniata* in the garden does especially well if grown in an artificial rock scree i.e., a rockery filled with acid compost between the rocks in which individual plants are planted.

### **Fertilizing Clivia**

Clivia love fertiliser. Fertilising your plant will result in darker green leaves, more growth, a better root system and better flowers. I have often seen plants in need of a good fertilising and the leaves have taken

on a more lime green colour. Nothing looks better than a healthy plant with dark green leaves and new leaves developing. I use a slow release fertiliser that lasts for 12 months on my plants. A small amount is mixed throughout the potting medium and a handful is sprinkled around the top of the pot. I also give my plants a liquid fertiliser once per month. These are plants in pots. Plants in the garden would also benefit from a slow release fertiliser and the occasional watering can of liquid fertiliser.

The following fertilisers are the most popular ones used at present. There are many more good fertilisers not listed here but I have not had experience with the others.

#### **Seasol**

Seasol is not a fertiliser. It is more of a tonic. I find it great to give to a stressed plant or when I have just repotted a plant. I use it on plants that seem to have a problem or have dried out too much. It is reported to be good for root growth. I use it diluted in water and watering it in with a watering can

#### **Charlie Carp**

Charlie Carp is a very smelly liquid fertiliser. I have heard some experts say that it is not as good as others such as Aquasol due to the carp living in fresh water and not sea water. I have used Charlie Carp extensively and find it great, however be aware you will need a shower afterwards. I also like the thought that we are helping to get rid of the carp in our rivers.

#### **Thrive**

Thrive is also a great fertiliser. I find that it is great for the growth of the leaves and not so much for inducing flowering. I use it at times on my seedlings.

#### **Osmocote**

I love Osmocote but to buy it in the quantity I need, it is too expensive. There is a similar product available called Multicote which has the same properties as Osmocote and is a great slow release

fertiliser. The one I use lasts for 12 months.

### **Powerfeed**

This product is made by the same company as Seasol. I use this on my young seedlings as I find it is not too strong and encourages growth.

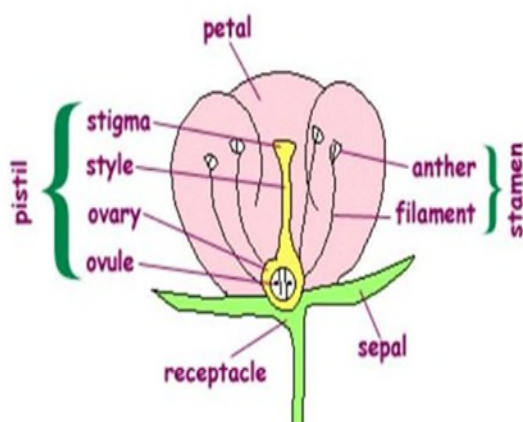
I use this as a foliar spray.

### **Seamungus**

This product I also use on seedlings. It comes in a pellet form or a crumble form. I find this not too strong and very good for the young plants.

## **Growing the size of your Clivia collection by Seed production**

### *Collecting and storing of Pollen Pollination*



### **How to Pollinate a Clivia Plant and Store Pollen**

What you will need:

- 1: A good set of tweezers
- 2: A Pollen Storage Tube, Matchbox, or something to hold any pollen you might want to store.
- 2a: Something to label your pollens with, be it a sharpie, a grease pencil, or a label maker.
- 3: Plastic straws from your local supermarket.

4: Some cotton balls or some form of heat source that can be used to close one end of the straw.

5: Some form of label for the plant itself. We use a hanging label on a string. note this sort of tag is NOT weatherproof.

6: A small disposable paintbrush, preferably a new one for every cross or plant you wish to pollinate.

So! You have a great Clivia and you are looking to Pollinate it! But you need to know how to do so.

Pollination is easy with a little bit of preparation and a steady hand. Let's get started.

This guide will be for pollination of a potted plant, but you can easily use it for garden plants as well.

First things first, we should be starting to think about this before the flowers ripen and open.

### **SELF POLLINATING A PLANT**

"Selfing" is the easiest pollination method, and in some cases your best choice for pollination. It does not require stored pollen, only the pollen on the plant. Also emasculating the plant (Removing its pollen prior to ripening) is not required. We like to pollinate right after the flower opens. This WILL shorten your bloom times on the flower however it is the most certain method of being sure your chosen pollen is the pollen that the plant uses for fertilization.

The Female part of a flower is called a Pistil, it is made up of the stigma, which is the 3 tiny prongs on the end of the stem, called a style, and the ovary, which is the bulbous shape under the flower petals. If you are pollinating outdoors or near other plants that are in bloom, it is important to make sure no stray pollen gets on the stigma. To do this you are going to use those straws and the cotton balls or heat source.

Take the straws, cut them into thirds. Stuff about 1/8th of the straw with cotton or Crimp the end of the straw closed and seal it with heat.

Put this over the end of your Pistil. It should stay there until the flower including the Stigma falls off completely. You want the stigma to sit in the straw below the cotton and not get stuck in the cotton.

Pollination should take place either in the early morning or around nightfall. We tend to pollinate multiple times just to be sure the "deed is done". The reason for this is that the female parts of the flower will exude a sticky substance during these times which catch the pollen.

The parts of the flower that hold pollen are called the Stamen, they are made up of an Anther of pollen and the stem they stand on, called the Filament.

Bring your plant into an area with no heavy airflow. Still air is the best for pollination. Barring that you can take a plastic bag and cover the flower you are working on.

Now, take off that straw. If you used cotton be careful not to break the Stigma in the cotton.

The first thing you need to do is take those tweezers and carefully snap the filament off around 1/4-1/3 of an inch from the base of your flower, being careful not to shake off the pollen. You can use your fingers to do this, but it's very easy to accidentally break the Style/Stigma, so a good tweezers saves you some heartache.

Now, simply rub the stigma with the anther until you see pollen on the stigma. Congratulations you just fertilized your flower!

Do this for every flower you wish to pollinate. Use a new Stamen for every stigma for best results.

Now, say you want to store some pollen from your Clivia blooms, either for use in the current blooming period or even years in the future. Pollen lasts up to 6 YEARS in cold storage, so even if you only get one great bloom from a plant, its genes could be used for years and years.

Storing pollen is very easy. We are going to go through the whole process here with pollens from a pre-emasculated plant, because that is the longest method. You can skip the portions that do not apply should you be storing pollens that have already opened. Our method is simple and works for us. It is not the only method out there.

If you are going to be crossing 2 different flowers together, it is imperative that you remove the Anthers before they open. A closed anther and an open anther look very different to the human eye. A Closed Anther looks smooth and an open one looks like a grainy yellow puffball. If you are going to pollinate a plant and the anthers have already opened, we recommend you go with self-pollination.

The reason for this is that pollen is super tiny, and it is nearly impossible to tell if pollen has shaken onto your Stigma once opened. If it does, it's possible that even a single one will fertilize your Egg. Remember those health education classes and the 1950s movies of how babies get born? Yeah. I can indeed do it.

The Anthers will open usually the same day or the day after a flower opens. Sometimes they will open beforehand in the flowers, sometimes after. Once your buds start to color up and start opening its important to sneak a peek inside and see how the anthers look. Hopefully they are closed. We tend to self the first few flowers on a plant simply to watch how long it takes for the anthers to open up...because we like enjoying our flower blooms! It is really easy to bust up a

## STORING POLLEN



flower trying to get pollen anthers out of it before they open up.

So, let's hope your plant decided to act normal and stays closed until the flowers start to open. Once you can see inside your blooms without prying open everything, its time to Emasculate.

First Things First: Let's put those straws over those Stigma! Same as above, this is simply to make sure no stray pollens get onto the stigma before you are ready to pollinate. Just because we are emasculating while the anthers are closed doesn't mean there is no other pollen source around or we didn't miss one of the anthers being open early.

Take your tweezers (A good long, thin, sharp nose pair is good for this, but a normal pair will work too and give you a better grip) and break the Filament of the Stamen about 1/4-1/3 of the way from the bottom of the flower. Now take that and put it somewhere cool and dry. The way we do it is we drop it into one of our Pollen Tubes, Stick the tube into the potting mix at the edge of the pot, and let that stay there open for a couple of days. This works because we are in a cool, dry, indoor environment with our blooming plants. If you are outdoors or in a greenhouse, we would tend to bring the pollen somewhere cool and dry. Over the next few days it should open up even though it is not on the plant.

You can use tin foil, wax paper, anything smooth that won't catch on the pollen to store the pollen. Just make sure you let it open up before storing it long-term.

Do this for all the Anthers on the bloom you are working with.

Now that you have your tube full of open anthers, close it up and put it in the freezer. (Freezer not Fridge) We pull off the Stems(Filament) of the anthers and only

keep the anthers. Some will shake the anther itself once dry and store just the pollen. It's completely up to you how you do this, the more non-pollen you remove the easier it will be to pollinate later.

This should go without saying but each plants anther should be stored in a separate container.

## **CROSS POLLINATING YOUR PLANTS**

Cross Pollination, either from Stored pollen or from 2 plants blooming at the same time, is a bit more complicated.

By now hopefully you followed the Emasculaton process shown in the Storage section. If not let's scroll back up and follow those instructions.

OK! We have our emasculated flowers, we have our stored pollen ready to go! Now what?

First things first, let's look at the environment your plant superstar is going to be making seeds for you in:

1: Is it wind free? Breeze Free? Strong Air Conditioning Free? Will people sneeze or even breathe on it funny? If not, you need straws just like in the section for Selfing plants. Cut them into 1/3s and have some method of closing one end of the straw. Hopefully you have the stigma protected from when you emasculated.

If like us you have a spot that has very still air, no other blooming Clivia, and you have emasculated your plant, you do not need straws.

2: You should have a new, clean, brush available to you for every pollen you are going to use. If not let's go, get that now. Pollen is tiny, a used brush is not an option here. Every single pollination needs a new brush. you can use Q-tips or something of

that type, but they will be fighting your Stigma for the pollen, a brush lets the pollen come off nice and clean.

3: You should, obviously, have some pollen ready to use. Ready to use means DEFROSTED. Let the pollen sit for an hour or so before use so that it is unfrozen.

4: You need some form of labeling system. This can be colored ties, it can be some sort of dot code with an indelible marker, or like us you can use hanging tags.

OK! We are ready to go! Open up your pollen container, dab your small brush in the pollen just like with paint, and paint the pollen on the stigma. Yep it's that easy. Do this until you can visibly see pollen sticking to the stigma. This should be done either in the early morning or around nightfall, as the plant exudes a sticky substance to catch pollen around these times, making your job easier.

Another great method if you use our tubes is simply to shake the pollen onto the sides of the tubes and slide the stigma into the tube until it picks up the pollen.

Cover your Stigma and Style, label your Pedicel (The stem the flower stands on) and move onto the next one! If the next one is going to be the same pollen, keep going with your brush, if it is different pollen, different NEW brush. I would do this 2-3 times per stigma over the course of the next few days.

That is, it! You just pollinated your plant! You virtually guaranteed that what you crossed is what you will get! Congratulations!

You will know very soon whether the pollen "took". Your plant will begin to grow berries, and within about a month the ones that were not fertile will fall off. This can be for many reasons. Sometimes the plant itself will be sterile, sometimes the

pollen will be sterile, and sometimes the pollen/plant combination will simply not work. For instance, Tetraploid Plants often will not take non-Tetraploid pollens.

Assuming you followed our instructions here, we might even be willing to buy your seeds next year! We buy all our seeds from high end niche breeders with extremely high-quality parent plants. All our breeders need to use this method or better to assure that their seed is in fact going to be of the cross that they were trying to make in the first place.



### *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 in May – June (Southern Hemisphere) when the berries are found to be 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.



## **CLIVIAS, THE FIRST 12 MONTHS: FROM SEED TO SEEDLING**

**Peter Haeusler**

Clivias are basically hardy, tolerant plants, and will cope with remarkably diverse conditions. There is no single, absolute, or perfect path that I or anyone can say you must follow to get results. We are all constantly learning, and it is through innovation, experimentation, sharing our knowledge and experiences, and above all through careful reflection on practices and outcomes that we gain new insights, increase our understanding, and hopefully achieve great results with our Clivias.

In the course of the following paragraphs I will outline the approach I have taken in that crucial first 12 months, when we take each Clivia from little more than potential - a seed - through to a robust seedling with several leaves and well on the path to realising that potential. Over the past five years I have germinated about 700-800 seeds each year, with an overall germination rate consistently around 95%. On average I would, in all honesty, lose less than 10 seedlings each year – touch wood!

There are several inter-related goals when it comes to propagating Clivias, and these underscores the importance of your management practices. These goals include: Maximizing your germination rate, achieving at the same time relatively quick germination;

- i. Achieving a good, consistent growth rate post-germination;
- ii. Minimizing losses through insect attack, rot and fungal disease; and ultimately,
- iii. Growing strong seedlings, with good leaf colour (and lustre), and healthy root systems.

### **Preparation**

As with so many areas of endeavour, sound preparation and consistent effort bears fruit. You need to think carefully about your seed germination arrangements, with different methods having their strengths and limitations. By all means experiment as you work out what suits you and do take into account the time you can commit to this stage as some propagation methods will be more demanding of your time than others. Shelter, yet good ventilation and sunlight are essential ingredients. As always, the mix you use must be well aerated and well drained, and you must manage carefully the amount of water your seeds are getting. Finally, the need for sound hygiene cannot be over-emphasised. This last aspect often fails to get the attention it deserves, yet it is a crucial element.

### **Propagating box**

I have built my own propagating boxes (Fig. 8). Essentially, it's a simple box arrangement built around a heated, thermostatically-controlled propagating tray (Garden Express at Monbulk sell single, double and four tray models). The propagating box has a simple hinged lid, with a clear corrugated polycarbonate sheeting (Laser lite) cover — the corrugations allowing a good amount of air circulation, but the overall effect of the

lidded box arrangement is still to retain a good deal of warmth and humidity (the temperature remains set at 23°-25°C).



*Fig. 8 Propagating box.*

You can, of course, germinate your seeds without the aid of a heated propagating system. Several years ago, I compared seed grown in my heated propagating boxes with seed that I germinated without heat (the latter were outside in pots, but still under clear Laser lite sheeting to control the amount of water). I found that I got *noticeably better germination* with the heated tray arrangement and faster early growth. However, I also found that by the time the seedlings were 12 months old I could see little overall difference between the heat-assisted and non-heat-assisted batches. If, however, you are spending money on good seed and scarce or unusual crosses then maximising germination and early growth is vitally important, in which case some form of heat-assisted propagation is desirable.

### **Cleaning pots**

It is essential that your pots are perfectly clean. Where I am re-using pots, I always scrub them thoroughly in a trough of warm soapy water (using sugar soap, a good general-purpose cleaner), and then rinse them in a bleach solution. They are then put on a table outside to dry in the sun.

### **Propagating mix**

I use Debco's propagating mix which has a bit more body (including a good proportion of coarse grit), than some of the commercial 'seed raising' mixtures. It is professionally produced, clean and free of pathogens, very well drained — which is essential — and I have found it to be of a very consistent standard over the years. It has no added wetting agent or fertilizer. The last thing you need is a wetting agent at this stage, and I don't apply any fertilizer until about the 3-month stage (more on that later) as the seeds already contain the nourishment needed for their initial growth.

### **Seed preparation**

In the case of my own seeds, after removing them from the berries I simply wash them in lukewarm water to which I have added a few drops of dishwashing detergent, rinse them, and then let them dry on a paper towel. I do not immerse the seeds in a fungicide solution, nor do I soak them in Seasol or such. I am a great believer in relying on the goodness and vigor that is bound up in the seed itself. If your seed needs all manner of such additives to kick-start life then it is not worth growing, and the resultant plants will in all likelihood only cause you grief later on.

In terms of seed that I purchase, providing it looks well cleaned with no traces of plant matter then I simply plant the seeds without further ado. If, however, the seed looks a bit 'spotty', feels sticky, or hasn't been well cleaned I will wash it in warm soapy water, then soak the seed in a fungicide solution (e.g. Mancozeb) for say an hour. Then, when the seed is dry, I'll plant it up. *However*, my experience with seed which is a bit spotty and/or sticky is that even when treated in this manner I still seem to experience problems with the seedlings down the track in terms of fungal infection. I do not continue to deal with any grower who sells me seed which is 'suspect' in such



ways, or indeed seed which is otherwise 'scrappy'. There are good reputable sellers out there and if you are unsure about who to buy seed from then seek advice from some of the experienced members of the Group.

### **The first three months**

#### **Planting seeds and germination**

I like to start my seed planting in July after the Winter solstice. The days are slowly beginning to lengthen and, as we know, plants everywhere start to respond to those early signals that Spring is coming. Any seed that I receive prior to this time is kept in a cool area out of direct light until I am ready to start planting – making sure that if they are stored in plastic bags there are a couple of holes for aeration. The pots I use for seed propagation are 80mm square and 100mm deep. Twelve of these fit neatly into a 290mm X 350mm plastic tray (with slotted, not solid, base), and these in turn fit neatly into the heated propagating trays I mentioned earlier.

Each pot is filled to close to the top with the propagating mix. I put up to about 6 seeds per pot, always keeping the one cross to a pot so that I can keep a good sense of how the cross is proceeding, variation in pigmentation, leaf form and so forth. Details of the cross are recorded on a plastic label inserted into a slit on the pot rim. This includes: the cross; the breeder; the date the seed was planted; and, number of seeds planted (if I have, say, 12 seeds of the cross I will record the number of seeds as 6/12 which reminds me that there is another pot of 6 seeds of this cross).

There seems to be a lot of discussion about how to 'situate' the seed in the mix. Basically, I sit it on the mix and press it down lightly, with the top half of the seed still visible. If I can see an 'eye' (the bud or germination point) then I will point that roughly downwards. While this was something, I was anxious to 'get right' in

the early days, I am now less fussed as seeds are, unsurprisingly, adept at 'getting it right' themselves. In addition, sometimes the 'eye' is not easy to locate in which case I will generally put the smoother rounded surface of the seed facing up. Once I have put the desired number of seeds into the pot, I then barely cover them with a mix made up in equal parts of coarse sand and the propagating mix. This is a bit heavier and doesn't wash about easily when watering, thereby helping hold the seed firm as it germinates.

Germination will generally occur between 4-6 weeks, even up to 8 weeks (I have found some varieties to be consistently slower than others, so patience may be needed). The radicle (primary root) develops, followed by the first seedling leaf. You need, however, to watch the seeds as they germinate, as sometimes the radicle will push the seed right up out of the mix. In such cases I have a screwdriver at hand and simply make a bit of a hole and pop the seed into it, root first of course, taking care not to fully bury the seed. Then just firm the mix – ever so carefully – around the root and seed. So, just to be clear, I do not germinate my seeds in sphagnum moss. Time is at a premium for me, so seeds are put straight into the pots (and mix) that they will germinate in and indeed remain in for up to the first 10-12 months of their lives. This minimises handling and disturbance. Moreover, the approach has borne very good results in terms of germination, plant development and overall health. Even if I had more time, I would not now change this method. The (individual cross-based) community pot approach also affords a good sense of how each cross is developing and allows easy assessment of pigmentation results for instance.



Fig. 9 Interspecific of Shige Sasaki's breeding (TK Yellow x Hirao) X (Gardenii x Hirao). Flowered this year at 3.5 years

You can, of course, use larger community pots for larger numbers of seeds. Be very careful, however, about the size of your pots as a large quantity of mix can translate to a wet and cold mass, leading in turn to fungal and other problems. The other advantage of the smaller pots such as I use is that each cross has a degree of isolation from the others. If a fungal problem emerges that cross can be readily isolated from the others and treated.

### **Watering and humidity**

While they remain in the propagating boxes, I water my pots of seed twice weekly. On the weekend when I have a bit more time, I remove the trays of pots and dampen (not saturate!) the matting underneath. Then I put the trays of pots back in place and water the actual pots. This helps generate some humidity – you will see the condensation on the underside of the Laser lite on cool days and evenings – which makes for a good growing environment. BUT be very careful not to create an overly warm and overly humid environment otherwise you will soon have fungal problems in your seedlings, and at this age it is nigh on impossible to save a seedling once afflicted. This is very definitely a case where prevention through careful management is better than cure!

For the watering I use a 1.5 litre soft drink bottle with a plastic rose type of watering fitting screwed on (these bottle top waterers can be obtained from The Diggers Club). This is a gentle way of watering the seed which doesn't wash the mix away from around the seed.

### **Pest and disease management early on**

Rather than insect pests, it is rot and fungal disease that you particularly need to guard against early on. If fungal infection takes hold it can cause a great deal of damage quickly as emerging seedlings have little capacity to fight infection, unlike a mature plant. For this reason, rigorous attention to the pillars of good preparation – clean pots, good clean mix, clean and healthy seed – is vitally important. If you start to encounter something like damping off then, yes, apply an appropriate treatment such as Fongarid. But, remove affected plants immediately – on no account leave seedlings you are treating alongside healthy plants. Above all, look carefully at your practices and try to get to the underlying cause of your problem. If numerous seedlings across different crosses are „falling over' due to fungal infection, then the chances are that there is something in your practices that needs to be changed. Perhaps you are over-watering, or the seed-raising environment is too humid. In such cases seek advice from a couple of experienced growers.



*Fig. 10 'Everton Green Goblin' breeding from Val Thurston.  
First flowered last year at 3 years.*

In terms of insect pests, I have not experienced insect-related problems while seedlings are at that early stage in the propagating box. Quite a few growers talk about the adverse impact of fungus gnats. I do get very small fly-like insects darting around the propagating boxes but have never seen any sign at all that these are having a harmful effect on the seedlings (either leaves or roots). However, as a precaution I locate several insect traps in each box. These stiffened plastic sheets are about 100mm X 200mm, bright yellow (the yellow is said to be insect-attracting), and very sticky. They are designed to control for thrips among tomato plants for instance (Bunnings sell a version, but I obtain mine from Muir & Sons in Silvan). I certainly find that a large number of these tiny flies get trapped on the sheets so in that sense they are very effective.

#### **After three months**

##### **Hardening off**

When the seedlings are about 3 months old the pots are removed from the propagating

box, although I try and avoid doing this during a cold spell. I tend to be guided very much by the size of the seedlings, and as we know different crosses will develop at very different rates. Essentially, I am looking for the seedlings to be about 75mm high before moving them out. For a couple of weeks, the pots being removed are left in trays on top of the propagating boxes where they will still derive a little heat (note that my propagating boxes are in an outdoor area which is semi enclosed and itself has a Laser lite roof, with shade cloth pulled across when the weather heats up). Easing the seedlings out in this way serves to harden them off somewhat.

#### **Location for young seedlings**



**Fig. 11 Seedlings**

When my community pots of seedlings are moved out of the propagating area, they are then located in a special area within one of my shade houses (Fig. 11). In addition to the shade cloth cover this special seedling area has a clear Laser lite roof (never use the darkened polycarbonate roofing as this will block too much UV, leading to poor leaf colour and weak growth). This means that I can continue to control the amount of water the seedlings get which I believe is particularly important while they are getting established and developing their root systems.

My seedlings stay in this area until I am ready to pot them into individual 100mm pots at 10-12 months. This area where I keep them remains relatively cool even in the hottest parts of summer. There are a couple of large deciduous trees nearby. This, in combination with the shade cloth structure (the cloth only goes down to the shelf height, about 45cm above ground level), means a reasonably bright, generally airy, yet sheltered and cool aspect. This, I believe, provides an excellent growing environment. Plants develop nicely with great root and leaf development, and I barely lose a seedling once they are out in this setting.

### Watering and fertilizing

From this stage onwards, the seedlings are watered weekly, and twice weekly in the summer. It is a generous watering (using a fine rose head) to the point that the water runs through the bottom of the pots. Seedlings need to be kept moist, but on no account should they be growing in soggy conditions. This, once again, is why it is so important to have a well-drained mix. On no account should your pots of seedlings be sitting in trays or situations where the water may lie around the base of the pots.

Only once seedlings reach the 3-month mark and are moved out of the propagating box do I apply fertilizer. Rather than chemical fertilizers, my strong preference is for organic products such as Seasol and Power Feed (or something like Charlie Carp) which I feel are easily absorbed and „softer“ on the young plants. These are applied roughly fortnightly at half strength.

### Pest and disease control



Fig. 12 Seedlings at 3 months, 12 months and 2 years.

As always, you need to watch for signs of fungal infection. Mancozeb is not overly „heavy duty“ and I prefer to use it if the need arises. If, in the summer months, we get a spell of particularly humid weather I may spray the seedlings with Mancozeb as a preventive, otherwise I spray plants only on a need basis.

### Twelve months, and beyond

By the time your seedlings reach 10-12 months old they should be a good height (15cm plus), with up to 4 leaves, and nicely developed root systems (see Fig. 12 of seedlings at 3 and 12 months, and a 2-year-old plant). Of course, there will be considerable variation depending on the cross. Some seedlings will be lower and spreading, with perhaps broad leaves. Others, such as *Clivia gardenii*, *Clivia robusta* and interspecifics can be much taller with amazingly developed root systems. At this stage I pot them up into individual pots (100mm) using a well-drained, moderately coarse, and above all well-composted mix. And for the first time I will apply a chemical fertilizer, a slow release fertilizer (I use 8-9-month Osmocote Exact which has added micro nutrients).





*Fig. 13 Interspecific flower of Sean Chubb's breeding.  
First flowered last year at 4 years.  
Has had a magnificently elevated umbel last year and again this year!*

If you have grown your plants well from day one, they will reward you and power along now. Moreover, time and again I see that seedlings which have got off to a great start are less prone to fungal and rot problems later. Most of my plants potted up into 100mm pots at 12 months are literally bursting out of these pots a year later, at which time they will be moved on to 150mm pots. But that's another story!

**Courtesy of Peter Haeusler, Melbourne Clivia Group and well known Clivia enthusiast.**

#### *Germinating Clivia Seed*

##### **First example**

Clivia seeds can actually germinate in almost any growing medium! Pure perlite, pure pumice, pure sphagnum moss, coconut chips, coconut coir, water, wet paper towel, seedling mix and a lot more. Coco chips works the best for me here in my growing conditions.

I use plastic containers with lids slightly closed at first. Coating the seeds with Captan can help prevent fungus but this is not necessary. Keep them moist and cosy (70-75F air temp works well for me).

Once the seedlings grow a leaf, I slowly open up the lids to give them more air circulation. These containers are quite convenient for me as I move around these containers depending on how much light the seedlings need.

Newly planted seeds don't need light, so I can place them anywhere I like. Once seedlings grow a leaf, they would need some kind of light already, so I move them near my window.

I start feeding them with a very weak organic fertilizer once they grow a root. When a seedling's root starts to push itself from the medium, I either plant them deeper to cover the roots, or place moist sphagnum moss over the root (so it won't dry) or just plant them already in a seedling mix.

##### **Second example**

Clivia berries take approximately 10 to 12 months to mature Indicated by a colour change.

Green berries transform into dark orange to pale cream and in-between hues. These coloured berries are an attraction to various animals. In South Africa, monkeys eat the soft pulpy outer berry, discarding the seeds which are poisonous. Thus, Clivia have been found growing on tree branches. In Australia, rats are known to eat the fleshy portion of the berry and collecting the seeds into piles.

For successful germination of Clivia seeds some of the following points may be of assistance:

- 1) Be sure to remove all soft berry pulp surrounding the seed.
- 2) Carefully strip off the thin membrane around each seed. Use a soft cloth if you find this difficult, rotating the seed until it is clean. Do not use sharp instruments as this may remove more layers or damage the embryonic shoot.

3) Non-removal of the thin membrane surrounding the seed tends to promote fungus formation.

4) Use normal Clivia growing mix, placing the seeds on the mix surface and lightly dust with a fungicide (i.e. Mancozeb).

5) Barely cover the seeds with the Clivia growing mix.

6) Keep the growing mix and seeds MOIST and free draining, never wet. Do not cover seeds/mix with plastic or lids or fungus will be a problem.

7) After a short while you will be rewarded by a leaf sprout breaking through the mix. Sometimes, when the root pushes down into the mix it can encounter a hard patch sending the seed into the air. Using a small stick, make a hole in the mix and place the aerial seedling into the hole so that the seed is level with the mix surface.

8) Be vigilant and check for small fungus gnats that can damage your seedlings. (The larval stage of the gnat can attack the seedling root which may facilitate fungus attack). If fungus gnats are present, spray with pyrethrum.

9) Continue your culture until seedlings have two or more leaves. Then pot into 100mm/4-inch containers. DO NOT OVERPOT.

10) For Clivia seeds sourced from elsewhere or overseas, seeds may be partially dehydrated and subsequently take longer to germinate.

(Soaking dehydrated wizened seed in a plant tonic (i.e. Seasol) may re-hydrate seed).

11) Note that Clivia seeds have relatively short-time viability.

The International seed repository has to replace Clivia seeds each one to two years.



### *Pigmented and Unpigmented Seedlings*

For the benefit of the new growers .... It is possible to tell a yellow flower Clivia from an orange flowering Clivia soon after it germinates. Look at the base of the seedling / plant .... can you see a difference? The one is green and the other a reddish dark colour. The unpigmented, green base seedlings will flower Yellow.



The reddish or pigmented seedlings will not. It is important to label the unpigmented seedlings asap as this difference disappears after about 3 years. This will not apply to the Chinese Blush Yellows and Group 3 Yellows but more about that later.



Pigmented seedlings

HiltonClivias



Unpigmented seedlings

HiltonClivias



Unpigmented seedling green in color  
Will flower Yellow

< Pigmented seedling  
Will not flower Yellow ...Probably orange

HiltonClivias



Pigmented and Unpigmented Seedlings

HiltonClivias



Pigmented and Unpigmented Seedlings

HiltonClivias

## **Pests and Diseases**

*Lily Borer*

*Mealy Bugs*

*Scale*

*Snout Beetles*

*Thrips*

*White Fly*

*Slugs and Snails*

*Red Spider*

*Fungal and Bacterial diseases*

## **Pests and Diseases**

© Copyright Frikkie Marais. Used with permission.

### **APHID**

Small delicate pear-shaped insects with soft bodies and long legs and antennae. Usually greenish or black, with or without transparent wings. Found in small colonies sucking sap of tender growths or flower buds. Often attended by ants. Transmitters of viral diseases.

#### **Treatment:**

Chlorpyrifos (Chlorpirifos, Dursban) as a full cover application when necessary.  
Mercaptothion (Malathion, Malasol) as a full cover application when necessary.

### **LILY BORER**

Black caterpillar with yellow bands. Feeds on leaves and tunnels into leaves, stalks and bulbs of various lilies and amaryllids.

#### **Treatment:**

Cypermethrin (Garden Ripcord) as a full cover application when pest is noticed.  
Deltamethrin (Decis) as a full cover application when pest is noticed.

### **MEALY BUG**

Small 3mm long oval-shaped light-pink bodied stationary insect covered by waxy threads with 2 long threads protruding. Found on tender growth. Heavy excretion of honeydew can cause growth of mould. Often attended by ants. Transmitters of viral diseases.

## **Treatment:**

Chlorpyrifos (Chlorpirifos, Dursban) as a full cover application when necessary.  
Mercaptothion (Malathion, Malasol) as a full cover application when necessary.  
Pyrethrin/Fatty acids (natural insecticide) as a full cover application when necessary.

### **RED SPIDER MITE**

Minute reddish-brown “spiders” with four pairs of legs of equal length and oval body. Weave a web on the underside of leaves. Eggs creamy white. Cause yellowing and bronzing of the leaves.

#### **Treatment:**

Chlorphenapyr (spidermitespray) as a full cover-application.  
Chlorpyrifos (Chlorpirifos, Dursban) as a full cover application when necessary.  
Tetradifon (Red spidercide) as a full cover application when pest is noticed. Kills eggs and sterilises females

### **SLUGS AND SNAILS**

Greyish-brown slimy legless soft-bodied creature. With (snail) or without (slug) coiled shell. Leaves a shiny trail of viscid secretion. Feed on young succulent growth of a great variety of plants. Active only under damp conditions.

#### **Treatment:**

Metaldehyde Karbaryl (Snailbait) scatter bait around.  
Methiocarb (Mesurol) scatter bait around.  
Carbaryl/Metaldehyde (Snailflo) apply evenly as a drench over plants and pots

### **THRIPS**

Minute insects with four long narrow fringed wings. Immature stages yellowish. Adults dark and very active, having the habit of turning up the abdomen. In order to feed they rasp the plant surface causing small silver blotches. Transmitters of viral diseases.

#### **Treatment:**

Mercaptothion (Malathion, Malasol) as a full cover application when necessary.



Gamma BHC (Bexadust) as a dustable powder over plants and affected areas.

### **WHITEFLY**

Small four-winged insects. Wings and body covered by fine white powder. Larvae minute oval-shaped and covered with short white waxy filaments. Suck sap from underside of leaves.

#### **Treatment:**

Pyriproxyfen (Whitefly insecticide) apply as indicated

Cypermethrin (Garden Ripcord) as a full cover application when pest is noticed.

Deltamethrin (Decis) as a full cover application when pest is noticed.

### **SNOUT BEETLE**

Brownish-black weevils, with the head elongated into a distinct snout. Feed mainly at night and damage leaves and bracts. Especially problematic in the Cape.

#### **Treatment:**

Mercaptothion (Malathion, Malasol) as a full cover application when necessary.

### **FUNGAL AND BACTERIAL DISEASES**

Various pathogenic organisms externally present on the seed, plants or in the soil. They are the causes of diseases like seed rot, root rot, damping-off, rust, leaf spots and bacterial rot.

#### **Treatment:**

Copper oxychloride (Virikop) apply as a drench to soils 1.5l per square metre (for bacteria and fungus)

Furalaxyl (Fongarid) apply as a drench to seedlings and cuttings in pots or beds. (for fungus)

Zineb (Zineb) apply as directed. Controls various leaf spots. (for fungus)

### **VIRUS**

Viruses are microscopic organisms consisting of pieces of nucleoprotein, which have to multiply in living tissue. Virus particles can be transmitted by seed,

infected gardening equipment, soil and various insects

#### **Treatment:**

No treatment available

All suspected plants/propagating material should be destroyed.

### **Frikkie Marais**

---

## **Clivia Pests and Diseases**

### **Melbourne Clivia Group**

Even though they are quite robust plants, Clivias are subject to a number of few pests and diseases. These should be treated promptly as the earlier they are attended to; the easier treatment should be. Good hygiene around the garden will help minimise attacks to plants, and includes removing weeds, old rubbish and any pieces of old rotting wood that may harbor pests. Regularly remove old and yellowing leaves from your Clivia clumps as these can harbor pests. Watch carefully for slugs and snails, mealy bugs, and fungus gnats, and treat accordingly if discovered.

The best way to help prevent disease is to keep your plants as healthy as possible, especially if they are container-grown plants. A stressed plant is more likely to succumb to disease than a healthy one, so ensure that plants are well fed, are not over or under watered, have adequate ventilation, and are in the correct pot for their size. Remove any dying or rotting leaves from plants, and always isolate any plants that are suffering from disease.

### **Pests**

#### **Mealybugs**

Mealybugs belong to the scale insect group and have a worldwide distribution. They are named because of the whitish 'mealy' wax which helps to slow down

water loss from their bodies. They generally prefer warm, humid, sheltered sites, and can build up huge numbers in a very short time severely damaging young leaves and transmitting plant viruses in the process.

Mealybugs feed by inserting straw-like mouthparts, known as stylets, into the plant tissue. Honeydew is the waste product of mealy bug feeding and is a perfect medium for sooty mould fungi. Ants also love to feed on this honeydew, and they shelter the mealybugs in 'barns' they construct on protected flat surfaces (e.g. under leaves), and in the leaf axils of plants. When the ants stroke the mealybug's abdomen, it secretes a drop of honeydew.

Mealybugs thrive freely in temperatures of approximately 25°C with a relative high humidity. In ideal conditions, there will be multiple generations within a year, so they can become resistant to pesticides in a relatively short time. For this reason, it is a good idea to vary the types of chemicals or such that you use to control them.

Parasitic wasps and ladybirds are two methods of biological control, the wasp usually being the more effective. Chemical methods include Confidor or Folimat for larger infestations, or a pyrethrum spray for mild attacks. Minor infestations may be removed by hand, or with a cotton tip dipped in methylated spirits.

It is very important to control or eradicate ants, as the ants will protect the mealy bug colonies, and even re-locate them if under threat. Ants will also attack parasites which attack the mealy bug. Care must be exercised with all chemical pesticides - they must be used according to manufacturer's instructions and used with caution. Neem Oil has also been used with great effect against mealy bugs if a non-chemical option is preferred.

## **Snails and Slugs**

These can-do enormous damage to Clivias, attacking the leaves, soft new growth, buds and flowers. They can be easily removed by hand if there are only a few, otherwise more aggressive methods will be required.

Common non-toxic methods are beer traps or placing a sharp material around the base of the plants, such as crushed egg-shells, or small sharp stones or gravel. More serious infestations will respond well to a new generation slug and snail killer called Multiguard. This product is not a scheduled poison, and is non-toxic to domestic pets, birds, wildlife, etc. Its active ingredient is based on iron. It lasts up to four weeks and will break down and add nutrients to the soil.

## **Fungus Gnats**

These tiny, mosquito-like insects are usually first noticed darting about new seedlings.

The adult fungus gnats are an annoyance, but it is the larvae that can-do great damage to your young plants and seedlings by feeding on the new roots. This feeding causes stress to the plants and provides an entrance for disease pathogens. The larvae can also carry fungal spores. The first sign of their presence may be the wilting and decline of the plant.

To monitor these pests place some of the commercially available yellow sticky cards (these are often used to catch thrips and white fly), or a slice of potato in the pots where you are germinating seedlings. The cards will attract the adults, and the larvae are attracted to the potato - these can be used to help gauge the amount of larvae present. The larvae also feed on fresh compost, so avoid using this in your pots. Use a well-draining potting mix, as overly moist conditions will also encourage their presence.

It is also important to practice good hygiene in your plant area and remove

old plant material and garden debris. Pyrethrum sprays are effective against the adults, and there are biological controls such as nematodes and predatory bacteria to control the larvae.

### **Diseases**

This list of diseases is by no means exhaustive. Clivias are subject to several different diseases, often depending on the area and climactic conditions where they are grown and need to be diagnosed and treated accordingly.

### **Damping-off Fungi**

Several species of fungi cause damping off, and include Pythium, Rhizoctonia, Phytophthora, and Sclerotium. This disease is more common in Clivia seedlings and can be a serious problem. Young plants and seedlings can rot at the base and collapse. These fungi can also attack adult plants, but the adults are generally not killed.

It is very important to maintain good hygiene, ventilation, and excellent drainage, especially in warm, humid conditions. Control is by drenching the soil with fungicides such as Fongarid, and copper oxychloride sprays.

### **Bacterial Soft Rot**

The symptoms of this usually begin with the yellowing of one or two bottom leaves and may not be noticed until the plant literally falls over.

The base of the plant will contain a dark sodden lesion, and the whole basal area may rot and have a strong stench. It is important to immediately isolate the plant, as it is very infectious. The plant may be saved if the problem is detected early enough. Cut away all the rotting tissue until only healthy plant tissue remains. Clean your blade with a methylated spirit or some form of disinfectant after each cut to prevent infecting new leaves as you

work. Apply a thick paste made with Mancozeb to the affected area, or soak in a Mancozeb solution and allow to dry for a day or so before replanting. In the case of severe root loss it you might need to replant your Clivia in either a coarse river sand or sphagnum moss until the roots regrow - and do not over-water!

This disease is caused by bacteria, and usually occurs when the potting mix or soil is poorly drained and over-watered.

### **Chlorosis**

Chlorosis is a yellowing of the leaves where the plant produces insufficient chlorophyll. It is usually caused either by a mineral deficiency, or the pH of the mix does not allow the uptake by the plant of certain minerals.

If the pH is too high i.e. above 7, iron will not be available to the plant. This can be helped by using iron chelates either as a foliar spray or applied to the soil. If the pH is too low i.e. below 5.5, magnesium will not be available. This can be remedied by using magnesium sulphate or Epsom Salts.

Courtesy of Melbourne Clivia Group

### **Suggestions for breeding that Special Clivia**



**GOLDEN DELIGHT**





**VICO YELLOW**



**BELLA LANISTER**



**RECURVE YELLOW**



**BELLA TYRION**



**DARUMA YELLOW**



**BELLA ARYA**



**CHINESE BROAD LEAF YELLOW**



**SHAE**





**JON SNOW**



**CERCEI'S GOLD**



**BRIENNE**

### **Yellow Clivias**

Although rare a few years ago, yellow Clivias are now bred by hundreds of growers around the world. Yellows come in a variety of shapes and a variety of shades from light cream to almost butter yellow. We select and breed with only my best yellows, choosing plants with large umbels, full round petals and good flower count. Our collection includes Vico Yellows, Nakamura Yellows and

group 2 yellows such as the Natal Yellow. Yellows are divided into group 1 and group 2 yellows of which group 1 yellows breed true to type yellow plants. Group 2 yellows are split for orange/pastel. The yellows with green centres have become very popular and I have several of these that I use for breeding. Our latest import is a TK original yellow with a green throat from Shige in Japan. This is also a group 2 yellow, but very good for breeding green throated plants. This year a beautiful tulip yellow flowered in my nursery and true tulip yellows are still rare. I am hoping to use this one extensively in my breeding program. I am also aiming to breed shorter broader leaf yellows to give a compact yellow plant. I have several of these seedlings and young plants growing on in my nursery. I was able to obtain some yellow Daruma pollen last year and did several crosses with it on my group 1 yellows. Now is the 4 year wait to see what might come of those seeds. I have bred several top yellows of which some of them have won top awards for first flowering yellow seedlings at major Clivia shows. Have a look at our show gallery to see some of these beauties.

We have since imported broad leaf yellow plants from China and have done extensive crosses with these. Our latest breeding programme is a series of yellows bred out of the original Bella Donna Ophra. These are stunning short leaf, compact plants with lovely large flowers on very good umbels. We have named them Bella Tyrion, Bella Arya, and Bella Lanister.

We have bred a beautiful large cream and have aptly named it "Jon Snow". This plant was bred from Ghost 2. Other first flowering beauties include "Shae", "Cersei's Gold" and "Brienne".

## **Yellow Clivia groupings:**

### **Group 1 Yellows:**

Mare's or Howick Yellow Blinkwater  
Yellow Mpumulo Yellow King  
Hamelin Yellow  
Arturo's Yellow San Marcos Yellow  
Kirstenbosh Yellow Eshowe or  
Saunders Yellow  
Watkins Yellow Karkloof Yellow Jim  
Holmes Yellow Whyte Yellow Noyce's  
Yellow Vico or Smither's Yellow Vico  
Gold Kewensis strain yellows 'GTS  
Delta Cream' Solomone Yellow, Yellow  
Daruma G1 Sir John Thouron Conway's  
'Megan' Vic Daniels Yellow G1 Pen  
Henry Yellow Lemon Chiffon Lemon  
Ice Solomone Cream  
Holmes Yellows Col Pitman Walters  
Yellow Morris Yellow Humbolt Yellow  
Dr. Hirao Yellow Lisa Mannion Yellow  
Solomone Yellow Nakamura Yellow

### **Group 2 Yellows:**

Centani Yellow Dwesa Yellow<sup>1</sup> Bashee  
Yellow Transkei Yellow Smith's  
Yellow  
Tsolo Yellow Floradale Yellow Natal  
Yellow<sup>2</sup> Giddy Yellow Gibelo Yellow  
Holl's Yellow Swellendam Yellow  
Stella Parish Yellow Cynthia's Best  
Port St John's Yellow Hirao Green  
Yellow Daruma G2 TK Yellow GT  
'Cynthia's Dream'<sup>3</sup>  
Vic Daniels Yellow G2 'Auriel Batten  
Yellow' 'Butter Yellow'<sup>7</sup> 'Pat's Gold'  
'Golden Fleece'  
TK Miniature Yellow TK short BL  
Yellow Nakamura Yellow  
Charlsgreen Green Bomb

### **Group 3 Yellows:**

Celtis Kloof Yellow<sup>4</sup> Potterill Blush  
Yellow Greendale yellow Peacevale  
yellow

## **Unknown Yellows:**

Mvuma Yellow<sup>5</sup> Ndwedwe Alpha  
Thurston<sup>6</sup> Ndwedwe Beta Thurston  
Oribi Gorge Yellow Byrne Valley  
Yellow Crookes Yellow Qora Yellow

## Clivia Species

*Clivia Nobilis*



*Clivia nobilis* Lindl

**Family:** Amaryllidaceae

Common names: Eastern Cape Clivia, Eastern Cape bush lily (Eng.); boslelie (Afr.); umayime (isiXhosa & isiZulu)

### Introduction

*Clivia nobilis* was the first species of *Clivia* to be described in 1828. It was a popular plant in England until the more spectacular *Clivia miniata* appeared on the scene some 30 years later.



### Description

*Clivia nobilis* is an evergreen bulbous plant which develops a rhizome and forms a tight clump as new suckers are produced, and the plant becomes larger.

In light shade the leaves are almost horizontal and are relatively short, approximately 300 mm in length, while in dense shade the leaves are fairly upright and grow to 800 mm in length. The width of the leaves can range from 25 to 50 mm. The leaves are a dull dark green, with some forms displaying a pale green stripe down the centre of the leaf similar to the stripe which occurs on the leaves of some *C. mirabilis* plants. The margins of the leaves on many plants are serrated and the leaf tips are rounded and often notched.



*C. nobilis* produces an inflorescence containing 40 to 60 pendulous cylindrical flowers ranging in colour from very pale to dark orange or orange-red with pale to dark green tips. There is also an unusual form with flowers that are very pale pinkish-yellow in the upper half and pale greenish-yellow in the lower half. It flowers between late autumn and spring. Flowers are followed by clusters of bright red berries the size of a marbles which take a year to ripen. The seed is round and about 6 mm in diameter.



The rate of growth of *C. nobilis* is considerably slower than that of all other *Clivia* species. From seed *C. nobilis* takes at least 6 years or more to flower. Under favourable conditions this species is a long-lived plant and will outlive many generations.

### Conservation Status

According to the website <http://redlist.sanbi.org> checked on 20 January 2016 the conservation status of this plant is Vulnerable (VU). The population has declined by at least 30% in the last 120 years due to harvesting for the medicinal plant trade, horticultural acquisitions and some habitat destruction caused by coastal development.

### Distribution and habitat

*Clivia nobilis* occurs as isolated populations on the east coast from Alexandria Forest near Port Elizabeth northwards to Hole-in-the-Wall (in former Transkei). Occasional populations occur inland, with the most westerly population occurring in the Zuurberge up to an altitude of 600 m.

Coastal populations occur on dune sand, while forest and inland populations are found on river banks, on shale and rocky outcrops. Both coastal and inland populations have been found growing in both bush cover and with a high forest canopy. These differing light intensities affect the leaf length. Rainfall in the area ranges from 1000 mm to 1400 mm which occurs in summer. Temperatures range from as low as 3° C to 30° C; however, the evergreen forests always have a cooling effect.

### History

*Clivia nobilis* was named by Lindley in honour of the Duchess of Northumberland, Lady Clive, who was the granddaughter of Clive of India. The plant was collected by William Burchell, a school teacher who arrived in Cape Town in 1810. He was fascinated by natural history and spent four years travelling in a covered wagon collecting herbarium specimens of plants. He collected a plant near Grahamstown



which later turned out to be a new genus, *Clivia*.

There are in total 6 *Clivia* species — [\*C. nobilis\*](#), [\*C. miniata\*](#), [\*C. caulescens\*](#), [\*C. gardenii\*](#), the recently discovered [\*C. mirabilis\*](#) and [\*C. robusta\*](#) — all of which produce pendulous flowers, with the exception of *C. miniata*, the most striking of them all with large open flowers which vary in size, shape and colour.

### Ecology

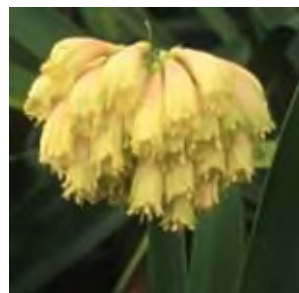
Not a great deal is known about the pollination of *C. nobilis*. It is possible that the flowers are self-pollinating or wind-pollinated. However, the flowers produce copious amounts of nectar so bees and sunbirds could also be pollinators of this fascinating plant. Birds are known to distribute the seed. *C. nobilis* is a plant which requires very little water to survive.

### Use

Unfortunately, all *Clivia* species are harvested in their natural habitats for medicinal and magical uses, a practice which is destroying many populations of *Clivia*. *Clivia nobilis* is not very well known horticulturally, possibly as it is so slow-growing and not as spectacular as *C. miniata*.

### Growing *Clivia nobilis*

Light shade is an ideal situation for this species, with good drainage in a frost-free area. Ideal companion plants are [\*Asparagus densiflorus\*](#), [\*Crassula muticava\*](#), [\*Clivia miniata\*](#) and [\*Veltheimia bracteata\*](#). *Clivia nobilis* is not deep-rooted, so plenty of compost applied as a mulch is most beneficial if applied once a year. In addition, feed once a year with an organic fertilizer.



Propagate *C. nobilis* by sowing the seed once all the soft tissue has been removed from the berry. Sow the seed while fresh in a mixture of equal parts milled pine bark and sand. Cover lightly with milled pine bark. Once the seedlings are large enough to handle, they need to be planted out into 15-cm pots. Three in each pot. Every 9 months they need to be repotted in fresh growing medium as the old medium breaks down and the drainage is impaired.

These plants can also be propagated by division using a sharp knife to separate each growing stem. Plant in the same medium as above. The divisions should flower within 2 years whilst your seedlings will take 6 or more years to flower.

Pests which occur in moist shady areas are slugs and snails and they do much damage to the young tender growths. Care must be taken to eliminate these pests. Another pest which much damage can do is the snout beetle. It is nocturnal and damages the leaves. A contact insecticide will eliminate this pest.

### References

- Duncan, G.D. 1999. Grow Clivias. Kirstenbosch Gardening Series. South African National Biodiversity Institute, Cape Town.
- Koopowitz, H. 2002. Clivias Timber Press, Portland Cambridge

**John Winter**  
**Kirstenbosch National Botanical**  
**Garden**  
**January 2006**

### Plant Attributes:

Plant Type: Bulb  
SA Distribution: Eastern Cape  
Soil type: Loam  
Flowering season: Spring, Autumn  
PH: Acid, Neutral  
Flower colour: Green, Red, Orange  
Aspect: Shade  
Gardening skill: Easy

### Special Features:



Attracts birds



Good pot plant



Medical plant

### *Clivia Robusta*



***Clivia robusta* B.G. Murray, Ran, De Lange, Hammett, Truter & Swanevelder**

**Family:** Amaryllidaceae

Common names: swamp bush lily, swamp Clivia

### Introduction

*Clivia robusta* is probably one of the tallest members of the genus as it can grow to a height of 1.6 m in ideal conditions. It is a strong grower and thrives in swampy conditions. The flowers are pendulous and range from various shades of orange to yellow with green tips. The yellow flowering form has now been described as a new variety of *C. robusta* and is known as var. *citrina*.



### Description

*C. robusta* has strap-shaped broad leaves which can reach 1.80 m in length. The habit is upright. Plants flower in late autumn to mid-winter, producing pendulous flowers ranging from pale to dark orange with green tips. The peduncles or flower spikes are strong and hold the inflorescence above the foliage.



The berries are round, green ripening to orange. Under ideal conditions, *Clivia robusta* is long-lived, produces buttress roots in very wet areas and can grow to a height of 1.6 m.

### Conservation Status

In nature this species is regarded as threatened because the natural populations are so scattered and isolated.

### Distribution description

*Clivia robusta* occurs in Pondoland, growing in marshes amongst forest species such as *Syzygium cordatum*, *Erythrina caffra* and *Phoenix reclinata*, in scattered isolated areas.

### History

The specific name *robusta* refers to the robust nature of the species. A visit a number of years ago to Kirstenbosch Botanic Garden by Dr Keith Hammett, a plant breeder from New Zealand, resulted in Graham Duncan giving him some seed of a *Clivia gardenia* collection which had been collected in Pondoland. This material was used to do genetic analyses which has resulted in the species *C. robusta* being described.

To the naked eye it is difficult to distinguish *Clivia robusta* from *C. gardenii*. *C. robusta* was described as a new species as a result of genetic analyses by Ran in New Zealand. *C. robusta* tends to be more robust with broader leaves than *Gardenii*.

### Ecology

Little is known about the pollinators of *Clivia* and studies are now being undertaken to discover what pollinates it. This species has adapted to growing in marshes by developing buttress roots. Seed is dispersed by birds.

### Use

Traditional healers and *Clivia* enthusiasts remove large quantities of this species which threatens their survival in their natural habitat. Fortunately, when plants are removed much of the root is left behind. These roots regenerate to form new young plants. The inhospitable marsh habitats do not prevent these collectors from removing plants. Traditional healers sell the stem of the plant for medicinal as well as magical purposes. This species is an ideal garden subject under suitable conditions.

### Growing *Clivia robusta*

This species is well suited to cultivation under ideal conditions. It is not frost

tolerant and does best in high-rainfall areas and light shade. Temperatures ranging from 5°C to 32°C would suit this species.

*Clivia robusta* requires light shade, good drainage, regular feeding and watering to do well. It is well suited to shady situations and marshy areas in the garden. Steep banks are also ideal as this helps to provide good drainage, particularly in heavy soils. The roots of the plant also help to stabilize the bank. Suitable companion plants are *Scadoxus multiflorus* subsp. *Katharinae*, *Crinum moorei*, *Plectranthus* spp, *Stangeria eriopus*, *Asparagus densiflorus* and *Encephalartos villosus*.

Before planting, prepare the area well by digging over and applying a generous quantity of well-decomposed compost which needs to be dug in. Plant the *Clivias* half a metre apart as they are tall, strong growers. To maintain good-quality plants and displays it is important to replant every five years. Thorough preparation of the site after lifting the *C. robusta* is essential. Dig over the area and then apply a liberal application of compost before replanting. It is also an opportunity at this time to divide the plants, to increase the size of the planting if necessary.

Each year in the autumn, apply a generous layer of compost around the plants. They derive a lot of benefit from this as they are not deep-rooting plants. In the summer an application of organic fertilizer can be broadcast around the root area of the plants. Alternatively, broadcast a layer of old manure around the root area.

Propagation of *C. robusta* is either from seed or division. As the berries start colouring, they can be harvested, and all of the soft tissue should be removed. Before

sowing, wash the seeds in a mild fungicide solution. The clean seeds can now be sown in a medium of milled pine bark by pressing them into the medium just below the surface. It is important to keep the bark moist at all times. This milled bark needs to be fairly fine when sowing seeds.

The seeds germinate within a month and after six months the seedlings should be transplanted into 15-cm pots, planting three to a pot to allow sufficient space for the plants to develop. A coarse growing medium of 12 mm bark must now be used.

*Clivias* are slow growers so it is important not to allow the young plants to stress as this slows down their growth. Stress is caused by lack of water, high light intensity, overheating, lack of food and poor drainage. Feed every two weeks with a general fertilizer at the recommended strength and replant the young plants at least once a year with fresh growing medium. All growing mediums deteriorate in time, as they become more compact, drainage deteriorates with the result that the roots start rotting because there is no longer any oxygen around the root area. So, it is important to repot regularly until the plants are large enough to be planted in the garden.

Because of the environment in which *Clivias* grow, slugs and snails are a problem, particularly when the flower buds start appearing. Bait needs to be scattered around the plants to eliminate the slugs and snails. Other pests are mealy bugs, amaryllis caterpillar, scale and snout beetle which all need to be eliminated by spraying with a suitable insecticide.

## References

- Murray, B.G., Ran, Y., De Lange, P.J., Hammett, K.R.W., Truter, J.T. &



Swanevelder, Z.H. 2004. A new species of *Clivia* (Amaryllidaceae) endemic to the Pondoland Centre of Endemism, South Africa. *Botanical Journal of the Linnean Society* 146: 369-374.

- Zwanevelder, Z.H., Forbes-Hardinge, A., Truter, J.T. & Van Wyk, A.E. 2006. A new variety of *Clivia robusta* (Amaryllidaceae). *Bothalia* 36: 66-68.
- Swanevelder, Z. H. 2003 Diversity and Population Structure of *Clivia miniata* Lindl (Amaryllidaceae). University of Pretoria. Pretoria.

**John Winter**  
**Kirstenbosch NBG**  
**July 2007**

### Plant Attributes:

Plant Type: Bulb

SA Distribution: Eastern Cape, KwaZulu-Natal

Soil type: Sandy, Loam

Flowering season: Autumn, Winter

PH: Acid, Neutral

Flower colour: Green, Yellow, Orange

Aspect: Shade

Gardening skill: Average

### Special Features:



Attracts birds



Good pot plant



Indoor plant



Poisonous



Medical plant



Wet sites

*Clivia Miniata*



*Clivia miniata* [Lindl.] Regel

**Family:** Amaryllidaceae

Common names: bush lily (Eng.); boslelie (Afr.); umayime (Zulu)

### Introduction

A striking plant, an international star, with its dark green leaves and trumpet-shaped orange flowers, *Clivia miniata* is the ideal plant for the shade garden or for containers.



## Description

*Clivia miniata* is a clump-forming perennial with dark green, strap-shaped leaves which arise from a fleshy underground stem. The flowering heads of brilliant orange (rarely yellow), trumpet-shaped flowers appear mainly in spring (August to November) but also sporadically at other times of the year. The deep green, shiny leaves are a perfect foil for the masses of orange flowers.



## Distribution description

The genus *Clivia* is endemic to southern Africa, meaning that they do not occur naturally anywhere else in the world! The wild bush lily grows in the forests of Kwazulu-Natal, Eastern Cape, Mpumalanga and Swaziland. The habitat may vary from subtropical coastal forest to ravines in high-altitude forest. It grows in dappled shade, often in large colonies. The soil is well-drained and humus rich. Occasionally they may be found growing in the fork of a tree.

## History

The genus name *Clivia* is after the Duchess of Northumberland, Lady Charlotte Clive, who first cultivated and flowered the type specimen in England. The species epithet *miniata* means the colour of red lead, referring to the flowers.

The world's love affair with South Africa's Clivias began in the 1800s when specimens were sent back to England from

Kwazulu-Natal. In Victorian times this beautiful plant was very popular for indoor use in England and Europe. The discovery of the yellow-flowered *Clivia miniata* (*C. miniata* var. *citrina*) in the late 1800s fuelled an interest which still persists today.



Part of the fascination has been with the breeding of Clivias, both amongst the four species (*C. nobilis*, *C. gardenii*, *C. caulescens*, *C. miniata*) and between forms and colours within the species. Breeders select for specific traits in each generation to produce pronounced qualities such as huge, broad petalled flowers, red, yellow or apricot coloration, broad leaves, fan-shaped leaf arrangement, variegation, dwarfism and many others. Internationally, the most advanced breeding of *Clivia* is happening in the Far East, most notably Japan.

## Use

Sadly, in many areas colonies of wild bush lilies have been destroyed by harvesting for traditional medicine and also by plant collectors. The rhizomes are reportedly extremely toxic but are used medicinally for various purposes.

## Growing *Clivia miniata*

*Clivia miniata* is easily cultivated and very rewarding. Plant in dappled shade — Clivias are sensitive to sunlight and will burn easily. Plant in well-composted soil, which will also help with soil-water retention during dry periods. The plants should be watered regularly during the summer months, which is their growing

season. Watering can be reduced during winter and the plants will tolerate fairly long dry periods. Bush lilies are spectacular container subjects. They should be grown in a well-drained potting medium which has plenty of compost added. This will also ensure good aeration which is another of their requirements. Clivias respond well to feeding in the summer months, either with slow-release fertiliser included in the potting mix or with a good liquid feed. Beds of established Clivia can be given a granular fertiliser such as 3:1:5 or 2:3:2 and will benefit from a thick layer of organic mulch such as well-rotted compost, annually.



The bush lily is frost-tender and may be damaged if in a position that is exposed, especially to cold winds. It takes a long time for the damage to grow out if this happens, so it is best to select a sheltered site.

*Clivia miniata* can be propagated by seed or by removing suckers. The fruits are bright orange when ripe (or golden in the case of the yellow flowered plants). The pulp should be removed from the seed when you are ready to sow. The seeds are large with a pearly sheen and should be sown fresh for best results. (Remember to wash your hands very well after cleaning the seed.) Sow the seed in deep trays in sifted seedling mix which has been

sterilised. Simply press the seeds gently into the mix until they are almost flush with the surface. The medium should be kept moist but since the seeds take a long time to germinate (four to six weeks), keep an eye out for algal growths on the surface which will deprive the germinating seeds of oxygen. They may remain in the trays for up to two years before they are large enough to plant on.

Large clumps can be split up using two forks to lever them apart or individual plants can be removed using a clean, sharp spade. These plants may not flower for a couple of seasons after splitting. This method of propagation is a reliable method of obtaining plants which are true to colour which is a problem when using seed. A yellow Clivia will not necessarily yield yellow seedlings!

### References

- Duncan, GD. 1999. Grow Clivias. Kirstenbosch Gardening Series. National Botanical Institute. Cape Town.
- Pooley, E. 1998. A Field Guide to Wild Flowers of Kwazulu-Natal and the Eastern Region. Natal Flora Publications Trust. Durban
- Van Wyk, B-E, van Oudtshoorn, B & Gericke, N. 1997. Medicinal Plants of South Africa. Briza Publications, Pretoria.

**Alice Aubrey**  
**Witwatersrand National Botanical**  
**Garden**  
**August 2001**

### Plant Attributes:

Plant Type: Bulb, Perennial

SA Distribution: Eastern Cape, KwaZulu-Natal, Mpumalanga

Soil type: Loam

Flowering season: Spring, Sporadic/All year

PH: Acid, Neutral

Flower colour: Yellow, Orange

Aspect: Shade

Gardening skill: Easy

### Special Features:



Attracts birds



Good pot plant



Poisonous



Medical plant

### *Clivia Mirabilis*



### *Clivia mirabilis* Rourke

**Family:** Amaryllidaceae

**Common names:** miracle Clivia

### Introduction

The discovery in the Nieuwoudtville area of the Northern Cape of a most unusual new *Clivia* species, *Clivia mirabilis*, caused much excitement in the botanical community.



### Description

"This *Clivia* seems to be able to tolerate the brutal northern Cape sun with little sign of leaf damage. It has unusual leaves with a prominent white stripe down the middle, that turn deep maroon at the base. It has a very large root system which is what allows the mature plants to survive the prolonged rainless summer" (John Winter, international *Clivia* expert and past Curator of Kirstenbosch).

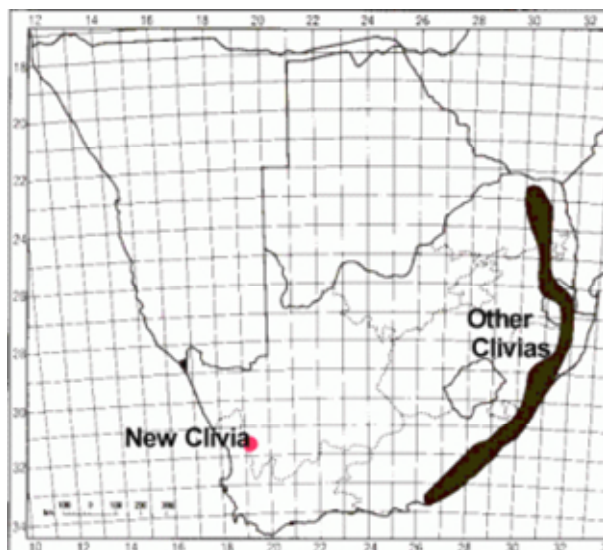
### Distribution description

The discovery of *Clivia mirabilis* was particularly unusual as *Clivias* are generally shade-loving and usually occur



in summer-rainfall areas. The Nieuwoudtville area has a semi-arid Mediterranean climate with a strictly winter rainfall, exactly the opposite climatic conditions experienced by the other four species of *Clivia*.

"Other than the centre of the Sahara Desert, you could not think of a more unlikely place to find a new species of *Clivia*. Its nearest relative grows nearly 800 kilometres away in the Eastern Cape", said Dr John Rourke, head of the Compton Herbarium at the Kirstenbosch Research Centre.



Nieuwoudtville is popularly known as the bulb capital of the world and is renowned for having the most species-rich display of indigenous bulbs in spring and winter.

The new species has been christened *Clivia mirabilis* by Dr Rourke, who described it formally in the May 2002 edition of the National Botanical Institute's journal, *Bothalia*. "This name, which means astonishing or miraculous, was chosen to reflect our amazement at the apparently endless surprises nature still has in store for us in this part of South Africa," said Dr Rourke.

The plant was discovered by Wessel Pretorius of the Oorlogskloof Nature Reserve and access to this population of plants is being strictly controlled by Northern Cape Nature Conservation.

This latest discovery brings to well over 70 the number of new, previously undescribed species discovered over the past five years in the Cape, an area renowned for its biodiversity.

### Use

The discovery of such a unique species of *Clivia* is expected to generate much commercial interest from the international horticultural industry, as *Clivias* are extremely popular worldwide, particularly in the Far East. During a boom in the demand for *Clivias* in China in the 1980s, desirable plants were being sold for amounts equivalent to around 300 times the average annual earnings of a Chinese university graduate.

### Growing *Clivia mirabilis*

Growing *Clivia mirabilis* has been a steep learning curve. It is very important to bear in mind the climatic conditions under which this species grows in the wild: discovered in the Northern Cape near Nieuwoudtville, the area experiences a semi-arid Mediterranean climate with winter rain of approximately 400 mm (16 inches) a year, dry summers, light frost in winter and maximum temperatures of up to 45 C in summer.

For various reasons, plant growers all have their own methods, be it climate, local conditions, personal choice or how advice from others is interpreted. Over the past two years John Winter says, I have cultivated the seedlings of *C. mirabilis* and I have not found this as easy as growing other *Clivia* species.

The following information results from my experience and hopefully these suggestions and comments will be of assistance to first-time growers of the plant.

I have found the seedlings of *C. mirabilis* prone to root- and stem-rot. They have been grown in two different media:

- a growing medium consisting of three parts milled pine bark (5 mm) plus two parts milled pine needles and a pelletised organic fertilizer added. (I grow all of the other species of *Clivia* in this medium without any rotting problems)
- a medium consisting of clean coarse sand added to the above medium in equal parts. This mixture resulted in far less root rot.

The seedlings have been grown in two tunnels, one of which is warmer as 2 of the seed beds are heated. For the last 4 months all the seedlings have been fed with calcium nitrate and some with Peters Professional and they respond well to feeding. To reduce the possibility of root- or stem-rot I suggest the following:

Use 8 mm composted milled pine bark (I would not add organic fertilizer to the mixture). A mixture of equal parts milled pine bark and clean coarse sand is also ideal. Water sparingly (once every 2 weeks or less depending on the weather). Check the growing medium before watering and, if moist, delay watering until medium is damp.

Stage pots on a generous layer of coarse grit or on wire mesh staging to ensure that all surplus water is able to drain freely from the bottom of the pot. Plant the seedlings at a depth where the base of the stem is level with the surface of the growing medium. Repot every 9 months with fresh growing medium to ensure a

well-aerated medium providing sharp drainage. Feed plants once a month with a general inorganic fertilizer. Plants that have lost their roots completely should be treated with a fungicide and then planted in clean sand where they will develop new roots. The sand needs to be kept moist. Once the seedlings reach a height of 400 mm and a stem diameter of approximately 15 mm, they appear to overcome their susceptibility to root- and stem-rot. The plants grown in the warmer tunnel have grown more rapidly and to speed up the growth rate I suggest growers provide heating a minimum of 15°C in winter and a maximum of 28°C to 30°C in summer.

Once the plants reach flowering size do not provide any heat because a cold spell will stimulate flowering. The seedlings not having been exposed to direct sunlight, I would consider the plants ready to be exposed to direct sunlight only once mature. Although there are plants in the wild growing in full sun, the majority grow in the shade and in my opinion the latter plants are a better quality. Although *C. mirabilis* experiences light frost in the wild, I am, as yet, unable to comment on how sensitive they are to frost.

**John Rourke and Nicky Malcolm  
and propagation and growing by John  
Winter  
National Botanical Institute  
May 2002**

### **Plant Attributes:**

Plant Type: Bulb  
SA Distribution: Northern Cape  
Soil type:  
Flowering season: Spring  
PH:  
Flower colour: Orange  
Aspect: Full Sun

Gardening skill: Challenging

### Special Features:



Good pot plant

### *Clivia caulescens*



### *Clivia caulescens* R.A. Dyer

**Family:** Amaryllidaceae

Common names: stem Clivia, stalked Clivia

### Introduction

*Clivia caulescens* is a strong grower, with stems up to 2 m long. It flowers in midsummer and will attract birds to the garden.



### Description

*Clivia caulescens* is an evergreen bulbous plant producing rhizomes, which tend to sucker. This species grows into a large plant with the stem up to a height of 0.5-2.0 m and 30-40 mm in diameter. In time, the lower portion of the stem becomes leafless, only the leaf scars remaining.



The leaves are dark green, 400-900 x 50 mm. The inflorescence consists of 15-20 orange to cream-coloured, pendulous flowers. The petals curve outwards at their tips, which are green.

This species flowers in summer (October to November). The light yellow to almost

purple berries varies from round to oblong and ripen after nine months.

### Conservation Status

Since many *Clivia caulescens* populations occur in inaccessible places such as vertical cliffs, the species is not regarded as threatened.

### Distribution and habitat

*Clivia caulescens* is fairly common in the summer-rainfall areas of Mpumalanga and Limpopo Provinces, occurring at Sabie, Mount Sheba, God's Window and as far north as the Soutpansberg, at altitudes ranging from 1 500 m to over 1 770 m at Elandshoogte, where the mountains can be covered in snow in the winter months and the plants exposed to mist, snow and extreme cold.

### History

*Clivia caulescens* was observed for a number of years and collected on several occasions before it was described in 1943. Initially there was doubt whether there was sufficient justification for this, as *C. nobilis* and *C. gardenii* are similar, except that they do not develop the tall stem which *C. caulescens* does. The specific name *caulescens* refers to the fact that this species has a stem.

Natural hybrids of *C. miniata* and *C. caulescens* do occur and produce vigorous plants of about a metre in height with broad, dark green leaves and delightful pendulous pale salmon-coloured flowers in midsummer and sometimes in midwinter.

### Ecology

The populations of *Clivia caulescens* occur in isolated pockets today as the forests of Africa have shrunk through time. This species occurs in leaf mould in forests, in leaf mould on rocks, even on old decaying tree stumps and on the branches of trees.

Little is known about the pollinating agents of *Clivia*, although it is thought that the pendulous species, with their large number of flowers, are self-pollinating as well as bird-pollinated, as they produce nectar which would attract birds and insects. The seed has been seen to be transported by samango and vervet monkeys as well as by the Knysna Loerie and other birds. Rodents are also responsible for distributing the seed. Mice as well as rats consume the soft tissue which covers the seed and they then leave the seed to germinate once they have finished their meal.



### Use

Fortunately, *Clivia caulescens* does not appear to be sought after for medicinal and spiritual purposes by the indigenous people.

### Growing *Clivia caulescens*

Like all *Clivia* species, *C. caulescens* is a long-lived plant and can survive indefinitely under ideal conditions: light shade; a well-drained growing medium; cool conditions ranging from 3°C-28°C; and adequate moisture. Although a mature plant of this species will survive frost, all the leaves will be burnt, and the plant will take a couple of years to recover.

In cultivation, it requires a frost-free area with light shade, a well-drained growing medium, cool conditions and not a great deal of water. As the plant grows fairly



tall, the following shade-loving plants complement this species: [Streptocarpus](#) species; [Asparagus densiflorus](#); [Veltheimia bracteata](#); *Clivia miniata* and *C. gardenii*. The two additional *Clivia* species flower at different times to *C. caulescens* and give added interest and colour in the garden. *C. caulescens* also makes a good pot plant.

An annual application of a 100 mm layer of compost plus an organic fertilizer will keep the *Clivia* in good condition.

Propagation from seed requires harvesting the seed nine months after flowering. Remove the soft covering tissue and sow the fresh seed in a growing medium of matured pine bark at a depth which just covers the seed. A 15-cm pot is ideal for sowing the seed which must be kept moist and in the shade. Once the leaves of the seedlings are 50 mm long, they can be pricked out into a 15-cm pot (3 seedlings per pot) and left to grow on for a year. Regular feeding with a balanced fertilizer is essential for good growth.

After a year, repot the seedlings into individual 20-cm pots where they should flower 3 to 4 years from sowing. Another method of propagation is by dividing the large plant. Firstly, remove all of the growing medium from the roots. The numerous suckers which have developed can now be carefully separated from the main plant. They can either be planted in a pot or directly into the garden. They should flower the following year. Division can be done at any time of the year except when the plant is in flower.

## References

- Abel, C. & Abel, J. 2003. Some observations on *Clivia caulescens*. *Clivia* 5: 66. Clivia Society,

- Dyer, R.A. 1943. *Clivia caulescens*. The Flowering Plants of South Africa 23: t. 891.
- Koopowitz, H. 2002. *Clivias*. Timber Press, Portland, Oregon.

**John Winter**  
**Kirstenbosch NBG**  
**December 2005**

### Plant Attributes:

Plant Type: Bulb

SA Distribution: Limpopo, Mpumalanga

Soil type: Loam

Flowering season: Early Summer

PH: Acid, Neutral

Flower colour: Green, Cream, Orange

Aspect: Shade

Gardening skill: Average

### Special Features:



Good pot plant



Indoor plant



Poisonous

## *Clivia Gardenii*



### *Clivia gardenii* Hook.

**Family:** Amaryllidaceae

Common names: Major Garden's Clivia, Natal drooping Clivia (English); boslelie (Afrikaans); umayime (Zulu)

### **Introduction**

*Clivia gardenii* is a subtle and delicately pretty sister to the well-known *Clivia miniata* (Bush Lily), which has been in cultivation for many years.



### **Description**

Like all *Clivia*, *C. gardenii* grows in the shade of forests and is a clump-forming perennial plant which, although slow growing, can attain a great age. The clumps reach up to 60 cm in height. Flowering occurs in autumn, from April until June. Bright red fleshy berries follow the flowers and are eaten by birds.

Where *Clivia miniata* has a head of trumpet-shaped flowers, *Clivia gardenii* has slender, tubular flowers which hang downwards in the inflorescence. The flowers are orange in colour, the petals tipped with green. There are two other species of *Clivia* which have similar pendulous flowers, *C. nobilis* (Eastern Cape Clivia) and *C. caulescens* (growing predominately in Mpumalanga and Northern Province).

### **Distribution description**

There are four species of *Clivia* in total and all occur naturally only in South

Africa, although they are cultivated widely throughout the world.

### History

*Clivia* is named after the Duchess of Northumberland, Lady Charlotte Clive, who first cultivated and flowered the type specimen in England. The specific name *gardenii* is after Major Robert Garden, who was stationed in KwaZulu Natal as a soldier between 1848 - 1853.

### Ecology

*Clivia* are the subject of many breeding programs which produce spectacular colours and forms.

### Use

Some *Clivia* species are used traditionally for the treatment of childbirth complications and also snakebite. However, there are findings that the chemical constituents in *Clivia* rhizomes (the parts used) are dangerous and should be avoided for medicinal purposes.

Sadly, its popularity as a medicinal plant and the fact that the rhizome is removed for use has led to the demise of natural *Clivia* populations in many areas.

### Growing *Clivia gardenii*

Originating mostly from KwaZulu-Natal, *C. gardenii* makes a beautiful addition to the shady garden. It is apparently able to tolerate fairly dry conditions, as the roots are fleshy and have water storage capabilities. This makes it a wonderful waterwise garden plant. It is also an excellent pot specimen that requires a well-drained humus-rich potting medium.

If planted in very deep shade, flowering may be adversely affected. *Clivia* also do not thrive in sunny conditions, becoming yellow and stunted. They should be

planted in a shady position with plenty of compost and bone-meal added to the soil.

Propagation may be through division or by seed. Clumps can be split up in late winter and replanted or bagged. Seed should be cleaned as soon as it is harvested. The fleshy pulp is peeled off revealing the large, pearly seed within. The seeds should be sown immediately in a deep seed-tray with seedling mix. The large seeds can be pressed gently into the seedling mix until they are flush with the surface and then covered lightly with sieved mix. If the seedling mix is too tightly packed in the tray, the young root will not be able to penetrate it and will lift the seedling right out of the soil. The medium should not be allowed to dry out and since germination is relatively slow, the seed trays should be monitored for signs of algal or fungal growth on the surface.

**PLEASE NOTE** that *Clivia* belong to the family Amaryllidaceae of which many species are poisonous, and it is advisable to wash your hands after handling the plants.

Alice Aubrey

Walter Sisulu National Botanical Garden

April 2001

### Plant Attributes:

Plant Type: Perennial

SA Distribution: Eastern Cape, KwaZulu-Natal

Soil type: Loam

Flowering season: Late Summer, Winter

PH: Neutral

Flower colour: Orange

Aspect: Shade

Gardening skill: Average

### Special Features:



Attracts birds



Good pot plant



Poisonous



Medical plant

## An introduction to Interspecific hybrids – by Helen Marriott

### Introduction

*Some attractions of interspecific hybrids*

*Types of interspecific hybrids*

*General characteristics*

*Breeding interspecifics*

*Main hybridisation patterns*

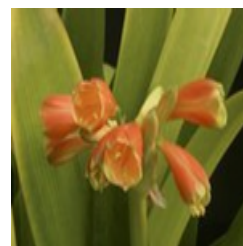
*Creating our own interspecific hybrids*

*Current and new directions in breeding*

In contrast to intraspecific hybrids which are hybrids between different forms of one *Clivia* species, especially, but not exclusively *C. miniata*, **interspecific** hybrids are hybrids between different *Clivia* species (Duncan 2008 p.17). Among the various exciting prospects for the development of the genus *Clivia* in the coming years, surely one must be the further advancement of *Clivia* interspecific hybrids involving crossings of the existing species – *C. caulescens*, *C. gardenii*, *C. miniata*, *C. mirabilis*, *C. nobilis*, and *C. robusta*. To start with, I recommend a visit to some websites that contain photos of interspecific hybrids. A list is given at the end of this text, but for seeing photos of the latest hybrids one of the 2 email

groups/forums is highly recommended as well as the gallery on the MCG website.

*Clivia x cyrtanthiflora* is the name given to the first recorded hybrid bred in Europe in the 19th century between *C. nobilis* and *C. miniata*. This hybrid (or later generations of it) seems to have arrived in Australia relatively early in the country's history of the introduction of *Clivia* and can be found in large massed displays in some Australian botanic gardens (e.g. Melbourne, Sydney and Adelaide) as well as in some older private gardens. It has often been incorrectly referred to as *Clivia nobilis* in the past in Australia (as well as in some other countries) and sometimes is now informally referred to as *oz nobilis*. With its original parentage involving *C. nobilis* (a pendulous species with a tubular flower) and *C. miniata* (the non-pendulous species with upright, trumpet-shaped flowers), this is typically a strong plant, may flower two or three times a year and deserves to be more widely grown. It is not commonly available in retail stores, at least in Victoria, and often seems to have been passed around through divisions.



In their natural habitat in South Africa, *Clivia* species that are growing in close proximity occasionally form natural hybrids. In 2006, *Clivia x nimbicola* was the first formally described naturally occurring hybrid, involving *C. miniata* and *C. caulescens*. (*Clivia* 5 pp. 78-80; *Clivia* 8 pp.23-27). A natural hybrid of *C. miniata* and *C. gardenii* is also pictured in Duncan (2008 p.105). While we may learn



of other naturally occurring hybrids in the future, it is predominantly the artificial interspecific hybrids that are increasing in many countries as a result of breeding efforts.

These days, with the spread of *Clivia* around the world, the various *Clivia* species as well as numerous different types of interspecific hybrids are now increasing in accessibility. We can thus enjoy observing interspecific hybrids in public places as well as in our own gardens or collections, and, if we wish, also create our own hybrids.

### Some attractions of interspecific hybrids

Some of the appealing features of interspecific hybrids can be summarized as follows:

- Expansion of the flowering period of *Clivia*, with the interspecifics predominantly flowering in Melbourne from June to August, and with some of them producing another flower stem during another season. *C. x cyrtanthiflora* may produce two to three flowers a year;
- Great diversity of flower form, with new flower shapes and umbels, e.g., semi-pendulous flowers;
- Different leaf combinations, e.g., *C. miniata* (daruma-type) x *C. nobilis*;
- New colours and new colour patterns or combinations in flowers, e.g., flared green tips, different colour(s) of the inner and outer surfaces of the flowers; and,

- A hugely under-developed category of *Clivia*, thus allowing much scope for new creations.

Indeed, there is considerable potential for the development of *Clivia* with more growing and breeding of interspecific hybrids.

### Types of interspecific hybrids

Koopowitz (2002 p.304) proposes a classification of the different types of primary hybrids involving crosses of two different species. He recommends group names be used to cover these hybrids, e.g., *Clivia* Minilescens Group for *C. miniata* x *C. caulescens* and so on. Although these group terms have some limited following, my impression is that the majority of *Clivia* growers or breeders continue to refer to the name of the full cross. Similarly, there is also a tendency for the natural hybrid involving *C. miniata* and *C. caulescens* to be labelled as such, and some people find use of the term *C. x cyrtanthiflora* also problematic, in that it referred to the original cross made in the 19th century rather than to the subsequent generations bred from it. Sometimes I follow the informal practice of Nakamura of using abbreviations on his own plant labels: MC for (*C. miniata* x *C. caulescens*), MN, MG and so on.

When seeds that are purchased are not specifically labelled, as in “my breeding mix” or else “interspecific hybrid”, it is sometimes difficult to identify the parentage of the resultant plant(s), so in addition to the flower, other features such as the leaf and overall appearance of the plant itself, or the flowering time, may need to be considered. Even then, some plants remain indistinguishable, especially

as the number of times *C. miniata* is used in the cross increases and it becomes more *miniata* -like. When identification is still not possible, statements such as “origin unknown” are sometimes used to accompany photos in published texts.

When an interspecific hybrid is named, sometimes the information on its background is not always readily unavailable. Knowing that Rudo Lotter’s ‘Chanèl’, for example, is an F2 *C. nobilis* x *C. miniata* is useful information for anyone *trying* to create a similar cultivar. In this regard, Ken Smith’s “A checklist and register of Clivia cultivar names” becomes an indispensable reference, though of course not all named plants are recorded here.

### General characteristics



After *C. x cyrtanthiflora*, the most commonly available interspecific group/category available in Australia is probably the combination of *C. miniata* and *C. gardenii*. These hybrids are likely to be fast growing, offset readily, flower in winter, and have flowers that may be semi-pendulous, slightly curved and perhaps with green tips on flared tepals. In Melbourne, these interspecifics seem to mainly flower in June and July. Bill Morris’s ‘Flame’ is a large-flowered orange interspecific hybrid of *C. miniata* and *C. gardenii*. The late George Hellen in Queensland often used *C. gardenii* in his interspecific hybridisation. Not infrequently, the tepals of the hybrids

exhibit green tips, inherited from the *C. gardenii* parent, but sometimes the green colour can be diffused throughout the tip area. The yellow interspecific ‘Moondrops’ (see photo in Clivia 2 p.39) is one well known example, among others, from the Wessel/Rudo Lotter family, which has specialised in interspecifics. ‘Moondrops’ is an F2 hybrid of *C. gardenii* x yellow *C. miniata*. The interspecific named ‘Gay Delight’ (Clivia 8 p.10 where it is misspelt) which was grown from Nakamura seed by Laurens Rijke was on display at the August meeting. It has an attractive multicoloured flower and is thought to be an F2 *C. miniata* x *C. gardenii* cross (not a cross with *C. caulescens* as originally claimed). Shige Sasaki has recently crossed an orange *C. miniata* with multipetals (polytepals) x *C. ‘Helleborus’*, an interspecific of unknown origin which has a slight green centre. The offspring is bronze in colour, with a green centre, and as expected in the F1, does not have multipetals (polytepals) but these should emerge in the F2.

New crosses of *C. miniata* and *C. nobilis* tend to be labelled as such. Here, the leaf texture and leaf tips, as well as its floriferous characteristic seem to be strongly influenced by the *C. nobilis* parent. These hybrids also may inherit some green colouration. The plants often flower in winter and may produce a second flower in another season. ‘Chanèl’, mentioned above, is probably the most well-known hybrid of this type, which Rudo describes as a kind of bicolour, with the outer surface of the tepals being red and the inner surface yellow.



Interspecific hybrids of *C. miniata* and *C. caulescens* typically flower in July/August in Melbourne, but also may produce flowers at other times, such as summer. At one stage Nakamura bred some extraordinary hybrids, and Rijke was fortunate in purchasing a good quantity of these seed. Inheriting the large plant form of *C. caulescens*, the interspecific hybrids may grow into largish plants themselves. Nakamura's outstanding cultivar 'Day Dream' combines *C. miniata* and *C. caulescens* (see below). 'Mandala', which is featured on the cover of Duncan's (2008) publication, is also a hybrid of *C. miniata* x *C. caulescens*. 'Stanmore Moulin Rouge', another Nakamura hybrid named and owned by Nick Powell (Queensland), is produced from *C. miniata* x *C. caulescens* x self. Keith Hammett, in New Zealand, has also produced some excellent interspecific hybrids, including 'Golden Nugget', a cross of (*C. caulescens* x *C. miniata*) x self (see Clivia 9 p.51).

Following the discovery of *C. mirabilis* in 2001, the South African National Biodiversity Institute (SANBI) has actively been utilizing this new species in a range of interspecific hybrids which first flowered in 2006 (Clivia 9 pp. 47-48; Duncan 2008 p.110-111). No doubt, some people are also using *C. robusta* in interspecific hybrids.

When we have interspecific hybrids in our collections there will be many observations that we can make. For

instance, if an interspecific hybrid produces flowers at different times of the year, we may observe a change in the flower colour across the different seasons or even in different growing situations. This seems to be due to environmental factors, especially the light intensity. In my own experience, the Australian form of *C. x cyrthanthiflora* can flower regularly in any of the four seasons, and flowers more often than any of the other interspecific hybrid forms. In contrast to *C. miniata*, many interspecific flowers have a solid colour inside, rather than a contrasting throat colour in the basal area, as is the general case with *C. miniata*.

### Breeding interspecifics

While Clivias can be enjoyed either as pot or garden plants, some of us will also be interested in the hybridization of interspecifics. In his introduction of interspecific hybrids, Rudo Lotter (CD or website) indicates that when colour mutations, leaf variations and other genetic variations within the six species are taken into consideration, an endless array of breeding possibilities exist. Quite commonly *C. miniata*, with its many variations, is used as the seed or mother parent and then crossed with one of the pendulous species, but it is also sometimes used at the pollen parent.



Although there are some differences of opinion, it is thought that each parent contributes 50% to the genetic constitution of the offspring (e.g. W. Lotter, Clivia 2

p.34; Spies Clivia 8 p.35). While inheriting characteristics of both parents, R. Lotter claims that a cross between *C. gardenii* and *C. miniata* will be more pendulous looking than a cross of *C. miniata* x *C. gardenii*. Undertaking a reciprocal cross, where each parent is used as the seed or maternal parent and vice versa is the best way to investigate the differences of using the same parent as the seed or pollen parent. Less commonly, pendulous species are crossed between themselves.

Wessel Lotter indicates that not all interspecifics will be attractive and he himself personally prefers those that are semi-pendulous, semi-open, gracefully curving flowers (Clivia 2, p.40). Different people, nevertheless, appreciate different flower forms and some of us like many different variations.

To maximize the potential of interspecifics, the breeding of more than one generation is necessary. R. Lotter, for example, argues that in a first generation cross (F1), such as crossing *C. miniata* x *C. gardenii*, the siblings will not exhibit a lot of variation. Also, to bring out further characteristics that are recessive, the best F1 siblings are crossed between themselves (or selfed) to create the F2 generation. It is through this method that we can obtain yellow interspecifics in the second (i.e. F2) generation.

These days an increasing number of yellow interspecifics are available, but if we wish to breed our own, this can be achieved using a good form of yellow *C. miniata* and crossing it to one of the other species. By following W. Lotter's (Clivia 2, p.41) example of a step-by-step description of an interspecific hybrid involving *C. miniata* x *C. nobilis*,

reproduced below, a yellow interspecific will emerge:

1. Cross *C. miniata* (yellow) x *C. nobilis* (or any other species) =  
100% F1 orange split (heterozygous for) yellow hybrids.
2. F1 orange split yellow hybrid x F1 orange split yellow hybrid =  
25% F2 yellow hybrids  
25% F2 orange hybrids  
50% F2 orange split yellow hybrids.
3. F2 yellow hybrid x F2 yellow hybrid =  
100% F2 yellow hybrids. (Clivia 2 p.41).



In other words, a yellow interspecific hybrid can be achieved in the second generation.

Although it has been suggested that we only need to proceed to the second generation (F2) in interspecific hybridization, Keith Hammett indicates that quite often, recessive traits are not expressed until generations much later than the F2 (personal communication), so there may in fact be reason to proceed to F3 or F4 through sibling crosses or selfing.

Yoshikazu Nakamura's experience is that excellent interspecific hybrids can be achieved already by the second generation (F2). Nakamura has often selfed his F1 interspecific hybrids, thereby bringing out



many attractive features in the flowers of the F2 generation. In selecting parents to hybridize, Nakamura pays attention to small features found in the species parent that might be accentuated in the subsequent interspecific hybrid, for example a round tepal in a small pendulous flower. 'Clementina', named by Rijke, is probably the very best cultivar to emerge from Nakamura's crossing of (*C. miniata* x *C. caulescens*) x self (see Clivia 7, inside cover). Note that if an F1 interspecific (or any other F1 for that matter) is subsequently used in a cross with a different plant, it becomes a new F1.

### **Main hybridisation patterns**

Primary hybrids are the results of crosses between two different species, e.g. *C. miniata* x *C. gardenii*, or *C. gardenii* x *C. miniata*. Thus, some of the examples given above belong to this category. Given the increasing availability of primary interspecific hybrids in recent years, these plants are now often being used in new crosses, whether it is with *C. miniata* or another combination. Where three or more species are involved, Hammett recommends that the term complex hybrid is an appropriate term (personal communication).

Although *C. x cyrtanthiflora* is already a primary hybrid, it is now often crossed to *C. miniata* again. Given its widespread distribution in many *Clivia*-growing countries, it is not surprising to find it used in many new interspecific hybrids. The photo of Lisa's attractive plant, 'Felicia', bred by John Craigie in Queensland and reproduced in the July newsletter and the current website, is yellow *C. miniata* x *C. cyrtanthiflora*. Kevin Walters has named another delightful cross of *C. x*

*cyrtanthiflora* x orange *C. miniata* as 'Sakura'. My own crosses using *C. x cyrtanthiflora* are now beginning to flower and I am interested to see the amount of variation that occurs, particularly based on whether *C. x cyrtanthiflora* is used as the seed or pollen parent and according to the use of different *C. miniata* (or other) parents.

In the May MCG newsletter (Vol. 2.3), John van de Linde outlined his experiences of undertaking a reciprocal cross of [*C. miniata* x (*C. caulescens* x *C. miniata*)] x *C. miniata*. He reports obtaining a higher flower count where the interspecific was used as the maternal plant in the cross. Nakamura's special cultivar 'Day Dream' is a hybrid of (orange *C. miniata* x yellow *C. miniata*) x (*C. caulescens* x yellow *C. miniata*) (see Clivia 8, pp.13-15; Clivia 9, pp. 49-54). In quite a lot of his hybridization, Nakamura has used (orange *C. miniata* x yellow *C. miniata*) as one parent, and this also applies to his interspecific hybrids such as 'Day Dream' and others.

When backcrossed to *C. miniata*, the flowers of the interspecific hybrids are characteristically larger in size and sometimes look more *C. miniata*-like. Rijke has produced some lovely interspecific hybrids using Nakamura's orange (*C. miniata* x *C. caulescens*) x *C. miniata* 'Aurea', achieving a number of highly attractive plants from just one cross, some of which have been named – 'Patsy', 'Pansy', 'Primrose' and 'M. Rose', displaying a range of different flower shapes and colours.



He brought 'Ester Clementina', another splendid sibling from this cross, to our August meeting. Whereas the majority of primary interspecifics or variations of them seem to flower in Melbourne during June and July, the interspecifics that are crossed back to *C. miniata* primarily flower during August, thus overlapping with the start of the main *C. Miniata* flowering season itself.

If we wish to retain the predominantly pendulous/semi-pendulous feature of an interspecific, rather than to cross it back to *C. miniata*, two hybrids of the same type could be crossed together, as in a sibling cross, for example, (*C. miniata* x *C. caulescens*) x (*C. miniata* x *C. caulescens*). Alternatively, to produce an interspecific hybrid that will carry a variety of different genes and which might flower at different times of the year, one could cross hybrids based on different species, such as (*C. gardenii* x *C. miniata*) x (*C. caulescens* x *C. nobilis*). Another way is to cross an interspecific hybrid to a single species, as in (*C. miniata* x *C. caulescens*) x *C. gardenii*.

The Queenslander mentioned above, George Hellen, sometimes backcrossed his (*C. miniata* x *C. gardenii*) to either *C. miniata* or to *C. gardenii*. The cross that I own of 'Green Imp' is of the latter type and this may explain the predominance of green in the tip and median section of the flower, since it has *C. gardenii* twice in its parentage. This year Nakamura has backcrossed some yellow interspecifics

(based on *C. miniata* and *C. gardenii*) to yellow *C. miniata* and, as expected, found all green-pigmented seedlings. Next year he plans to cross these yellow interspecifics with (orange *C. miniata* x yellow *C. miniata*) and no doubt hopes for some new and different colouration patterns in the resulting flowers.

### Creating our own interspecific hybrids

It is certainly not difficult to create our own interspecific hybrids. Planning the goals of the hybridization and then selecting suitable parents is a good place to start. This may involve selecting features in the parents that we wish to produce in the offspring.



Since the different species may flower at different times of the year, storing pollen in the refrigerator (or freezer) will probably be necessary, making sure that it is labelled and dated. Pollen might also be available at MCG meetings from time to time. Some people say that pollen will remain viable in the freezer for seven years; kept in the refrigerator, the pollen will certainly last for the season (or year) when it is used, if not longer. Interspecific hybrids with variegation are still relatively unusual, so using a variegated *C. miniata* would be a good choice for those who like variegates. Crossing interspecifics that we already own back with *C. miniata* or with another species is also worthwhile. In other words, there are seemingly endless possibilities. It goes without saying that we should keep full records of our crosses.

## Current and new directions in breeding

It is interesting to speak with breeders about their current work in interspecific hybridization or to view photos of some of the outcomes. We can also examine some of the seed lists that are put out by *Clivia* growers from around the world to see examples of the crosses that they are currently making. At the forum held in NZ in October last year, Jim Shields suggested that the most interesting developments will come from among the serious backyard hybridizer. Although he made this remark in general, it is not hard to envisage that growing and breeding interspecific hybrids is one area where creativity – or is it luck? – may have a role. In any case, we can continue to be stimulated by seeing some of the fantastic new crosses arising from hybridization that is being done locally, nationally and internationally.

**Websites** to view photos of interspecific hybrids:

### Melbourne Clivia Group

(<http://www.melbournecliviagroup.org.au/gallery.html>)

### Rudo Lotter:

<http://www.rudosclivias.co.za/> (see under Clivia showcase)

### Shige Sasaki:

<http://members.jcom.home.ne.jp/clivia.3/>  
(see under My collection: Interspecific hybrids; Nakamura collection: Interspecific hybrid)

### Other internet resources:

Yahoo Clivia Enthusiast Group  
: [tech.groups.yahoo.com/group/clivia-enthusiasts/](http://tech.groups.yahoo.com/group/clivia-enthusiasts/)

The Clivia Forum: [www.cliviaforum.co.za](http://www.cliviaforum.co.za)

My thanks to Keith Hammett NZ.

## References

Duncan, G. (2008) (2nd ed.) *Grow Clivias*. South Africa: SANBI.

Koopowitz, H. (2002) *Clivias*. Portland: Timber Press.

Lotter, W.J. (Clivia 2) Advanced hybridising of *Clivias*. (pp. 34-41)

Marriott, H. (Clivia 8) Nakamura's contribution to *Clivia* breeding. (pp.6-18)

Marriott, H. (Clivia 9) *Clivia caulescens* and its hybrids. (pp.49-54)

Rourke, J. (Clivia 5) Natural interspecific hybrids in *Clivia*. (pp. 78-80)

Spies, J. (Clivia 8) Genetic aspects of *Clivia* breeding. (pp.31-38) Truter, J.T. et al. (Clivia 8) *Clivia x nimbicola* – a stunning beauty from the Bearded Man. (pp. 23-27)

---

## **Acknowledgements**

*This Reference Book is for the total benefit of the Clivia Beginner in getting to know all about the Clivia species we know and love. We are extremely grateful for the contributions made by the following experts who have made a difference for the knowledge base of the new enthusiastic beginner, thank you.*

Gary Conquest JP

Web: <https://www.growingclivias.com>

Facebook:

Growing Clivias for Beginners

Email: [growingclivias@gmail.com](mailto:growingclivias@gmail.com)

---

### **Clivia Society of South Africa**

*also, Special note: where mentioned on Interspecifics, Clivia 8 means Clivia Society Yearbook 8*

\*\*\*

### **Clivia Nature and Nurture**

Dirk Swanevelder and Roger Fisher  
2<sup>nd</sup> Edition electronic 2012  
Britz Publications Pretoria

\*\*\*

### **Grow Clivias**

Duncan, G. (2008) (2<sup>nd</sup> ed.)

\*\*\*

### **Clivia Market**

\*\*\*

### **Toowoomba Clivia Society Inc**

\*\*\*

### **Hilton Clivias**

\*\*\*

### **Helen Marriott**

\*\*\*

### **Bothalia - African Biodiversity & Conservation**

\*\*\*

### **CliviaUSA**

\*\*\*

### **Utopia Clivias**

\*\*\*

### **Clivias**

Koopowitz, H. (2002) . Portland: Timber Press.

\*\*\*

**Lotter, W.J.** (Clivia 2) Advanced hybridising of *Clivias*. (pp. 34-41)

\*\*\*

**Marriott, H.** (Clivia 8) Nakamura's contribution to *Clivia* breeding. (pp.6-18)

\*\*\*

**Marriott, H.** (Clivia 9) *Clivia caulescens* and its hybrids. (pp.49-54)

\*\*\*

**Rourke, J.** (Clivia 5) Natural interspecific hybrids in *Clivia*. (pp. 78-80)

\*\*\*

**Spies, J.** (Clivia 8) Genetic aspects of *Clivia* breeding. (pp.31-38) Truter, J.T. et al. (Clivia 8) *Clivia* x *nimbicola* – a stunning beauty from the Bearded Man. (pp. 23-27)

\*\*\*



\*\*\*

### **Melbourne Clivia Group**

\*\*\*

---