

First Edition Reference Book for growing Clivias for Beginners

March 2019

Growing Clivias

A Reference Book on growing Clivias for Beginners and beyond

This book provides various opinions purposely as most Clivia Breeders and Growers do their Clivia growing very differently. Many suggested ways of seed germination and seed sowing provides variety. Each method works, you only must find one that suits you.

Clivia Breeders and Growers need plenty of PATIENCE in breeding and growing their beloved Clivia. The Clivia are slow growing; from seed to a full flower may take 4/5 years. However, when you provide the proper circumstances for Clivia to grow, your reward melts away all the waiting time involved.

It has been a great pleasure to bring this Reference Book together. I trust and hope the Clivia BUG hits everyone who decides to have a good read.



Kevin Walters, Australia

World renowned Authors, Breeders and Growers who have graciously allowed their articles to be published here for the betterment of everyone who wishes to go to a level in growing Clivias

(in no special order)

- *Jim Shields, USA*
- *Dr Keith Hammett, New Zealand*
- *Paula Szilard, USA*
- *Bernard Chapman, Garden Drum Magazine*
- *Hilton Clivias, RSA*
- *Clivia Society, RSA*
- *Sakkie Nel, RSA*
- *Professor Mark Laing, RSA*
- *Lisa Fox, Australia*
- *Clivia Market, Australia*
- *Peter Haeusler, Australia*
- *Ray Perks, Australia*
- *Professor Hannes Robbertse, SANBI, RSA*
- *Mal Foster, Australia*
- *D. Coetzer, RSA*



PLEASE NOTE

Before you begin reading this comprehensive Reference Book, please read the following carefully.

The information provided within the Reference Book is a breadth of information, some easy to understand, some more technical and by checking the contents Page, the Beginner will be led to a more appropriate level.

Suggested Beginners Level

Pages 5, 7, 33, 36, 37, 38, 41, 47, 48, 54 61,62, 63, 72, 74, 75, 76, 86, 87, 94, 95, 100, 103, 109, 114, 117, 119, 124 & 160.

Next Level of experience

Pages 40, 46, 50, 51, 52, 65, 99, 110, 127, 135 & 140.

The Book provides various opinions purposely as most Clivia growers do their Clivia growing very differently. Many suggested ways of seed germination and seed sowing provide variety. Every method works, you only must find one that suits you.

Clivia growers need plenty of **PATIENCE** in growing their beloved Clivia. The Clivia are slow growing; from seed to a full flower may take 4/5 years. However, when you provide the proper circumstances for Clivia to grow, your reward melts away all the waiting time involved.

It has been a great pleasure to bring the Reference Book together. I trust and hope many 'Beginners' will get the **BUG** and become keen Clivia growers.

Gary Conquest

<https://www.growingclivias.com>

growingclivias@gmail.com



Name: **Monica Conquest**

Species: *Clivia miniata*

Color: Yellow

Other traits: Green Throat;

Raiser: Kevin Walters

Breeder:

Ref: y2/2000

Country: Australia

Description: a Kevin Walters hybrid yellow that shows some green in the throat. Bred from ['Aurea' x Kewensis orange]

World renowned hybridist, Kevin Walters who passed away in 2012 was given his first Clivia by his grandmother when in primary school, was dux of his college, a founding member of the international Clivia Society in 1992 and later awarded life membership. Kevin was described as a specialist and champion of Clivias by the top Japanese Clivia breeder Yoshikazu Nakamura and was an associate of Dr Keith Hammett from New Zealand and Nick Primich from South Africa. A Clivia seed takes seven years to flower. In Kevin's own words "In 1979 I made another fortuitous cross — Aurea x a Kewensis orange. The Orange had been grown from seed abducted in a handbag from Kew Gardens. This cross gave 33% yellows which were, in the main, an improvement on Aurea in size and width of petals. One had a green throat and was later named Monica Conquest"

Reference Book Growing Clivias for Beginners and Beyond

March 2019 Gary Conquest, Toowoomba, Queensland, Australia

www.growingclivias.com

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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** (vrugbeginsel) 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 (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 1

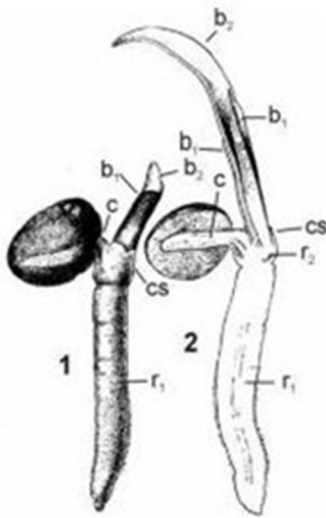


Fig 2

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 meristeem) 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.

Courtesy of Professor Hannes Robbertse, South Africa



Clivia Species

Clivia Nobilis



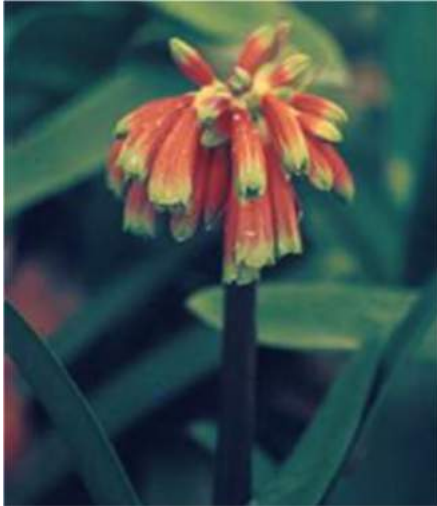
Clivia nobilis Lindl

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 favorable 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

Gardening skill: Easy

Special Features:



Attracts birds

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 cm 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.
- Swanevelder, 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



Joan Mary

Exhibitor:
Andrew Kajewski

Breeder:
Unknown

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 fueled 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 fertilizer included in the potting mix or with a good liquid feed. Beds of established *Clivia* can be given a granular fertilizer 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!

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- 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:





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.



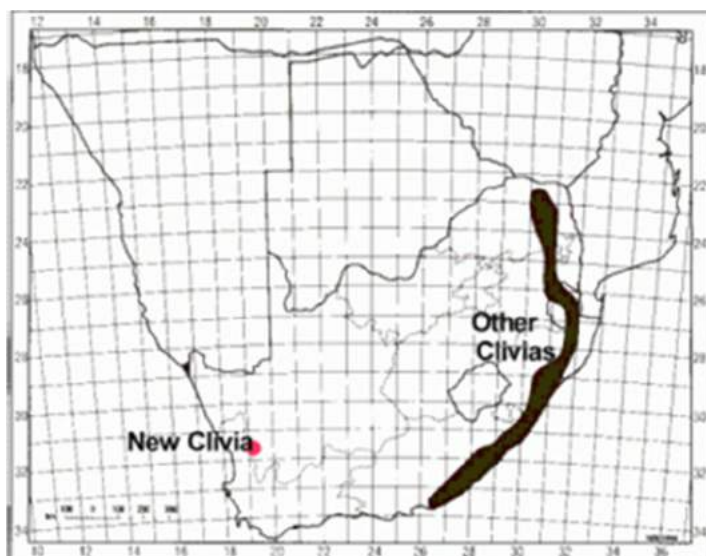
Description

“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



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:



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

Gardening skill: Average

Special Features:



Attracts birds



Goodpotplant

Courtesy of South African National Biodiversity Institute (SANBI)



Clivia Information Website Locations

Breeding Program	http://www.cliviasociety.org/
Bush Lily Plant	https://www.plantopedia.com/clivia-miniata/
Cleaning, Germinating & sowing Clivia Seed	http://dragonflyclivia.co.za/.cm4all/iproc.php/Resources/Sowing%20Seed.pdf?cdp=a
Clivia	https://www.rhs.org.uk/advice/profile?PID=655
Clivia – Plants O Love	http://robinpowell.com.au/2014/09/clivia/
Clivia Activity Guide for the year in Southern Hemisphere – The Clivia Calendar	http://www.cliviasociety.org/
Clivia Care and Culture	http://www.shieldsgardens.com/info/CliviaCare.html
Clivia Colours and Crosses	http://cliviamarket.com/
Clivia Miniata	http://pza.sanbi.org/clivia-miniata
Clivia Miniata	http://www.igarden.com.au/plant-type.jsp?t=clivia
Clivia Pests and Diseases	http://www.melbournecliviagroup.org.au/wp-content/uploads/2014/09/cultivation-notes-2014.pdf
Contacts of Clivia Society RSA	http://www.cliviasociety.org/
Cultivation of Clivia – The Basics	http://www.cliviasociety.org/
Cultivation of Clivias	http://www.cliviasociety.org/
Cultivation of Clivias	http://www.melbournecliviagroup.org.au/wp-content/uploads/2014/09/cultivation-notes-2014.pdf
Fertilising Clivia	http://cliviamarket.com/
Germinating Clivia seeds	http://cliviamarket.com/
Germinating Clivia Seeds	http://www.melbournecliviagroup.org.au/wp-content/uploads/2014/09/cultivation-notes-2014.pdf



Growing, feeding and plant care of Clivias	https://www.dayliliesinaustralia.com.au/growing-feeding-plant-care-of-clivias/
General Information on Clivia	http://www.shieldsgardens.com/amaryllids/clivia.html
History of Clivias	http://www.cliviasociety.org/
How to grow Clivia plant	https://www.sundaygardener.net/clivia-plant-care/
How to grow Clivia plants	https://www.whiteflowerfarm.com/how-to-grow-clivia-plants
How to Pollinate a Clivia plant and store Pollen	http://www.cliviausa.com/pages/How-To-Pollinate-a-Clivia-Plant-and-Store-Pollen.html
How we pollinate our Clivia	http://dragonflyclivia.co.za/.cm4all/iproc.php/Resources/Pollinating.pdf?cdp=a
It's Clivia Month September 2013	https://www.babylonstoren.com/blog/post/its-clivia-month
Links to Clivia Websites	http://www.northamericancliviasociety.org/links.php
Newsletter July 2013 Vol.6.4	http://www.melbournecliviagroup.org.au/wp-content/uploads/2014/03/mcg-vol-6.4.pdf
Newsletter NZ Clivia Group	http://www.nzclivia.org/Newsletters/12.3.2014NewsletterAutumn.pdf
Overseas contacts of Clivia Society RSA	http://www.cliviasociety.org/

Reference Book for Growing Clivias for Beginners and Beyond

	
Peach and Pink Clivia and how to breed them	http://www.shieldsgardens.com/info/PeachClivia.html
Pests and Diseases	http://www.cliviasociety.org/
Propagating Clivia from seed	https://www.tanyavisser.com/grow-your-own/propagating-clivias-from-seed/
Queen of the Shadows	http://www.abc.net.au/gardening/images/pdfs/2818_queenofshadows.pdf
Queensland Gardening Pages	http://www.calyx.com.au/clivia.html
Seed preparation and Sowing	http://www.melbournecliviagroup.org.au/wp-content/uploads/2014/09/seed-preparation-and-sowing.pdf
Seeds and Offsets for sale	http://www.cliviasociety.org/
Starting Clivia from seeds	http://www.shieldsgardens.com/info/StartCliviaSeeds.html
Stuck Flowers	http://cliviamarket.com/
Terminology for describing Clivia plants	http://www.cliviasociety.org/
Why won't my Clivia, flower	http://cliviamarket.com/
Utopia Clivias	http://www.utopiaclivias.co.za
Yellow Clivia and how to breed them	http://www.shieldsgardens.com/info/YellowClivia.html

Courtesy of Growing Clivias for Beginners

Helpful Clivia sites around the world

Name	Site Details
Toowoomba Clivia Society Inc	www.toowoombacliviasociety.com.au
Melbourne Clivia Group Inc	www.melbournecliviagroup.org.au
The Clivia Society (South Africa)	www.cliviasociety-oig
New Zealand Clivia Club Inc	www.nzclivia.org
North American Clivia Society	www.northamericancliviasociety.org/home.php
The Clivia Website	www.clivias.com
American Clivia Society	www.americancliviasociety.org
CliviaUSA	www.cliviaUSA.org
Clivia Market	www.cliviamarket.com
Olivia Register	www.cliviregister.com
Clivia Society of NSW	www.facebook.com/cliviasocietyofnsw/
Australian Clivia	www.facebook.com/www.australiacivia.com.au/
Japan Clivia Society	www.clivia.jp
China Clivia	www.clivia.net.cn
Dr Keith Hammett	www.drkeithhammett.co.nz
Utopia Nursery	www.utopiactivias.co.za
Clivias4U	www.clivias4U.co.za/index.php
Beijing Clivia Society	www.bjjzl.cn
Clivia Mart	www.cliviamart.co.za
Clivia Name Register and Checklist	www.northamericancliviasociety.org
The Clivia Forum	www.cliviaforum.co.za
Lisa Mannion Clivia	www.clivia.co.nz
Clivia South Africa	www.clivia.sa.cx
The Clivia Web Site	www.clivias.com
Ken Smith	cliviasmith@hotmail.com

Courtesy of Growing Clivias for Beginners

Reference Book for Growing Clivias for Beginners and Beyond

CLIVIA Species Comparison Chart –			Courtesy of Clivia Society			
	C. mirabilis	C. nobilis	C. robusta	C. gardenii	C. caulescens	C. miniata
Date described	2002	1828	2004	1856	1954	1854
Distribution	W escarpment	SE coast	E coast	E escarpment	NE escarpment	E escarpment
Habitat	humic sandstone scree	Sandstone slopes to coastal sand dunes	Swamp forest in wet sand, Arid drainage at cliff ledges	Humic scree on sandstone	Epiphytic on sandstone / trees in moss, humus on sandstone	Humic scree on sandstone, rhyolites, dolerite
Flowering time	October to mid-November (late Spring)	August to January (Spring – Summer)	late March – early August (Autumn – Winter)	May to July (late Autumn to mid-Winter)	September to November (Spring)	August to November (Spring – early Summer)
Peduncle colour	?	Green	Reddish then green	Reddish then green	Green	Green
Perianth shape	pendulous tubular	pendulous tubular	pendulous tubular	pendulous tubular	pendulous tubular	upright trumpet
Perianth width		11 mm		10 mm		50-70mm
Perianth length		25-40mm		40-70mm	35 mm	
Flower colour	Bicoloured orange/yellow turning orange-red with age, green tips fading as it opens	Dark orange with green tips, but varies from pinkish yellow to dark red	Orange-red with green tips	Orange-red with pronounced green tips; but varies from yellow to brownish red	Orange-red with green tips	Orange with white or yellow throat; but varies from almost white through yellow to dark red
No of flowers	20-48	20-50	15-40	10 to 20	14-50	10 to 40
Stigma & style	Not exerted	protruding 6 mm		Exserted > 7mm	protruding 6mm	various
Fruit shape	Irregular glebulose-gonyloid	Round to teardrop	Round	Round to oblong	Round	Round to pointed, slightly irregular
Fruit ripens	February – April	winter 9months		winter 15months	winter 6months	winter 9months
Ovary colour	Orange-red then green	Sometimes red then green				Rarely red then green
No. of seed in fruit	(1)2-4	1-2(-6)	1-2(-4)	1 to 2	1 to 4	1 to 4
Explanation: minimum 1 seed, 2 to 4 on average, 7 maximum	(-7)					(-25)
Seed size	±10mm	±9(6-1)mm	10-18mm	9-18m	±12(9-13)mm	±12 mm
Seed membrane colour	colourless	purplish red	colourless	colourless	colourless	colourless, rarely reddish
Seed radicle		radicle produced by the germinating seed is very thin, about 1.5 mm thick		3 mm	3 mm	3 mm
Stem	non-aerial	non-aerial	aerial to 450 mm with buttress roots when growing in swampy conditions	non-aerial	aerial, up to 3 m in mature specimens	slightly aerial with age
Leaf length (mm)	600-1200	300-800	300-1200	350-900	300-600	400-900
Leaf width (mm)	30-50	25-50	30-90	25-60	35-70	25-70
Leaf median stripe	Pronounced	Moderate to weak	Weak to none	None	None	None
Leaf substance	Stiff	Stiff	Soft	Soft	Soft	Soft
Leaf texture	Rough	Slightly rough to smooth	Smooth	Smooth	Smooth	Smooth
Leaf margin	Smooth	Rough	Smooth	Smooth	Smooth	Smooth
Leaf apex	Rounded point	Indented	Rounded	Pointed	Pointed	Pointed
Leaf base	Pigmented purple red	Non-pigmented	Non-pigmented	Non-pigmented	Pigmented red to non-pigmented	Non-pigmented

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.

Courtesy of Clivia – Nature and Nurture



CLIVIA REFERENCE RESOURCES

Hardcover Book – CLIVIAS by Harold Koopowitz 2002 Timber Press Inc

Softcover Book – GROW CLIVIAS by Graham Duncan 1999/2002/2008 by Kirstenbosch Gardening Series South African National Biodiversity Institute

Softcover Book – CULTIVATION OF CLIVIAS 2005/2007
Lena van der Merwe – Hannes Robbertse – Bossie de Kock

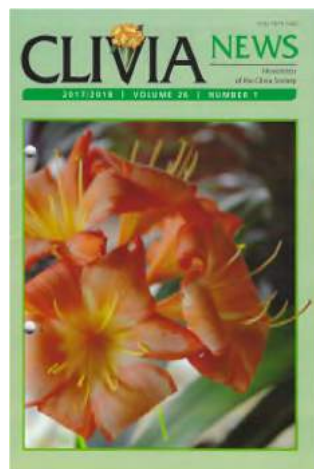
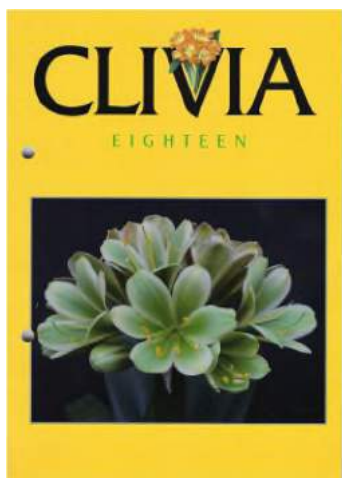
Softcover Book – ILLUSTRATED TERMS AND DEFINITIONS FOR DESCRIBING CLIVIA 2011 – William McClelland

CD / Book – CLIVIA NATURE AND NUTURE 2012 Dirk Swanevelder & Roger Fisher

Softcover Book – BASIC GENETICS FOR CLIVIA BREEDERS 2016 – Johan Spies

The CLIVIA Society – www.cliviasociety.org

Yearbooks – currently No 1 to No 19 – some unavailable



Clivia News – currently issued quarterly with an annual membership subscription.

<http://www.cliviasociety.org/newsletters-clivia-society/clivia-news/> for editions 1992 to 2016 – ready for download

<http://www.cliviasociety.org/shopping/> to purchase books and Reference material.

Clivia Society Membership

Lisa Fox is the Australian Representative of the Clivia Society based in South Africa.

Members of the Clivia Society receive an annual Yearbook which is a beautiful publication with photos and articles. They also receive quarterly newsletters and have access to other publications.

Anyone interested in becoming a member, please download the membership application form and send back the completed form with fees.

Fees (AUD \$) for 2019 are:

- One calendar year \$35
- Student discount one year \$17.50

Payment methods are as follows:

- Cheque, money order or bank cheque made out to Lisa Fox. Sent to 88 Mangans Road, Lilydale, VIC 3140

- Bank transfer to Account name: Lisa Fox BSB: 063853 Account #: 10090099. Please use your surname as the transaction description.
- Via PayPal directly to the Clivia Society. Use the email – corgas@vodamail.co.za.
PAYMENTS VIA PAYPAL MUST BE IN US DOLLARS equivalent to AUD\$ Membership Fee

Contact with any questions – Lisa Fox

Mobile: 0417 087 667

Email: lisa.fox@gmail.com

Courtesy of Growing Clivias for Beginners

Seed Biodiversity in Australia

Changes to seed importation WEF 25 January 2018

Please note that the Australian Biosecurity Import Conditions have changed, and this **does** affect Clivia seeds that are imported to Australia from other countries. Review the changes below carefully and understand that seed imports that do not meet these requirements could potentially be seized or destroyed.

Seed arriving through the mail and as passenger baggage will need to be appropriately identified. This can be done by any of the following:

- Commercial packaging and label with the full botanical name (genus and species).
- Commercial invoice listing the full botanical name (genus and species) accompanying the seed.¹
- A laboratory report listing the full botanical name (genus and species) accompanying the seed.¹
- Commercial supplier's declaration² listing the full botanical name (genus and species) accompanying the seed.
- Phytosanitary certificate listing the full botanical name (genus and species) accompanying the seed.
- International Seed Testing Association (ISTA) certificate listing the full botanical name (genus and species) accompanying the seed.
- Naktuinbouw Authorised Laboratories (NAL) certificate listing the full botanical name (genus and species) accompanying the seed.

This change is now in affect and will make it difficult for seed exchanges between Clivia enthusiasts in the future. Seed will either need to be from a commercial entity (commercial invoice, commercial supplier declaration or commercial packaging and label) or the seed must be inspected and certified (Phytosanitary Certificate, laboratory report, NAL certificate or ISTA certificate).

If you currently have seed in transit, then it will be subject to these conditions.

For more information please contact Plant Import Operations on 1800 900 090
or imports@agriculture.gov.au

For more information on the alert, please refer to the BICON website:

<https://bicon.agriculture.gov.au/BiconWeb4.0/ViewElement/Element/Alert?elementPk=815125>

<https://bicon.agriculture.gov.au/BiconWeb4.0/ViewElement/Element/Index?elementPk=810774&caseElementPk=817328>

UPDATE – Clarification of seed identification requirements for seed arriving by mail or accompanied baggage

This alert is to provide clarification of the import conditions for seed arriving through the mail or as passenger baggage.

- If seed is not commercially packaged and labelled, then one of the following documents listing the full botanical name must be provided:
 - Commercial invoice
 - Supplier's declaration
 - Laboratory report
 - Phytosanitary certificate
 - Seed analysis certificate
 - ISTA Orange International Seed Lot Certificate
 - NAL quality certificate.
- Supplier's declarations will be accepted from **organisations or commercial entities**. Supplier's declarations must be presented on the organisation or business letterhead.

Courtesy of Clivia Market Melbourne www.cliviamarket.com

The Clivia Calendar

I have enjoyed growing Clivias for twenty-five years. The following is a brief description of the cultural practices I employ. This does not mean that there are no other ways of achieving success. Indeed, there are many other ways of growing Clivias as no two Clivia cranks will be unanimous on all aspects of growing their favourite plant!

Harvesting seed: Seed from the previous spring's blossoms will ripen from April to July. As soon as the berry becomes soft to gentle pressure (something like ascertaining when a peach is ready for eating) it is ready for picking. This may be while the berry is still completely green. It is not essential to postpone harvesting until the berries turn colour. Remove the skin, the gelatinous pulp and the enveloping membrane from the seed. Dust lightly with a suitable contact fungicide and store in a ventilated container.

Planting seed: I generally commence germinating my seed some two weeks after harvesting. Some growers will do so immediately after harvesting, while others will wait for several months until ambient temperatures rise in spring. The seed is placed between moist sheets of paper towel placed in any suitable container. Follow the same procedure as in primary school when germinating beans! Place the container in a warm spot to stimulate germination. If you are really hasty for results, then invest in a heated germinator specially designed for this purpose.

As soon as the seed begins to germinate, transfer it to the seedbeds. Here I use containers at least 15 – 20 cm deep. The containers are filled with 1:1 mixture of polystyrene pellets (2 – 5 mm diameter) and sifted compost. Compact the substrate slightly, then place the germinating seed on the surface. Cover the seed with about 1 cm of the same mix with a thin layer of coarse sand on top. The sand will prevent the fine mix from being washed out of the container when watering with a hose. If the compost is properly prepared and heats up well during decomposition, most weed seeds and pathogenic fungi will be destroyed. Under these circumstances it is not necessary to fumigate the compost prior to it being used in seedbeds. If, however, you experience damping-off of the young plantlets, then resort to either fumigation or heat-sterilization of the compost or use specially prepared commercial substrates for the purpose. Do not delay transfer of the germinating seed to the seedbed too long, or you will damage the growing radicle (rootlet) or the root hairs which cling to the paper towel.

Keep the seedbeds in a shady place. Keep moist but not wet or soggy.



The Clivia Calendar (based on Southern Hemisphere growing conditions)

ACTIVITY	J	F	M	A	M	J	J	A	S	O	N	D
HARVESTING SEED												
GERMINATING SEED												
PLANTING SEED												
PLANTING OUT SEEDLINGS												
POTTING-ON												
DIVIDING AND TRANSPLANTING												
FEEDING												
LOOK OUT FOR PESTS												

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Keep the seedbeds in a shady place. Keep moist but not wet or soggy.

Planting out seedlings: When the first leaf of the seedlings reaches a length of five to ten cm, transfer the seedlings to individual 15 cm plant pots. I prefer the tapered to the cylindrical design as it is easier to remove the young plant and soil from the pot when potting-on into larger containers. The potting mix should approximate the medium in which Clivias thrive in their natural habitat i.e. the leaf litter found on the forest floor. My mix consists primarily of garden compost to which some milled pine bark has been added.

Clivias grow slowly and in their natural habitat are subjected to strong competition from other roots for available nutrients. In other words, they do not need a nutrient-rich medium to thrive, but rather a loose, friable medium in which to develop. If your compost heap is not invaded by roots of nearby trees which deplete available nutrients, it will not be necessary to add any slow-release fertilizer to your potting mixture. The nutrients released by the compost being converted into humus will be more than adequate for the growing plant. Many growers swear blind that foliar feeding really stimulates growth – my conviction is that this is entirely imaginary. Young plants can best be grown in dappled shade. Shade cloth with an 80% light-exclusion factor would appear to be the ideal alternative.

Potting-on: A year after planting out the seedlings they are ready to be transferred to 17,5 cm (7 inch) pots. At this stage I provide some drainage at the bottom of the pots. Crushed stone or brick is suitable, but heavy. Broken pieces of polystyrene make for less weight, but cinders are ideal in that they are light and provide excellent drainage. It can also be argued that

cinders will contain traces of most nutrients (with the obvious exception of nitrogen) to

supplement the potting mix in the event of a trace element deficiency.

In the potting-on procedure, disturb the plants as little as possible – hence the usefulness of a tapered pot. If plants are watered prior to transfer they will slip out of the pot more easily.

A further year on, the plants are potted-on to 20 cm (8 inch) pots and again one year later into 25 cm (10-inch pots). Clivias can be flowered in 20 cm pots, but larger plants will respond to the additional space provided by larger pots.

Dividing and transplanting: There are many old-wives tales concerning the do's and I's of dividing and transplanting Clivias. One of these is that if you disturb a plant in any way it will not flower in the coming spring. Well, I have yet to experience this! Another is that pot-bound plants will flower more profusely than their counterparts having adequate room in their containers. There may be more substance to this claim but after twenty-five years it has escaped my observation!

I believe that- in the warmer parts of the country – Clivias can be divided or transplanted at any time during the year without detrimental results. Given the choice, however, spring and summer are preferable for these operations, as the divided/transplanted plants will establish more quickly.

In the case of a single offset to be removed, disturb the plant as little as possible and gently pull the roots apart. If, however, you are dividing an old well-established plant with many growing points and the plant is pot bound as well, it is a good idea to use a jet of water from a hose to remove all the soil around the root ball, before teasing the roots apart. Where offshoots are still attached to the mother plant these should be cut off and the cuts dusted with flowers of Sulphur or copper oxychloride before repotting.

Soil preparation

a) **Texture, structure and pH:** Clivias do not like wet feet, hence good drainage is essential. In the preparation of compost, a sandy or sandy-loam soil should be used. More important, however, in ensuring good drainage is an open structure of the growing medium. Adequate compost and milled bark will ensure this. The pH of this mixture should be in the region of 5.5 to 6.5 which approximates that of the leaf litter in the Clivias natural habitat.

b) **Nutrition:** As already mentioned, I do not believe in the feeding of Clivias grown in a compost-rich medium. Where cultivation occurs in sand or milled bark only – where available nutrients are virtually absent or are leached out rapidly as there are few colloids to

Where the texture and structure of the growing medium is ideal there is little danger of overwatering – even during winter. Over-watering of plants growing in a less-than-ideal medium will precipitate root-rot. When this becomes evident remove plants from the soil and permit callus-development after treating with a suitable fungicide before re-potting.

Diseases: Damping-off of young seedlings is probably the worst disease to contend with. As mentioned earlier this problem can be eliminated by using a pathogen-free germinating mix. Some plants seem to show a predisposition to fungal attack of the foliage. This problem is best overcome by a strict selection in the breeding programme. No plant is worth constant pampering and treatment – no matter how special it is! Another problem, which may be encountered, is the appearance of rust pustules on the underside of the leaves. This will occur

when particularly humid conditions prevail. Improved ventilation will remedy the situation. Treatment of affected plants with a systemic fungicide (e.g. funginex) will prevent spread of the disease but affected leaves will remain unattractive. Occasionally in late summer plants will simply topple over and, on closer examination, will have rotted off at ground level. Only a small percentage of plants will be thus affected and, upon dusting with a suitable fungicide and callusing for a period can be successfully re-potted with minimal setback to the plant.

Pests: By far the greatest problem is the amaryllis borer. Several generations of moths will oviposit on the underside of leaves of both young and adult plants per year. If left untreated the larvae will tunnel down in the leaf and in severe infestations completely destroy the corm. From early October until late April plants should be inspected several times a week. The telltale sign of sub-laminar tunnels indicates immediate treatment with a suitable insecticide (e.g. chlorpirifos or carbaryl). A full cover-spray is essential. Choose an insecticide with low mammalian toxicity, which will degrade rapidly thus limiting pressure on the environment to a minimum. As even light infestations can do considerable cosmetic damage, you have to intercept the borer at an early stage. Many growers apply prophylactic treatments throughout the summer months, but this is superfluous provided the grower is on his toes.

Mealybugs can be a nuisance and disfigure the emerging leaves, as the insects are particularly populous in the leaf sheaths. To ensure that the insecticide (e.g. chlorpirifos or carbaryl) penetrates between the leaves at the base of the plant add a spreading agent, which reduces the surface tension of the spray liquid thus promoting penetration. A repeat treatment some seven to ten days later is recommended.

Bing Wiese
(From Clivia Club Newsletter Volume 8, Number 2, Winter 1999)
Clivia Society of South Africa

Clivia Breeding Compatibility Chart

As a generalization, if you cross any of the 'Groups' with any plant from outside that group you will get pigmented seedlings that will flower orange. Compatibility i.e. giving similar colour flowers as the parents when crossed. If you feel that any of the information is incorrect or you have any plants to add to the chart, feel free to contact us.

Group 1 Yellows and Peaches: (unpigmented seedlings)

Kirstenbosh Yellow/ Eshowe Yellow or Saunders Yellow/Howick yellow/ Karkloof Yellow
Vico Yellow/ Solomone Yellow/ Chubb Peach/ de Villiers Peach/ Lotter's Peach/ Vico
Peach Moondrops (INTERSPECIFIC)/ Yellow Caulescence/ Gail's peach/ Saunders Yellow/
Watkins Yellow/ Karkloof Yellow/ Sir John Thouron Yellow/ Morris Yellow/ Vico Peach
BUFFELSDRAAI YELLOW/ KING HAMELIN YELLOW/ CLEOPATRA/ GOLD RUSH
LEADING LADY/ MOONLIGHT/ SECRET MISSION

Group 2 Yellow and Peaches: (unpigmented seedlings)

Charls green/ Jade Pearl/ Hirao Green/ Port St Johns Yellow/ Centani Yellow/ Cynthia's
Best Butter Yellow/ Natal Yellow/ Dwesa Yellow/ TK Yellow GT/ Transkei Yellow/ Pat's
Gold Cransley Peach/ Spearmint (from Charls Green)/ Emmerudo/ Green Delilah/ Carrie's
Green

CYNTHIA'S BEST/ KHOWE/ Cynthia's Dream.

Euro Peaches and Pink Group:

(Some plants within this group produce pigmented seedlings, but still flower peach)

Pretty Pink/ Simply Pink/ Wittig Pink/ Cameron Peach/ Tipperary Peach/ Victorian Peach
CHERYL'S APRICOT/ Conway's Sunrise Sunset/ Conway's Tessa

Splash or Blush Group: (unpigmented seedlings)

Andrew Gibson/ Naude's Peach/ 777 Series/ Msubo Wow/ Fairytale/ Msubo
Nguni Royal Gala/ Rumpelstilskin/ Ruby Stewart/ Chubb Splash/ Skibezi
Versicolor

4 Mary's Group : (unpigmented seedlings)

Lady Jane/ BRENTHURST/ Lynns Parfait/ Lady Marmalade

Appelblossom Group : (pigmented seedlings)

Gloria/ MopiHirt/ Q1/ Q2/ Q3/ Q4/ Q5/ Q6/ Q7
Q8 also known as Peach Glow.

Courtesy of D. Coetzer, South Africa

Dividing Clivia Clumps

Well-grown Clivia plants eventually get too large. When my plants start to crowd in a 5-gallon container, I know it is time to divide and repot. The first task will be to get the plant out of its container. In a plastic container, the simplest way is to get a stout, sharp knife and slice through the plastic, all the way from top to bottom, two or three times. Try to hold the knife as nearly parallel to the container wall as possible while cutting, to avoid damaging too many roots. Plants in clay or ceramic containers will be tougher to extract and might require the assistance of a couple of strong gardeners. I often end up simply cracking ceramic pots carefully with a hammer.

If the plant is growing in the ground, you face a much tougher job. You may want to just dig out a section of the plant, leaving the rest of it undisturbed. Dig around the outside of the clump, cutting through as few roots as possible. When the outer boundary of the section of the clump you want to dig up is exposed, you can cut very carefully through into the centre of the clump. Spare as many of the roots as possible.

Once the clump is extracted from its container or from the ground, remove as much of the soil from the roots as you can. Shake as much soil off as you can. Use your fingers to work into the spaces between the roots where soil is held and loosen it up.

Now comes the traumatic part: cutting through the rhizomes to free the various offsets. Use a long, sharp, and sturdy knife. Cut through the thick rhizome between the crowns, leaving as much of the rhizome on the freed division as possible. All I can say is, "Try to do as little

damage as possible!” Take your time, be careful, and don’t cut your fingers in the process.

Some points to remember:

1. Wetness encourages rot. Rot is your enemy!
2. Don’t put wet paper towels, or anything else wet, on the roots or anywhere else. Those roots survive for months at a time in the wild in a very dry environment. They will do just fine, left bare-root and dry for days if not longer.
3. Do let the divisions sit in air, bare root and dry, for several days after you divide them. Keep them in the shade at all times when they are out of the ground.
4. I personally would use dilute Clorox® or hydrogen peroxide solutions only if the plant showed overt signs of rot. In any case, do not replant until all portions of the plant’s below-soil surfaces are quite dry.
5. Then when you pot them up, you can cover the cut surface with medium – just don’t water for at least several more days.

I haven’t tried it on Clivia, but when we divide clumps of Hemerocallis (daylilies), we powder the cut surfaces with dry fungicide. We used to use benlate (benomyl) for this, but now we use Cleary 3336® (thiophanate-methyl) wettable powder. Be sure to wear rubber gloves to protect your skin from irritation by the fungicide if you do try this.

Courtesy of Jim Shields shieldsgardens@gmail.com

Starting Clivia from Seeds

If you are starting with freshly harvested seeds from your own plants, be sure to wash the seeds well before trying to germinate them. There is a translucent membrane surrounding the seeds, dividing them into three groups in most berries. Remove that membrane. You can tell this membrane from the skin of the seeds themselves because it slides around over the seed as you try to remove it.

If you are not sure your Clivia seeds are fresh, it is always wise to start them by soaking them overnight in clean tap water or distilled water. If they are old or shrunken, you should change the water the next morning and soak for another 24 hours.

According to Prof. Gert Venter of South Africa, writing in the [clivia-enthusiast] list on Yahoo Groups, there are just three conditions necessary for successful germination and starting of Clivia seeds:

1. An optimum temperature of about 23°C to 25°C (ca. 73°F to 77°F)
2. A relatively high humidity. (\pm 60 – 70 %), and
3. Sterile conditions.

Following the statement of Prof. Venter and the practice of several other clivia growers, we suggest that you proceed as follows:

1. Sterilize the cleaned and soaked seeds. You can use dilute hydrogen peroxide, dilute hypochlorite bleach, or diluted Physan 20 or Consan 20.
2. Dilute 1 part by volume of 3% hydrogen peroxide solution with 2 parts water and mix well. This gives a 1% solution of peroxide.
3. Dilute 1 part by volume of ca. 5% sodium hypochlorite bleach with 9 parts water and mix well. This gives a 0.5% solution of hypochlorite.
4. Dilute Consan 20 or Physan 20 to 100 parts per million (ppm) by adding 3/8-teaspoonful to 1 gallon of water and mixing well.
5. Place the seeds on the surface of moistened Perlite, or Vermiculite, or a mixture of the two. Use a pot of sufficient size to hold the seeds. Be sure the pot has drainage holes in the bottom.
6. Cover the top of the pot with plastic to hold moisture in and to exclude mould and bacterial spores. Stand the pot in a tray or saucer so that it can be watered from below.
7. Place it in a brightly lighted spot but out of any direct sunlight. This spot should be warm.
8. When the seeds have all germinated and grown their first real leaf, they can be transplanted into a well-drained soilless potting mix.

If you feel that you must start your seeds in soil, we can make the following suggestions:

Plant the seeds by pressing very lightly into the surface of a well-drained soilless potting mix. We use Promix and sand and granite chick starter grit (1/8-inch mesh) in a ratio of 2: 1: 1 parts by volume. Wet the mix well with water and cover the pot loosely with a sheet of clear plastic, such as Saran® wrap. You can then water from below as the surface of the potting mixture dries out.

Once the seed sprouts, which can come anywhere from 2 weeks to 6 months after planting, the new root shoot will push the seed out of the soil. You can make a new hole for the root with your finger when the shoot is about 1 to 2 inches long. Insert the root into the hole and press or wash the soil gently back into the hole around the root.

Once leaves start growing, remove the loose sheet of plastic and continue growing your seedling in bright indirect light or under fluorescent lights. We prefer fluorescent lights about 6 to 8 inches above the growing leaf tips. At this time, start feeding your plant with a dilute solution of a soluble fertilizer. We like Peters® 20-20-20 with trace elements used at ½ teaspoon per gallon of water applied at every other watering.

STORAGE

Clivia seeds, like most seeds in the Amaryllis Family (Amaryllidaceae) are classified as “recalcitrant” - that is, they refuse to go into a dormant state. Left at room temperature and dry for a long time, they will slowly shrink and either germinate dry or else eventually die. You can store them for a few months by putting the seeds in a sealed plastic bag. A few drops of water added will help retain viability. It is a good idea to only store washed and sterilized seeds this way. Fungus (mould) can slowly grow in a refrigerator. It is inadvisable to freeze clivia seeds; that should kill them quickly.

We wish you good luck with your new Clivia seeds.

Peach and Pink Clivia

and how to breed them

The famous yellow-flowered Clivias once sold for enormous prices. More recently, peach and pink Clivia have become very valuable. For the most part, there are now plenty of the yellows in cultivation. Now we need to breed more peaches.

Two of the most famous yellow Clivias from the wild were ‘**Kirstenbosch Yellow**’ and ‘**Howick Yellow**’. Both are what is referred to a genetic **Type 1** yellow. There is a second genetic type of yellow flowered clivia, the [Type 2 yellow](#). ‘**Natal Yellow**’ and ‘**Transkei Yellow**’ are both **Type 2** yellows. Other well-known yellows such as ‘**Vico Yellow**’ and the strain of **Nakamura Yellows** are also **Type 1** yellow.

See the discussion of Type 1 and Type 2 yellow genetics.

The physical difference between a yellow flower and a peach flower is that the peach has a small amount of [anthocyanin pigment](#) in the outer-most cell layers of the petals and sepals. Both colours have [carotenoid pigment](#) in the middle layers of cells in the petals and sepals.

Genetics

Just as there are three or more genetic types of yellow flowered Clivia, there are multiple types of pink and peach flowered Clivia. A brief summary:

The ‘Chubb Peach’ strain is in the Type 1 Yellow genetic class. We can call this “Class Y1” in this discussion. In referring just to the peach colour, we can call this “Class P1.”

John van der Linde has posted a very informative message on the [clivia-enthusiast list in Yahoo Groups](#) (on 22 September 2009, titled “Re: [clivia] looking for Victorian peach to buy”)

John classifies the following Peach clones and strains into a single genetic group which he calls “European Peaches.”

- Victorian peach
- Welgemoed peach
- Tipperary Peach
- Cameron peach
- Anderson’s Peach (the Australian one by this name, not the American one!)
- Tessa
- Ellexa
- Sunrise Sunset

‘Wittig Pink’ appears to be in the same class as the Appleblossom series (Q1, Q2, Q3, Q4, Q5, etc.). Let’s call this “Class P4” for now.

There are other pink and pastel strains, such as Solomone’s ‘Watercolour Washed Pink’ and ‘Watercolour Washed Pastel’, which may have genes related to some of the above classes. Other pastel plants include such as ‘Gladys Blackbeard’, ‘Ella van Zijl’, ‘Umtamvuna Pink’ and

others.

There is no data on the genetics or breeding potential of these plants so far as I know.

The near white types, especially Jim Holmes' 'Snowball' strain and related plants, seem to be Class Y1 yellows in which the yellow has disappeared from parts of the petals, because many of the seedlings bloom pale yellow. The green plants, such as 'Charl's Green' and 'Hirao', might be compatible with more than one of the above classes. We'll have to wait for eventual breeding results to become known.

Courtesy of Jim Shields shieldsgardens@gmail.com

Yellow Clivia and how to breed them

The famous yellow-flowered Clivias once sold for enormous prices, and a few still do. For the most part, there are now plenty of the yellows in cultivation. We can buy seeds of them at comparatively reasonable prices, \$6 per seed or less.

Two of the most famous yellow Clivias from the wild were '**Kirstenbosch Yellow**' and '**Howick Yellow**'. Both are what is referred to as genetic **Type 1** yellow. There is a second genetic type of yellow flowered clivia, the [Type 2 yellow](#). '**Natal Yellow**' and '**Transkei Yellow**' are both **Type 2** yellows. Other well-known yellows such as '**Vico Yellow**' and the strain of **Nakamura Yellows** are also **Type 1** yellow.

Genetics

The orange pigment in typical clivia flowers is an [anthocyanin](#). When you cross two **Type 1** yellow Clivias, 100% of the seedlings from that cross will be yellow flowered. If you cross a **Type 1** yellow with a normal orange C. miniata, the first generation of seedlings (F1) will all have some shade of orange flowers. If you then cross the F1 siblings among themselves, their offspring, the second generation or F2, will have about 25% yellow flowered plants and 75% orange flowered.

Similarly, if you cross two **Type 2** yellow Clivias, 100% of the seedlings should be yellow-flowered. Likewise, crossing a **Type 2** yellow with a normal orange-flowered miniata will give 100% tints and shades of orange in the F1 generation.

Even more interesting, if you cross a **Type 1** yellow with a **Type 2** yellow, 100% of the F1 seedlings will be orange flowered. The two types of yellow genes will not produce yellow in the first generation.

We can say that the **Type 1** yellow gene occurs at a different location in the chromosomes from the site of the **Type 2** yellow gene. Further, this shows us that both the Type 1 yellow gene and the Type 2 yellow gene are recessive.

If we call the Type 1 yellow gene "**y1**" if yellow and "**Y1**" if orange; y1 and Y1 are two different ["alleles"](#) of the same gene. Call the Type 2 gene "**y2**" if yellow and "**Y2**" if orange.

Then we can represent the genes of a Type 1 yellow as **y1,y1,Y2,Y2** while the Type 2 plant would have genes **Y1,Y1,y2,y2**.

The pollen and the ovules of a Type 1 plant will all be y1, Y2 while they will all be Y1,y2 for a Type 2 plant. We can show how crossing a Type 1 with a Type 2 works with a simple table.

	y1, Y2
Y1, y2	y1, Y1, y2, Y2 orange

The genotypes of the F1 plants are all the same: y1, Y1, y2, Y2

The pollen and the ovules of the F1 plants can be of 4 different types: y1, y2 or y1, Y2 or Y1, y2 or Y1,Y2 if we assume that the two gene distribute independently of each other in formation of the pollen and ovules. The F2 plants then will be as follows:

	y1,y2	y1,Y2	Y1,y2	Y1,Y2
y1,y2	y1,y1,y2,y2 yellow	y1,y1,Y2,y2 yellow	y1,Y1,y2,y2 yellow	y1,Y1,y2,Y2 orange
y1,Y2	y1,y1,y2,Y2 yellow	y1,y1,Y2,Y2 yellow	y1,Y1,Y2,y2 orange	y1,Y1,Y2,Y2 orange
Y1,y2	y1,Y1,y2,y2 yellow	y1,Y1,Y2,y2 orange	Y1,Y1,y2,y2 yellow	Y1,Y1,Y2,y2 orange
Y1,Y2	y1,Y1,y2,Y2 orange	y1,Y1,Y2,Y2 orange	Y1,Y1,y2,Y2 orange	Y1,Y1,Y2,Y2 orange

This shows how you get the results that the F2 generation is 1/16th yellow in both Type 1 and Type 2 genes, while 6/16ths are yellow due to either the Type 1 or the Type 2 genes being [homozygous](#), and 9/16ths show tints or shades of orange.

Courtesy of Jim Shields shieldsgardens@gmail.com

Clivia Leaves – Length and Width

In Afrikaans: Maatstaf vir blaar breedte en blaar lengte by boslelies:

Op ‘n vergadering gehou in Februarie 2003 het die vereniging op ‘n aanbeveling van Oom Ammie Grobler die volgende voorskrifte aanvaar:

Ekstra smal blaar <25 mm

Smal blaar 25 – 50 mm

Semi breë blaar 51 – 75 mm

Breë blaar 76 – 100 mm

Ekstra breë blaar 101 – 110 mm

Super breë blaar > 111 mm

In China besit 'n man 'n plant wat se blare 180 mm wyd is wat jy mag gaan kyk as jy gelukkig is, maar jy mag nie 'n foto neem nie, want hy vrees roof en diefstal.

Indien die volgroeide plant se blaar lengte <200 mm is, is die plant 'n miniatuur.

Kort blare 201 – 350 mm

Medium blare 351 – 600 mm

Blare lank > 600 mm

Die Heng – lan plant van China se blaarverhouding in sy volgroeide stadium is 1:1.2. Dit is 120 mm lank en 100 mm breed.!

In English: Criterion for Clivia leaf width and Clivia leaf length:

At a meeting held in February 2003, on a recommendation by Oom Ammie Grobler, the association accepted the following prescriptions:

Extra narrow leaf <25 mm

Narrow leaf 25 – 50 mm

Semi-breeding leaf 51 – 75 mm

Wide leaf 76 – 100 mm

Extra wide leaf 101 – 110

mm Super wide leaf > 111

mm

In China, a man owns a plant whose leaves are 180 mm wide, which you may see if you are happy, but you may not take a picture because he fears robbery and theft.

If the full-grown plant's leaf length is <200 mm, the plant is a miniature.

Short leaves 201 – 350 mm

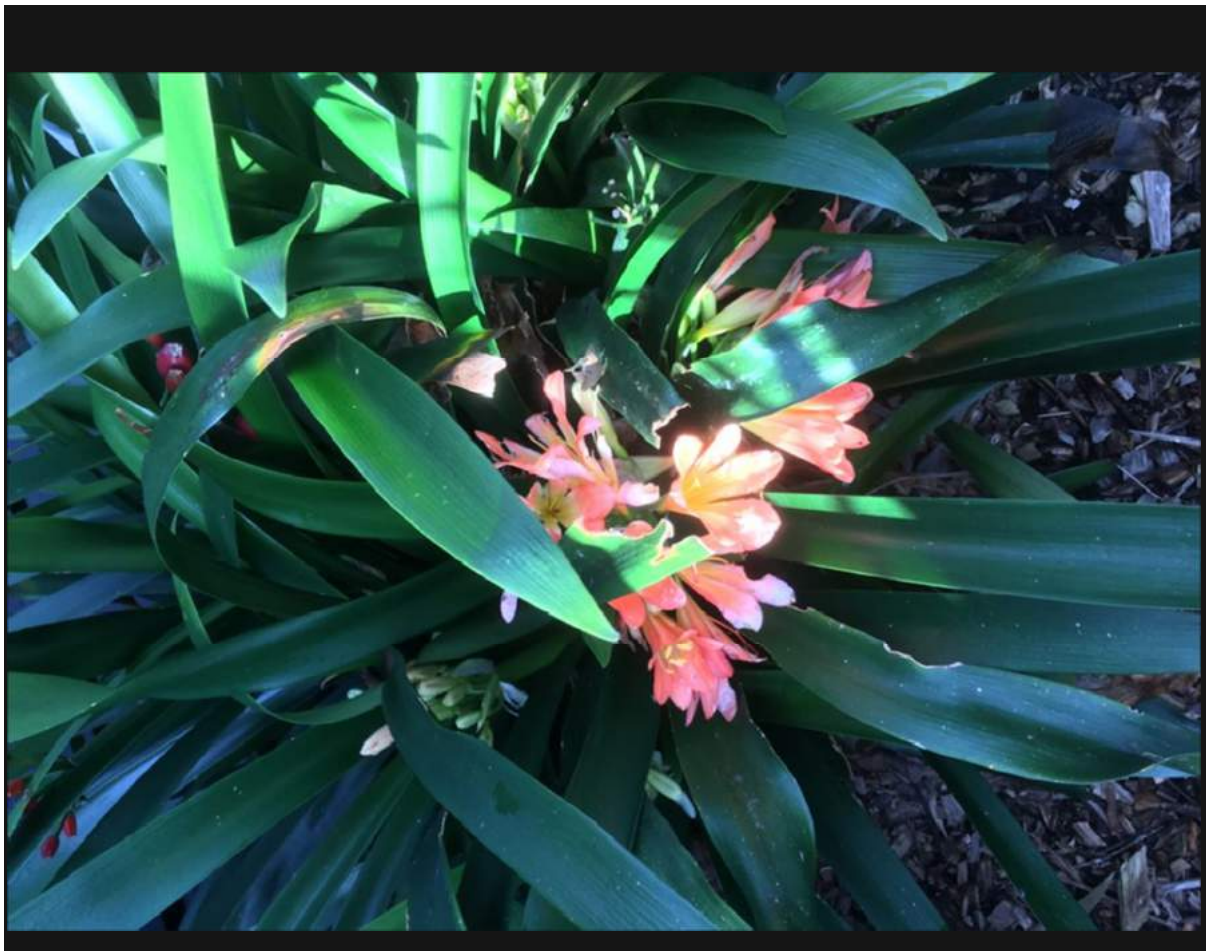
Medium leaves 351 – 600

mm Leaves long > 600 mm

The Heng – lan plant of China's leaf ratio in its mature stage is 1: 1.2. It is 120 mm long and 100 mm wide.!

Courtesy of the Clivia Society of South Africa

Clivia Propagation



How to propagate Clivia

This article will show how we propagate Clivias. We use the seeds. We have approximately 15 well established clivia plants in our garden and each year we collect the seed, which we use to produce over 400 new plants.

This is very easy to do and here we will show you how. All that's required is some patience as Clivias are very slow growing but the reward so worth the wait. Clivias would have to be one of my favourite plants! They can tolerate very deep shade, but not only that they can thrive. Also, they are super hardy able to withstand very dry conditions.

These amazing plants remain a vibrant green all year round and the trumpet flowers in large clusters are just spectacular! I love to mass plant them in very shady areas where not much else will grow. They are available in a wide range of colours these days.

Collecting berries

Clivias main flowering time is at the very end of winter into early spring. These flowers will become berries over time.

It usually takes about 9 months from the flowers finishing for the berries to be ripe. This sounds like a long time and it is, but we just don't cut off any flower stems on the plants. The flower stems blend into the plant quite well so they do not look unsightly. And once the berries start to form and ripen, they are quite striking against the lush green foliage.

Whilst Clivias main flowering is at the end of winter into spring they will sporadically flower

throughout the year though not in mass. Because of this it is usually possible to find ripe seeds almost any time of year, although late autumn early winter is when the harvest is most bountiful.

Collect the berries when they are a nice vibrant colour, avoid green berries these are not ready. The Berries will vary in colour depending on the plant, for example orange flowers tend to produce red berries. Whilst cream and yellow flowers tend to produce yellow berries. I should note that berry colour does not guarantee what colour the plant will flower as. Because seeds are cross pollinated by bees and insects there will be genetic variations. This doesn't bother me as any of the different colour variations look amazing against the vibrant scrappy leaves.

So once the berries are ready to be collected, we like to store them in a small cardboard box or laid out on newspaper. We like to dry the berries for about 2-3 weeks. This makes them much easier to peel. Do not store them in a plastic bag as this won't allow the berries to breath and may lead to the berries rotting.



Clivia berries starting to ripen



Clivia berries ready for harvest



Harvested clivia berries

Removing the seeds from the berries

We find that by peeling the berries to reveal the seeds speeds up the germination times and increases the success rates of germination.

You'll find that there is quite often multiple seeds within a berry. I think my personal record was a berry that contained 13 seeds.

The berry has quite a lot of pulp and if you peel them fresh its quite fleshy and sticky. The seeds are encased in a film that needs to be broken to extract the seed. I find that if the seeds are fresh this becomes quite challenging as my fingers (covered in pulp) just slip and slide over this film. That is why we dry the seeds for 2-3 weeks.

We do like to make sure there is still some moisture within the seed, if left to long the outer berry shell becomes almost impenetrable. A good guide is that once the berry skin begins to shrivel it's a good time to start peeling.



Clivia berries at various stages



Clivia berries ready for peeling



Clivia seeds

Sowing the seed & germination

Once all your berries have been peeled, they can be sowed. We always sow our seeds into a

Reference Book for Growing Clivias for Beginners and Beyond

used vegetable crate. If you're only sowing a few I would sow directly into small pots. I like to allow a depth of 12cm (4"). The roots on Clivias can be quite extensive.

Simply fill the crate with good quality potting mix (not all the way to the top) and evenly spread the seeds over the top. The general rule with seeds is that you only want to cover them lightly. A clivia seed is about 1cm (1/4 ") and should therefore only be covered with 1cm (1/4") of potting mix.

If you are sowing into a pot. Fill up the pot with potting mix then gently push the seed into the mix just below the surface.

After the seeds have been covered water them and store in a shaded area. Clivias love shade! direct sunlight as they emerge from below the soil may cause them to burn and die.

If your shaded area is in a green house or under a porch remember to keep the potting mix moist whilst you wait for the seeds to germinate. Avoid over watering, the seeds will rot if kept wet. Clivias are best kept on the drier side.

Germination is fairly quick. Small green leaves should start emerging within 3 months.



Sowing clivia seeds





Clivia seedlings

Potting seedlings

Whilst the seedlings will start to sprout within 3 months, I prefer to let them mature a while longer before potting. Generally, I wait between 6 & 9 months before potting, these particular seedlings in this article I waited 12 months. Clivias do not mind being pot bound.

If you wait 12 months like I did these seedlings are strong enough to be planted into the garden.

Generally, we wait about 6 months and pot them into 100mm (4”) pots. Again, use a good quality potting mix. When removing the Clivias from the crate it’s important to avoid cutting or breaking the roots.

These cuts and breaks can sometimes allow root rot to take hold. I find this not a problem when dividing long established plants, But young seedlings care should be taken. We find it’s best to gently shake the seedlings apart rather than pulling them.

When we plant into pots, we use a slow release fertilizer to provide a steady stream of nutrients to the young plants. If planting into the garden if possible, provide some nice compost. Whether planting into the garden or pots we always make their first drink a Seasol solution (seaweed fertilizer) we find this reduces any plant shock and provides our young seedlings a great start. We hope this has been helpful and would love it if you subscribed to our website. Happy planting.

Clivia Propagation Video

This video is about how to propagate clivia miniata. In this video we used seeds we collected to produce hundreds of new clivia plants.

<https://youtu.be/UrpFVL6mVCg>

Propagating Clivias for 8 minutes 24 seconds.

Propagation Kit

We've put together a propagation kit that is available on eBay Australia. If you'd like to check it out, please click the link below.

EverydayWits propagation starter pack

If you would prefer to create your own propagation tool kit below are links to some of the products we use in our nursery. All readily available on eBay.

- Perlite (we like to use a medium grade)
- Peat Moss
- Seedling trays
- 50mm (2") round pots
- 140mm (6") round pots
- Propagation Secateurs
- Potting mix
- Seasol
- Control release fertiliser



Clivia miniata information & care

Clivia miniata is a evergreen perennial. It forms clumps of very dark green strappy leaves. In winter into spring it produces clusters of orange trumpet like flowers on strong sturdy stems.

Over time the stems will hold the seed pods, which start off green and once ready will turn an orange-red.

Bush lily is a great choice for very shady areas of any garden. Can be grown in pots. Adds a vibrant splash of colour when in flower, while the foliage and compact clumping habit provide year-round value.

Really should be planted in shade but will tolerate part shade provided there is no afternoon sun exposure. A very hardy plant it's great for under larger trees as it can easily adapt to dry conditions. Frosts will really damage the leaves so plant under evergreen trees. It contains small amounts of [lycorine](#), making it poisonous if eaten.

Courtesy of Kev and Petra Whitmore

<https://everydaywits.com/gardening/clivia-propagation/>

SECURING YOUR CLIVIA BERRIES BEFORE HARVEST

Mal Foster

Instead of wrestling with a piece of orange bag netting or similar and tying off with some hay band, I've found that using sheer organza children's party lolly-bags are very simple and easy to use, to secure my valuable clivia berries before harvest. They are supplied with a pull tie ribbon, so it's easy to slip the bag over the bunch of berries, pull the ribbon to firmly secure to the stem and gently tie off if required. The organza fabric allows air flow and light to the berries.

The white bags come in a range of sizes, but I find 130mm x 180mm suits most situations. With larger crops you might even consider colour coding for groups of plants for easy identification they are available in half a dozen or more colours.



Fig.18 Organza Bag for berries

Now if a berry is accidentally knocked loose or falls before I'm ready to harvest, it remains secure with the parent plant and most importantly, easy to identify. They even look quite smart, uniform and presentable across the crop.

Organza bags are available in packs of 10 at most small variety shops at around \$2.50 per pack or may be sourced in bulk at significantly cheaper rates on-line. They are also washable for re-use, but at this price it's probably safer to use new ones each season.

Courtesy of Mal Foster, Melbourne Clivia Group

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.



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). Note that Clivia seeds have relatively short-time viability.
- 11) Clivia Mirabilis seeds are red and soft and ripe within 3 months after flowering. They will fall off with mice and rodents having a liking to carry these precious seeds to their nests. You may need to secure the seed pod with panti-hose.

The International Seed Repository replace Clivia seeds each one to two years.

Courtesy of Lionel Marten, Toowoomba Clivia Society



Clivia History – Jim Shields

Clivia is a genus in the [Amaryllidaceae](#) family from South Africa. Clivias are rhizomatous plants with thick, branching roots. Displaying absolutely gorgeous flowers, they are becoming quite popular throughout the world. Hybridizers have been expanding on the beautiful colour combinations nature had already provided, so in addition to the bright orange *Clivia miniata* commonly appearing in landscapes here in Southern California, we are now seeing gorgeous yellows, peaches, pinks, and some near-whites. New colour combinations are also being introduced by breeders working with the pendulous forms of *Clivia*, *Clivia nobilis*, *Clivia gardenii*, and *Clivia caulescens*.

In addition to the beauty of the flowers, the foliage is exquisite. Indeed, while most South African, American, Australian, and Japanese breeders are experimenting with flower variations, many Chinese breeders are focusing their energy on the leaves, selecting plants for leaf width, veining, and variegation.

Clivias possess one more claim to fame: they are amazingly easy to grow. They prefer shade, which means that they thrive and flower in areas where other plants often languish. If you ever have a chance to visit the Getty Center in Los Angeles, one of the first things you'll note as you drive under the overpass which covers the entrance is that both sides of the entry are lined with *Clivia miniata*. These plants never see the sun but were still in bloom in April! When discussing bulbs that can be grown in the shade, [Jim Shields](#) has found that *Clivia caulescens* and *Clivia nobilis* can tolerate sun, but also survive being grown in the shade. Clivias will grow happily even when root bound. Howard Koopowitz, who quite literally wrote the [book on clivias](#), observed that they "will suffer much abuse and neglect, and on top of that they are difficult to kill." Such a plant deserves a place in every gardener's heart!

List members have shared tips for success in growing *Clivia* from seed. Harvest seeds as soon as the capsule feels flaccid. The capsule is peeled, and the seeds removed from the surrounding flesh. One member found seeds could be sown immediately. Other suggestions were to place the seed in a cardboard carton and allow it to dry out for 3 to 5 days, or to clean seeds by scrubbing them with a toothbrush or soaking them overnight in warm water. Most recommend that seeds be sown on the surface of the mix and not covered until sprouted, but one person pushes them half way into the medium and another just barely covers them. The soil mix should be loose and airy such as African violet mix with added clean sand. Keep the soil damp but not wet and keep the pots in warm place (over 70 degrees F, 21 degrees C) Another member has found an entirely different way of growing *Clivia* from seed that works for her. She puts the seeds in a plastic bag of damp vermiculite and keeps them warm, checking regularly and then transplanting when roots and leaves have formed.

Photo by Matt Mattus of an adventitious *Clivia* shoot emerging from the edge of a discarded leaf (near the bottom end). The remnant was buried under potting soil on a bench in the greenhouse for an entire winter.



Clivia caulescens R.A. Dyer is native to South Africa. The photos below were taken by [Dylan Hannon](#) from the Huntington Botanical Garden where they grow underneath a Coast Live Oak (*Quercus agrifolia*).



Clivia × *cyrtanthiflora* is a name given to hybrids between *Clivia miniata* and *Clivia nobilis* with narrow pendent flowers. Photos 1-2 are of plants growing at the LA Arboretum with a huge number of blooms! The second was a large peach and the third was a F1 × *cyrtanthiflora* from Rudo Lotter. Photos John Ingram.



Clivia gardenii Hook. is an evergreen plant growing up to 60 cm.? It is usually found growing in deep shade in forested areas and steeply sloping areas, cliffs and sometimes marshy spots. It comes primarily from [KwaZulu-Natal](#), and has also been found in Mpumalanga and Swaziland. It has orange red hanging tubular flowers with greenish tips and exerted stamens and the fruit is a bright red fleshy berry. It is similar to *Clivia nobilis* but has fewer flowers, recurving tepal tips and leaves that taper to a pointed tip. There is much variation in plant size and flower color. Bloom time is fall into early winter. This species can tolerate fairly dry conditions. Photos by [Alessandro Marinello](#) and [Hans Joschko](#).



Clivia miniata (Lindl.) Bosse has bright green leaves and scarlet flowers with a yellow throat. It is an evergreen plant to 500 mm that grows in large colonies in partial shade of forest and coastal bush in the Eastern Cape. It takes about 4 years for seed-grown plants to mature. These plants will flower even in tiny pots relative to their size. The first two photos from [Andrew Harvie](#) were taken in habitat near the mouth of the Kei River in the Eastern Cape. Photos 3-4 were taken by [Bob Rutemoeller](#) in the same place January 2010.



Photo 1 by [Arnold Trachtenberg](#) who wrote: "A“ orange given to me by a neighbour who has had it for 40 years",”and photo 2 from [Mary Sue Ittner](#) who grew hers from seed. Photos 3 and 4 were taken by [Mary Sue Ittner](#) at [The Royal Botanic Garden, Sydney, Australia](#) in 2007.



Photos by [David Pilling](#), 1 is of the typical fleshy ephemeral amarlyllid seed on a 10 mm grid and 2 shows the roots of one plant grown from the seeds. The remainder show fruit and contents.



Clivia miniata var. *citrina* S. Watson has yellow flowers. The first photo was taken by [Mary Sue Ittner](#) who wrote: "I" March 1998 I received two seeds of a yellow *Clivia miniata*. Both germinated and are blooming for the first time in March 2004 five years later." Photos 2-4 were taken by her in subsequent years. The last two photos were taken by [Liz Waterman](#).



There are many *Clivia miniata* cultivars. Below are pictures of some examples.

Clivia miniata 'A'igail' has purple seed pods. Photo 1 from John Ingram.

Clivia miniata 'A'ricot Spider' has soft apricot. Photo 2 by [Jamie Vande](#).

Clivia miniata 'A'rea' 'T'ropical Sunset' Photo 3 from John Ingram.



Clivia miniata 'D'ris' is a dark orange-red variety from Conway (photo 1).

Clivia miniata 'J'nnny' is a Dave Conway selection, orange with a yellow stripe (photo 2).

Clivia miniata 'L'mon Chiffon' is a yellow variety from Conway with nicely formed flowers (photo 3). Photos 1-3 by John Ingram.



***Clivia miniata* 'L'mon Ice'** 's a yellow Dave Conway selection that becomes paler as it ages (photo 1).

***Clivia miniata* 'L'ttle Charm'** 'eries from Joe Solomone, a series of diminutive flowers in medium-sized umbels (photo 2).

***Clivia miniata* 'S'brine Delphine'** 's a Conway selection with dark flowers, brick red deepening to dark maroon (photo 3).

***Clivia miniata* 'S'n Marcos Yellow'** 'photo 4). Photos 1-4 by John Ingram.



***Clivia miniata* 'S'lomone Yellow'** 's a yellow flowered strain from Joe Solomone of Watsonville, California. Photos taken June 2007 by [Jay Yourch](#).



***Clivia miniata* 'T'ny Tim'** 's a miniature with short leaves and mid orange tulip shaped flowers with a large white throat that are carried just above the foliage. Photo by John Ingram.



***Clivia miniata* 'V'co Yellow'** 'as bred by Sir Peter Smithers and was one of the first tissue-cultured cultivars offered in the trade. It is a creamy pale yellow with a darker throat and is also known as 'S'ithers' 'ellow'. The first photo was taken by John Ingram. The second and third photos taken by [Arnold Trachtenberg](#) are of a plant grown from an IBS tissue culture distribution in 2000 and blooming for the first time in 2008.



Clivia nobilis Lindl. is a coastal species from the Eastern Cape. It grows in the understory of stabilized dune forests in almost pure sand, but in areas with dry winters and wet summers. Leaves are notched or bluntly rounded dark green. The vermillion-orange with green tip flowers appear in the spring. It takes about 7 years for seed-grown plants to mature. Photo #1 was taken by [Cameron McMaster](#) and photos 2-3 were from [Alessandro Marinello](#). The last three photos were taken by [Andrew Harvie](#) near the mouth of the Kei River in the Eastern Cape showing the habitat for this species.



Photo below taken by [Mary Sue Ittner](#) in the bulb room of [Kirstenbosch National Botanical Garden](#) January 2010.



Clivia robusta B.G.Murray & al. was named in 2004 after genetic analyses of seedlings from seed of what had been considered a *Clivia gardenii* population were determined to be a new species. *Clivia robusta* grows in marshes in the tall closed canopy forest of Pondoland in the Eastern Cape of South Africa in sandy, acidic, highly leached soils. Some populations also grow in seepage areas on or below cliffs in humus-rich soils. This species also occurs in the southern

coastal area of [KwaZulu-Natal](#). As its name implies, this is one of the tallest members of the genus (1.6 m) with strap shaped, broad leaves and pendulous pale to dark orange flowers with

green tips born on reddish changing to green pedicels. When growing in very wet areas it develops buttress roots. Flowering occurs autumn to winter (late March to early August.) This is followed by round green ripening to orange-red berries containing up to 4 seeds that take a year or more to ripen. There is a yellow flowered form known as var. *citrina*.

In spite of being rare, this species is reported not to be difficult to grow and can flower within four years of being grown from seed. It requires light shade, good drainage, and regular feeding and watering. It prefers cool nights and may be able to survive a light freeze. It can be grown indoors in a pot. More information can be obtained from South African National Biodiversity Institute's [plant information website](#). Photos below were taken by [Mary Sue Ittner](#) November 2014.



Photos below were taken by John Ingram. It's not clear what their parentage is. Photos 1-2 are of *Clivia* 'H'pnos'. Photo 3 is a photo of 'T'rracotta Treasure'.



The first photo is of a white throated Tulip and the second is an interspecific from Rudo Lotter.



By courtesy of Jim Shields shieldsgardens@gmail.com

Article and photographs with permission of Carrie Kruger – Utopia Clivias, South Africa

Clivia: How to grow Clivias from seed



A: Introduction to Clivia seeds:

Soon after the plant finished its flowering phase, the berries on the plant will start to develop if they have been properly pollinated. The berries will reach its maximum size but will remain dark green in color for about six months. You can harvest the berries once it starts colouring up and is soft to pressure. This can take from 6 months up to a year after flowering. When harvesting the berries, you can just pick them from the stems. Some people cut the stem with berries. Dust the cut with a fungicide or ordinary Flowers of Sulphur powder. Ripe berries can vary in colour from yellow to dark red. After harvesting the seeds, you can put them out to dry in a well-ventilated shade area for up to 7 days. This should make cleaning of the berries less messy. Always label the berries and keep them separate. This will make sorting out and planting out in colours easier.

B: Harvesting, cleaning and planting of Clivia seeds:

1. Harvesting and cleaning of seeds:

Seed from the previous spring's blossoms will ripen from April to July. As soon as the berry becomes soft to gentle pressure it is ready for picking. This may be while the berry is still completely green. They are ripe from 6 months onwards. It is not essential to postpone harvesting until the berries turn colour. Remove the skin, the gelatinous pulp and the enveloping membrane from the seed. Wash in sunlight liquid. Dry with a paper towel. Dust lightly with a suitable contact fungicide and store in a ventilated container.

2. Planting seed:

I generally commence germinating my seed some two weeks after harvesting. Some growers will do so immediately after harvesting, while others will wait for several months until ambient temperatures rise in spring. The seed is placed between moist sheets of paper towel placed in any suitable container. You may also use coarse sterilized sand or peat moss in the plastic containers. Place seeds on top of the mixtures. Place the container in a warm spot to stimulate germination. If you are really hasty for results, then invest in a heated germinator specially designed for this purpose. After the leaves have reached a length of 5-10 cm, I transfer them to seed trays outside in the shade. Keep the seed trays in a shady place. Keep moist but not wet or soggy.

3. Planting out seedlings:

When the seedlings are about one year old, I transfer the seedlings to individual 10 or 12

cm plant pots. My mix consists primarily of milled pine bark to which filter sand and eco T, (a beneficial fungus) has been added.

4. Potting-on:

A year after planting out the seedlings they are ready to be transferred to 17,5 cm (7 inch) pots. At this stage I provide some drainage at the bottom of the pots. Crushed stone or brick is suitable. Broken pieces of polystyrene make for less weight. In the potting-on procedure, disturb the plants as little as possible. If plants are watered prior to transfer they will slip out of the pot easier. A further year on, the plants are potted-on to 20 cm (8 inch) pots.



POLLINATION DONE AND SEEDS STARTING TO SET ON PEDUNCLE



RIPE CLIVIA BERRIES



MOTHER PLANTS WITH SEEDS



SEEDS TREATED WITH FUNGICIDE



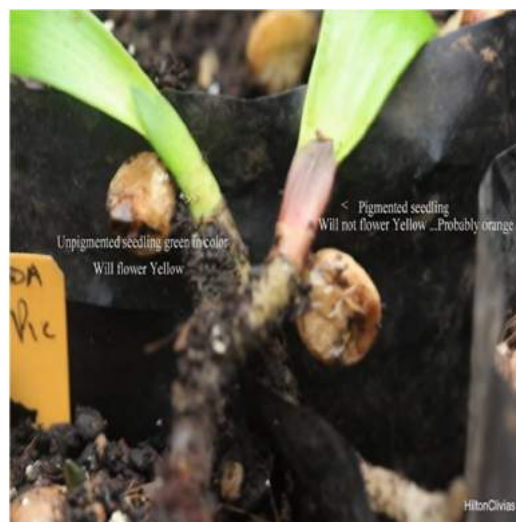
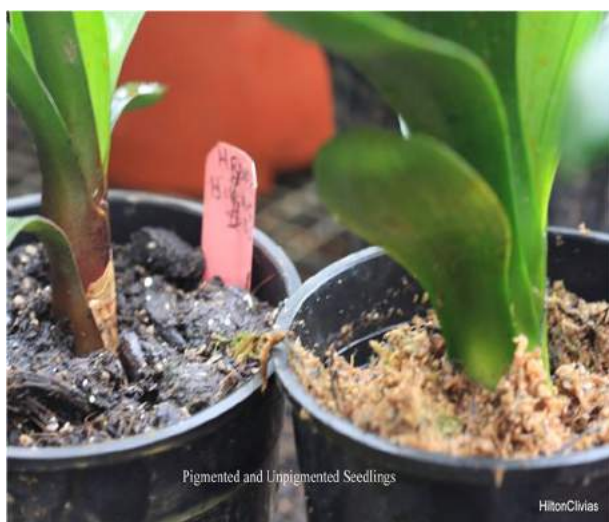
CLEANED SEED JUST SPROUTING



FIRST LEAVES APPEARING

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 / plantcan you see a difference? The one is green and the other a reddish dark colour. The unpigmented, green base seedlings will flower Yellow, however, Clivia *Caulescens* seedlings are always green stemmed but very seldom with Yellow flowers. 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.



Courtesy of Hilton Clivias, South Africa

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 peats 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.

Courtesy of Clivia Society of South Africa

Caring for the roots of the Clivia plant

Sakkie Nel

The article in Clivia News Vol.26.2 of 2017 by Dr. Lena van der Merwe about “Take good care of the roots of the Clivia plant” is to my mind the most valuable contribution to all Clivia lovers during the past 20 years made by any person.

With this huge wake-up call we all know now why the Chinese growers are decades ahead of us, and we might never be able to bridge the gap? So far, I am amazed that the Clivia News letter box is not flooded with contributions of members sharing their experiences about this important matter?

Harold Koopowitz wrote in his book “Clivias” on page 101+: ***The most important needs are the correct amount of sunlight, soil aeration and adequate drainage. The latter two parameters are interconnected. If a deep container is needed for land- or hardscape purposes, then part of the depth of the pot can be filled with broken crocks, Styrofoam chunks, or gravel (first make sure that there is sufficient drainage at the bottom of the pot).***

The so-called Styrofoam peanuts are excellent for drainage and plant roots seem to like them, but one should avoid concave Styrofoam chips or other shapes with indentations where water can accumulate.” On page 102 he wrote÷:” ***Clivia will succeed in a variety of soil types provided they are well drained and have sufficient organic matter. Many of the currently available soil mixes used in pots have little sand or inorganic matter incorporated into them, and after a year or two, the soil level in the container will start to drop and the plants will sink down in the pot, spoiling the effect. To maintain the soil level, at least half of the volume of potting soil should be gravel, pumice, coarse sand or small chunks of lava rock about 3/8 inch (1 cm) in diameter.***”

Take note that he does not mention any bark chips. I will never use bark chips in my growing mix, because you never know whether they are well composted. In our house we have an inner court with eight large cement pots containing 55 mature Clivia plants. This area has an open roof and it normally gets quite hot and wet (from rain) and is therefore very prone to

mealy bug, because of the lack of air flow. Lena told me that I need to check the roots of all

the plants in these pots, after taking care of the mealy bug, “because they show signs on the leaves of root-stress”.



Not any healthy roots



Out of the cement pot



Plants before repotting

To me, apart from the occasional dry leaf tips the other leaves did not look too bad. Please see photo when they flowered in September 2017. Before I started to replant them, I knew that they had been in the same growing mix for longer than ten years. When uprooting them, on January 18, 2018, I found that they were all planted on March 15, 2003 in my home-made mix. (Info I got from the plastic markers that I submerged inside the mix). So, to the day the 55 plants were in the same mix for 14 years 10 months and 3 days!!! The growing mix was a bigger shock to me than the condition of the roots and their tips. The whole block of mix was like Lena indicated “a block of very fine concrete” with hundreds of dead Clivia roots.

Clearly a matter of: “What is left in the mix or what is short in the mix; the plant’s roots do not even want to touch it and thus try to avoid it completely!” We watered the pots the day before repotting and that is why the growing mix shows a solid block and not dry fine sand, as in Lena’s photos. At least, it absorbed the water well. Amazingly no earthworms were found in any of the pots. Looks like they died off due to a lack of oxygen too! The roots of all the plants chose to sit on top of the mix and some over the edge of the pot. Please see the photos.



Red Clay Pot '17



*Roots on top of mix clearing
having huge oxygen problems*



the mix 14 years later

Maybe I am biased, but to me their roots looked a bit better than the roots in Lena's photos. What I saw was that the roots "tried to avoid contact" with the growing mix as far as possible. To avoid this situation in future, I will be using coarse crusher sand in my growing mix. What I was thankful for was that my plants had survived so well in the same mix for nearly 15 years. I also feel that my home-made mix is near perfect, but not for 15 years! I do not feed my Clivia, because I know that all the nutrition, they need is in my planting mix.

Courtesy of Sakkie Nel, South Africa

Managing soil fertility and plant nutrition

Sakkie Nel

Dr Lena van der Merwe, in Yearbook 19, published three articles on the requirements for healthy roots. I want to look at the importance of the soil composition and the requirements for cultivating healthy Clivia.

Properties and composition of soil

- a) Plants need soil to stay upright and to obtain nutrients, water and air.
- b) It is important to understand the chemical and physical properties of soil and to understand their influence on the ability of plants to grow.
- c) Soil with ideal properties is not always available for cultivation, but steps can be taken during soil preparation to correct or at least improve the condition of the soil.

Physical soil properties

- a) Physical properties include texture, structure, depth, layering (stratification) and aeration.
- b) Texture is a fixed soil property and ranges from clay to sand.
- c) Soil with a clay content of between 7% and 30% is suitable for most plant growth.
- d) Soil ranges from having no structure to being granular. Soil structure determines the aeration, water penetration and drainage of the soil.
- e) Aeration refers to the ability of the soil profile to supply air to the roots. Poorly drained soil becomes water-logged and anaerobic (without oxygen), which may result in root death.

Chemical soil properties

- a) Chemical soil properties include the pH of the soil, electrical conductivity and resistance, fertility level, cation exchange capacity and organic matter.
- b) pH indicates the acidity of soil. The optimal pH of soil for most plant production is between 6.5 and 7.5. In pots the pH is usually lower and can be as low as 5.5.
- c) Electrical conductivity, EC and resistance indicate the salinity of the soil. Soil salinity affects both the soil fertility and the physical properties of the soil.
- d) Soil fertility indicates the ability of soil to sustain plant growth.
- e) The cation exchange capacity of soil determines the ability of soil particles to bind with nutrients and have them available to release to the roots.
- f) Organic matter in the soil consists of dead plant and animal material, microbial debris, and humus.

Basic symptoms of nutritional deficiencies

- a) Each nutritional element has a very specific role and function in the metabolism or life of a plant.
- b) The most limiting element is the nutrient element present at the lowest percentage of its optimum concentration. Even if only one nutrient element is not at optimum concentration, the plant will be limited in its ability to grow.
- c) Nutrient deficiency symptoms are specific to the nutrient that is not at an optimum level, but the effects may be blurred by a combination of deficiency symptoms or symptoms of other factors.
- d) The fertilization program should keep the nutritional elements at optimum levels. Mild deficiencies can be tolerated during certain times of the year.
- e) The cause of the deficiency needs to be identified to deal with it effectively.

Plant nutrition elements

There are 16 main nutrients or elements that plants require for normal growth and development. These nutrients are divided into two main groups, the macro-elements that are required in relatively large quantities and the micro-elements or trace elements, which are required in very small quantities. The macro-elements are carbon, hydrogen, oxygen, nitrogen, potassium, phosphorous, calcium, magnesium, and Sulphur.

The macro-elements are generally present in soils, but not necessarily in adequate

concentrations.

Macro elements

Three important elements that can be added to soil for plant growth are nitrogen, phosphorous, and potassium. The numbers that appears on fertilizer packaging such as 3:1:5, indicates the N: P: K ratio (nitrogen, phosphate and potassium) that the specific fertilizer in the bag contains. In a 3: 1: 3 fertilizer for example, there are 3 parts of N for every 1 part of P and every 3 parts of K. This means that fertilizers that are high in nitrogen (those with a high N value) are suitable for leafy vegetables such as lettuce and lawns because it stimulates vegetative growth. An example of a lawn fertilizer is one that has a NPK ratio of 7: 3: 2. A more balanced NPK ratio such as a 2:3:2, is suitable for flowering plants. The remaining macro elements (calcium, magnesium and Sulphur, are also important. The main reasons why each nutrient is important to plants.

Nitrogen

- a) Nitrogen is essential for the synthesis of proteins in plants.
- b) Nitrogen is necessary as a building block for genetic material.
- c) Nitrogen is an essential part of the green pigment chlorophyll.
- d) Nitrogen is good for leafy vegetables or as a general tonic to boost plant growth.

Where do we find nitrogen?

- a) Plants use nitrogen in two forms, these are ammonium and nitrate.
- b) These are both available in inorganic fertilizers.
- c) Ammonia will stimulate leafy growth.
- d) Applying nitrate or urea, as an inorganic fertilizer or as a foliar spray very quickly stimulates crop growth.
- e) Take care when applying these as they scorch the plants easily, when used in too high a concentration.
- f) Nitrogen is also found in organic matter, such as lawn clippings, compost, manure and bone meal.

What does a plant look like that is deficient in nitrogen?

- a) Plants are stunted.
- b) Leaves are pale green or yellow (chlorosis).
- c) Yellowing is normally seen on the older leaves first.
- d) On closer inspection yellowing starts at the tip of the leaf, progressing down the middle of the leaf to the leaf base.

Phosphorus

- a) Plants require phosphorous throughout the year.

- b) There is a strong relationship between the phosphorous and nitrogen requirements of plants.
- c) If there is no nitrogen, the plant cannot take up phosphorus from the growth medium.
- d) Phosphates is essential for the growth and development of stems, roots, seeds, flowers and seedlings.
- e) In crops phosphates improves crop quality, increases root growth and leads to earlier crop maturity.

Where do we find phosphate?

- a) Phosphorous occur naturally in soils.
- b) Phosphors deficiency can be corrected by adding phosphorous to the irrigation water in the form of potassium phosphate, or a foliar application of ammonium phosphate.
- c) As with nitrogen, scorching of leaves may occur.
- d) A long-term source of phosphorous is superphosphate, which is added to the soil.
- e) Bone meal is also high in phosphorous and breaks down relatively slowly. It is also a source of calcium.

What does a plant that has a phosphorous deficiency, look like?

- a) Plants are stunted.
- b) Leaves take on a purplish colour.
- c) The undersides of the leaves become characteristically purple, especially the veins of the plants.
- d) Fruits mature late and seeds do not develop properly.
- e) The change in colour, first develop on older leaves.

Potassium

- a) Potassium is important for a range of plant growth processes.
- b) Potassium is not an important element for the structure of the plant.
- c) Potassium is important for photosynthesis and aids in the plant's overall vigour, strength, water uptake and disease resistance.
- d) Potassium plays a role in maintaining the water balance of the plant, controls transpiration, and activates enzymes.
- e) Potassium improves the plants' flower, fruit and seed quality.

Where do we find potassium?

- a) Potassium does occur naturally in the soil
- b) Potassium deficiency can be overcome by a foliar application of potassium sulphate, or potassium nitrate. A more long-term source of potassium is potash, which is worked into the soil.

What signs does a plant with a deficiency in potassium show?

- a) The first sign of potassium deficiency is the leaves turning dark green.
- b) In time, the leaves become a purple-brown colour.
- c) This discoloration is followed by a yellowing of the leaf edges, leading to a browning and dying off (necrosis), of the leaf.
- d) Weak stems with yellow or brown discoloration or leaves with a similar colour change, are a tell-tail sign of potassium deficiency.

CALCIUM

- a) Calcium is involved in nitrogen metabolism and activates enzymes.
- b) Calcium helps to build strong stems.
- c) Calcium is a major constituent of the cell walls.

Where do we find calcium?

- a) Calcium occurs naturally in the soil.
- b) The effects of calcium can generally be reversed.
- c) This is corrected by a foliar application of calcium nitrate.
- d) Agricultural lime and gypsum may be added to the soil.

How does a calcium deficiency affect the plant?

- a) Common symptoms of calcium deficiency are stunting, wilting and dark green discoloration.
- b) Leaf margins become scorched.
- c) Roots are poorly developed, and the root tips die off.
- d) In fruit crops, a deficiency causes blossom rot. This condition is irreversible.

Magnesium

- a) Magnesium is an essential part of the green pigment, chlorophyll and is thus an extremely important element.
- b) Where do we find magnesium? a) Magnesium occurs naturally in the soil.
- c) Magnesium deficiency is common and can be corrected by foliar application of magnesium sulphate, also known as Epsom salts. Magnesium is also found in commercial fertilizers.

What does a plant that is deficient in magnesium, look like?

- a) A plant that has a deficiency of magnesium, develops yellow leaves.
- b) Usually the older leaves of the plant, rather than the young new leaves, develop this symptom.
- c) The margins of leaves turn yellow, spreading to involve the whole leaf.

Sulphur

- a) Sulphur is important for the production of chlorophyll.
- b) Sulphur is important as a protein constituent.

Where do we find Sulphur?

- a) This element is naturally found in soils
- b) Sulphur is found in super phosphate, calcium sulphate and gypsum.

What does a plant that has a Sulphur deficiency, look like?

- a) A Sulphur deficiency affects the quality and flavour of fruit and vegetables.
- b) It is seen as a light purple discoloration of petioles, stems and veins, with the leaves turning pale yellow.
- c) Dead spots and patches may develop on the leaves.

Micro elements or trace elements.

Trace elements are necessary in the plant to facilitate the usage of other elements by the plant. They are required in very small amounts. Intensively farmed soils such as vegetable gardens, heavy clay soils or light sandy soils often are deficient in trace elements.

Iron

- a) Iron plays a vital role in the formation of chlorophyll during photosynthesis.
- b) The lower the pH, the higher the amount of iron available to the plant.
- c) Iron can be applied as iron chelates and iron salts.

Where do we find iron?

- a) Iron occurs naturally in soils.
- b) Iron can be applied as iron chelates and iron salts.
- c) Deficiency develops if the pH of the growth medium is too high or if anaerobic conditions develop in the soil or if there is too much magnesium is found in the growing medium.

What signs does a plant show with a deficiency of iron?

- a) Iron deficiency symptoms are similar to those of magnesium.
- b) The major symptoms are yellowing of young developing leaves.
- c) The veins remain green, but the rest of the tissue becomes yellow, causing a mottling effect on the leaf.

Manganese

- a) Manganese is essential for the manufacturing of “sugars”.
- b) Manganese is required for nitrogen metabolism.
- c) The lower the pH, the more manganese that is available for the plant.

Where do we find Manganese?

- a) Manganese is found naturally in the soil.
- b) Manganese can be applied as manganese sulphate.
- c) Care must be taken however, as this element is toxic in high concentrations.

What appearance does a plant display with a deficiency of manganese?

- a) Manganese deficiency results in an overall leaf discoloration and may also cause necrotic spots.
- b) The discoloration develops first on young leaves and thus may easily be confused with iron deficiency.
- c) In severe cases of deficiency, the leaves become distorted.

Zinc

- a) Zinc plays a role in enzymes synthesis.
- b) Zinc is also involved in the synthesis of the plant hormone indole-acetic acid.

Copper

- a) Copper plays a role in the activation of several enzymes and affects cell wall formation.
- b) Plants require very little copper.

Where do we find copper?

- a) Copper, a trace element is found naturally in the soil.
- b) Copper deficiency can be remedied by the application of copper sulphate or blue vitriol.

What does a plant that is deficient in copper look like?

- a) Copper deficiency causes stunting of the plants, leading to shortened inter-nodes and small leaves.
- b) Chlorotic blotches develop on older leaves, gradually spreading to the younger leaves.
- c) Affected leaves change to a dull green or bronze with the edges curling upwards.

Boron

- a) Boron is required for healthy plant growth.
- b) A plant that lacks boron cannot take up calcium from the soil.
- c) Boron easily becomes toxic to the plant, and thus boron toxicity is more common than boron deficiency.
- d) Beetroot plants are highly susceptible to boron toxicity.

Where do we find boron?

- a) Occurs naturally in the soil.
- b) Boron deficiency can be readily corrected using sodium borate (borax). This may be

used as a foliar spray or added to the soil.

What does a plant that is deficient in B look like?

- a) Boron deficiency is first seen as yellowing of leaf tips on older leaves.
- b) The growth tip or stem apex dies off and the veins supplying the young leaflets become clogged.
- c) The tops of plants assume a bushy appearance, the stems and petioles become brittle causing them to break easily.
- d) The leaves may develop orange to yellow discoloration.
- e) Roots become blackened.

Molybdenum

- a) Molybdenum is involved in the activity of enzymes and is essential for the conversion of nitrogen from the air into a soluble form that the plant can use.
- b) Mo becomes more available to the plant as the root medium pH is increased.

Where do we find Molybdenum?

- a) Found naturally in the soil.
- b) Molybdenum deficiency can be corrected by applying a foliar application of sodium molybdate or ammonium molybdate.
- c) Molybdenum deficiency is uncommon but may be found in acid soils. (South African soils are poor in molybdenum).

What does a plant that is deficient in molybdenum look like?

- a) Older leaves become mottled and this spreads slowly to the younger leaves. Later on, the leaves become scorched and curled.

Chlorine

Chlorine is essential for plant growth, but chlorine toxicity is more common than deficiency. An analysis of water for chlorine is especially important for hydroponics.

Appearance of leaves with a chlorine deficiency.

- a) Dead spots and patches may develop on leaves.

Courtesy of Sakkie Nel, South Africa



Fertilizing Clivia

Clivia love fertilizer. Fertilizing 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 fertilizing 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 better 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.

Courtesy of Clivia Market www.cliviamarket.com

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.

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.

Courtesy of Clivia Society, South Africa

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 understory 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.

Courtesy of Clivia Society, South Africa

WHEN IT (FLOWERING) DOESN'T GO TO PLAN - Ray Perks

This article represents the combined wisdom of my experiences as well as that of Laurens Rijke, Peter Haeusler, Helen Marriott and Lisa Fox, to whom I'm indebted for their preparedness to freely share their knowledge and experiences.

So, are you ready for the best time of the year? NO, not the footy finals! I mean the *Clivia miniata* flowering season. You are prepared, right ? ... repotted, blended your best ever potting mix, fertilised and sprayed regularly, played their favourite music... done it all? So, what's this? That flower is opening too early, it has a short stem, it's a stuck flower (Fig. 2).



Fig. 2 An example of a short stem or interrupted flower.

Why does this happen? The unanimous view of my experienced advisers was that you are not to blame. It's the weather. That is, it is most likely your plant made a false start at flowering when there was a short burst of warm conditions. It got stuck when the weather resumed its usual cold winter climate.

Yes, we know that all your Clivias experienced the same burst of spring conditions but only one or two developed stuck flowers. There are several possible explanations for this variation in plant behaviour. Most likely, those plants that made a false start towards flowering shared a similar micro climate within your shade house or they were those types which were preparing to be the first flowerers anyway.

Alright, stop grumbling, it's not the worst thing that can happen to a clivia grower. One can normally salvage a stuck flower providing you found it early enough and it is a flower you want to save. All solutions recommended by my advisers involved moving your plant to a warmer location, preferably indoors to a heated room. No one suggested the "remedy" that appears in some clivia literature, namely, to place your plant in a dark room or wardrobe. The alleged science behind this method is that the flower stem will grow as the flower searches for a source of light.

In addition to warmth, Laurens suggested a good watering and continuing increased humidity. To be sure, I usually dunk the plant in a solution of soluble high potassium fertilizer. Peter reports a remedy which was suggested to him by Harry Erasmus where he adds a dash of full-strength beer directly to the base of the plant. The non-drinkers out there could readily substitute molasses, honey or a sugar-syrup to provide the sugar "hit" seemingly offered by the beer.

The final thing one should do in respect to short stems or stuck flowers is to make a note of the event on the label or in your "book" so that if in the rare circumstance this

plant has a stuck flower next season you might reconsider this plant's place in your collection and breeding program. Now, what is this? Where is that flower going? It has got a curved flower stem.



Fig. 3 A curved stem

There are numerous possible reasons for curved or distorted flower stems and this time you may have to experience some guilt. Most such occurrences seem to be the result of pest damage and you are the officer in charge of pest control in your backyard. Pests that might contribute to curved stems most commonly are snails, slugs and earwigs, however grasshoppers, crickets (especially mole crickets) can also cause considerable damage to stem, if endemic to your area.

Fig. 3, however, appears to show stem curvature resulting from a more uncommon cause, namely, gritty debris between the leaves of the plant, and Figs. 4 and 5 show the results of severe slug damage. Stem curvature resulting from physical damage can't be reversed but you might minimise the curvature if you address the cause in a timely manner.



Fig. 4 Last year's flower stem from the same plant as shown in Fig 3.



Fig. 5 A close-up of slug damage

Some plants may develop curved or distorted stems as a result of their position in the shade house. Others, it is believed, have a genetic predisposition for abnormal growth. For those flower stems which you believe are simply turning to face the light, you might rotate the plant, say 180 degrees, so the flower stem has to straighten if the flower is to realign itself to the light source. If you wish, warmth, fertilizer, beer etc. might be administered to give you an improved chance of enjoying flowers on curved stems. Again, you should make a note of the incidence with the plant and be prepared for a tough decision if it occurs again.



Fig. 6 A flower head on one of my best seedlings with slug damage



Fig. 7 See organic matter, including a small gum nut, at the base of the stem and flower sheaf

Most authorities will tell us that to successfully flower Clivias one should reduce watering coming into winter and retain a dry plant until flowering. But, for most of us who grow under shade cloth or under shade trees, reducing the amount of moisture being received by our plants can be a problem which is often overshadowed by trees, so how can we "dry off" our plants in preparation for flowering? Figures 5 and 6 are really self-explanatory when it comes to illustrating the perils of growing under shade cloth. It is impossible to control the amount of water your plants receive but it is possible to ensure our plants are not covered by leaf litter and bird droppings which, when mixed with water, will form a perfect habitat for micro pests and which will coat and degrade your emerging buds.

Remember Murphy's Law? When interpreted for our hobby it might read:

Of the five things that might go wrong when flowering Clivias, those one or two things that will cause the most damage will happen only to your favourite or best plants.

One might temporarily cover some or all of your shade cloth with clear plastic or move your best plants to a more sheltered spot to control the amount of water delivered to your plants. One should make every attempt to clear organic matter from between the leaves of your plants. A child's paint brush can be used for this task.

Above all, you should inspect your plants at least twice a week from this time forward. I know it's dark when you leave for work and arrive home. Inspecting plants at night, even if it is raining, is a great opportunity to detect hitherto unseen pests. Ideally you should also detect stuck flowers and curved stems as early as possible to improve the chances of reversing those conditions. Time to buy new batteries for the torch.

Finally, carefully apply snail and slug bait around your plants. Since the event shown in Fig. 5, I am now even trying to place one pellet inside each emerging flower sheaf.

Courtesy of Ray Perks, Melbourne Clivia Group



Preparing Clivia for Exhibition

This is a timely topic for me considering the Melbourne Clivia Group Expo is only 9 days away as I write this. This is not just for people who wish to exhibit their plants, but even for people who would just like the plants looking their best when visitors come to see them flower. Often, we see photographs that people have posted on a forum or Facebook and although the flower may be beautiful, the leaves look dirty, yellowing or generally very untidy. Being a bit of a neat freak, I like my flowering plants to look their optimum whether exhibiting them or not.

It is always preferable for a plant to progress their flower spike and flower outside the house where it is cold and has good lighting. The reason for this is that the colour of the flower will be truer and if there is a green throat to the flower then it will be more prominent. Most years at this particular time of the year, I have to bring many of my plants into the house where it is warm to speed up the flower spike and flowers open, so I can exhibit them at the expo. A warm house is the fastest way of bringing up a spike or getting a flower to open. However, it is important to place the plant near a window or in a location that has good lighting.

A common problem with beginners is to place the plant in a slightly dark room or location and the flowers end up looking more of a pastel or lighter colour than they usually would. I made this mistake many years ago and wondered why my pastel was orange the next year when flowering outside.

It is amazing how quickly flowers can open when in a warm house, though with 9 days until the expo and still many green buds, perhaps I left this a bit late. In the right circumstances you can speed the flower spike up by bringing into the house, but then put the plant outside just before the flowers open. If you are not in a hurry to have the flowers, then you may have the luxury of leaving the plant outside until the flowers open naturally.

It is important to place something under the pot such as a saucer or even a piece of cardboard as moisture from the pot can find its way out and onto the floor surface ruining your carpet or floor boards.

Around the time that I need to bring the plants in the house, I have a good look at the plant and remove any outer leaves that may be looking a bit worn or unbalance the plant. I wipe the leaves with a damp cloth to remove dust or spray residue. I also look for leaves that are broken, yellowed on the ends or have any fungal spots. Using scissors, I trim off the damaged part of the leaf, but I shape the end of the leaf to match the rest of the leaf ends. This looks so much better than a straight cut across the leaves.

I also give the plant a good water with a weakened liquid fertiliser or similar to give the flowering a bit of a boost. If the plant is a little crooked in the pot, I may use a small stake to try to straighten the base. Make sure you water the plant once per week if it is in a warm house and heating will dry the pot out faster. Also check for little creepies and crawlies such as Mealy bug, spiders, ear wigs or other nasties.

The day before show day, I clean the outside of the pot with water and a touch of vinegar in the water. This will remove any staining around the drain holes of the pot. If the pot is in really poor condition and won't come up clean, I place the plant and pot inside a new pot. It needs to be a good tight fit and you would barely realise that it is a pot within a pot.

With cleaning a plant, some people use water with a touch of milk to shine up the leaves. I have tried this but these days I tend to lean towards water with a tad of White Oil in the water. You need to ensure that you do not add too much White Oil or the leaves will look greasy. Just a drop or two into the water will give the leaves a lovely shine without looking oily.

I use a small paintbrush to get at dirt or any other litter that falls down between the leaves. If the top of the potting mix in the pot looks a little old or messy, I lightly top the pot with a new layer. If the flower has a long peduncle and will be travelling by vehicle to a venue, it may be necessary to place a long stake in the pot and gently tie the peduncle to the stake so there is not a lot of movement. It is amazing in a car how much the flower spike shakes around with the normal movement of the vehicle. You can always remove the stake and tie when you arrive at the venue. If you feel the peduncle needs the support, then leave the stake and tie. I understand in official shows that this is frowned upon, however for display purposes this is fine. Plant ready for exhibition.

Courtesy of Lisa Fox, Clivia Market Melbourne www.cliviamarket.com

Clivia YouTube Videos 2019

How to divide and repot Clivia plants

<https://youtu.be/eC4N2Pc3kqA>

Germinating Clivia seeds

<https://youtu.be/Sc29f98IRig>

Growing Clivias from Seed Part 1

<https://youtu.be/Lea4a4vWO4A>

How to Grow Clivias – Dividing and rising from seed

<https://youtu.be/NgpcrvOoFak>

2017 Toowoomba Annual Clivia Show Introduction

<https://youtu.be/Yh0Oyba2vS8>

2015 10th Anniversary Toowoomba Annual Clivia Show

<https://youtu.be/ixs4MsC8tvM>

How to self-pollinate a Clivia Miniata

<https://www.youtube.com/watch?v=M7I0ZXODCrk&sns=em>

2016 Toowoomba Annual Clivia Show

<https://youtu.be/L3Fc0DvyfOE>

Amaryllis done blooming? Here is what to do

<https://youtu.be/VnNuDb31gHw>

Amaryllis has finished blooming, now what?

https://youtu.be/ulEpO_jc11o

Amaryllis & Clivia Dormancy

<https://youtu.be/-leOFC5Eyv0>

Clivia Plants

<https://youtu.be/yEhvyhOk0WO>

Practical gardening tips: Propagating Clivias in Spring

<https://youtu.be/UrpFVL6mVCg>

Germinating Clivia seeds

<https://youtu.be/iW9sZDjCeMw>

Growing Clivias from seed Part One

<https://youtu.be/Lea4a4yWO4A>

Paper towel method of seed germination

<https://youtu.be/7D16VBtWAXw>

Clivias; divide plants & grow from seed

<https://youtu.be/0WuuJN2Oevk>

Clivia Miniata seed pods Keffir Lily- Bush Lily- Natal Lily

<https://youtu.be/uyfE6g24Lxl>

Clivia Interspecifics by Andrew Kajewski

<https://youtu.be/suLxOrEP3-8>

How to propagate Clivia Miniata

https://youtu.be/e5Yj_xmRzVY

Clivia Show Palmerston North NZ 7 Oct 2017 Info and Flowers

<https://youtu.be/5rNO3ufX3H4>

Practical Gardening Tips: Propagating Clivias in Spring

<https://youtu.be/UrpFVL6mVCg>

Unusual Clivias at Utopia Clivias

<https://youtu.be/Evlttz-FneI>

Courtesy of Growing Clivias for Beginners



Clivia Pests and Diseases

Pests and Diseases – South Africa

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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.

Karbaryl/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.

Courtesy of Frikkie Marais, South Africa

Clivia Pests and Diseases - International

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 25C 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 number 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.

Known Clivia Pests and Diseases

Lily Borer

Mealy Bugs

Scale

Snout Beetles

Thrips

White Fly

Slugs and Snails

Red Spider

Fungal and Bacterial diseases

Courtesy of Melbourne Clivia Group



Example of a Fungal attack

This plant was diagnosed by a University lab to be a type of Fusarium. I successfully treated the plant with a **systemic fungicide**. The new leaves are flawless.



Courtesy of Marilyn Paskert, Planet Clivia on Facebook



CLIVIA Insecticides / Fungicides / Fertilisers - Australia

CLIVIA Spraying Guide - Fertilizer/Insecticide/Fungicide/Systemic solutions

THRIVE All Purpose Soluble Fertilizer	YATES	500gms	2 spoons =9 Litres
CONFIDOR	BAYER	200ml =60 Litres	
Insect Destroyer (Natural Pvrerthrum)	KENDON	250ml	20ml/1 Litre
SUCCESS Ultra (Insect Control)	YATES	200ml	5ml/1 Litre
FUNGUS GUN (Systemic Fungus Control)	YATES	750ml	Prepared ready
CHARLIE CARP (All Purpose Fertilizer)	Charlie Carp	1 Litre	1 Litre =300 Litres
Potash Liquid (Fruit & Bloom Booster)	Searles	250ml	Makes 500 Litres
MAXGUARD (Systemic, Contact & Residual Insecticide Concentrate)	Scott Defender	1 Litre	50ml = 1 Litre
NITROSOL (Liquid Plant Food)	AMGROW	1 Litre	Makes 250 Litres
MANOZEB (Fungicide)	Searles	200gms	20gms =10 Litres
Tomato/Vegetable DUST (Insecticide & Fungicide)	YATES	500gms	Sprinkle On
Tomato Spray (Insecticide & Fungicide)	BRUNNINGS	750ml	Prepared ready
ANTI ROT (Phosacid Systemic Fungicide)	YATES	500ml	5/10ml = 1 Litre

Courtesy of Growing Clivias for Beginners

Suggestions for breeding that Special Clivia



GOLDEN DELIGHT



VICO YELLOW



RECURVE YELLOW



DARUMA YELLOW



CHINESE BROAD LEAF YELLOW



BELLA LANISTER



BELLA TYRION



BELLA ARYA



SHAE



JON SNOW



CERCET'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 Yellow1 Bashee Yellow Transkei Yellow Smith's Yellow Tsolo Yellow Floradale Yellow Natal Yellow2 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'3

Vic Daniels Yellow G2 'Auriel Batten Yellow' 'Butter Yellow'7 'Pat's Gold' 'Golden Fleece'

TK Miniature Yellow TK short BL Yellow Nakamura Yellow Charlsgreen Green Bomb



Article and photographs with permission of Carrie Kruger – Utopia Clivias, South Africa

Clivia colours and crosses

Colours with *Clivia* and breeding for colour has always been a controversial topic and continues to be. Many can't even agree on the same terminology for colours, and there are many opinions on what the outcome of certain colour combinations will be. These notes are based on my own observations and notes from fellow growers. We will not delve into the scientific reasons for colours or in-depth genetic possibilities. I have also not gone into great details regarding green-throats, white-throats, picotee, splash, bi-colours and a few others..

Orange

Orange is the dominant colour in *Clivia* and most crosses involving an orange parent will result in orange offspring. With crossing an orange with a yellow there are three potential outcomes:

1. All offspring will be orange.
2. If the orange parent had a yellow parent, then approximately 25% of the offspring will be yellow and the remainder will be orange.
3. There is also a possibility of the yellow diluting the orange to a certain degree and result in some pastels.

A pigmented based seedling will most likely flower orange or a shade of orange.

Group 1 Yellow

In my experience, breeding a yellow with a yellow will always result in yellow offspring. I have heard discussions from several growers who say that yellow crossed with yellow can breed orange until there have been seven generations of pure yellow breeding, but there is also the possibility that any pigmented based seedlings are the result of stray pollen.

A non-pigmented based seedling of yellow breeding will flower yellow. See also Group 2 Yellow.

Pastel

Pastel is a colour that can have a wide range of possibilities, with anything from a light pinkish colour and apricot through to salmon and a darker pink. They are all a form of orange dilution and many pastels are a result of crossing with a yellow. Crossing a pastel with another pastel can result in orange offspring, possibly pastels and often yellows if the pastels have a yellow gene each. Likewise crossing a pastel to a yellow can result in orange, pastel and yellow offspring.

No one can guarantee a young seedling will flower pastel as it is too variable. If the seedling has a pigmented base, then the flower colour may be pastel or could well be orange.

Peach

There are two types of peaches that behave differently with breeding so to simplify it, I will call this one the African peach and the other, the European peach. The African peach is the more common of the two in the general gardening population and less expensive.

This peach has a non-pigmented base as a seedling. The flower colour can vary from a very pale, almost yellow peach through to a dark, rich peach colour. Breeding peach to peach should result in peach, however, if both of the peach parents have a yellow gene then there is a 25% chance of the offspring flowering yellow. Peach is dominant over yellow so many peaches have been crossed with yellow to improve the flower shape and form. This means that there are a lot of peaches out in the gardening world that have a yellow gene.

European Peach

The European peach is different to the African peach in many ways. It may have a pigmented or non-pigmented base as a seedling though I would worry if I saw a very dark pigment as I would expect the plant to flower orange. It demonstrates 'bleeding' on the petals if there is any damage to the flower. Often the flower is more of a tulip or cup shape than the African peach. It is NOT compatible with a yellow plant and will breed 100% orange offspring if crossed with a yellow. It is also not compatible with the African peach and will produce orange offspring. Crossing a European peach to another European peach should ensure the offspring are all European peaches. Having said that, I have had plants flower orange that were supposed to be European peach. As the seed came from other sources, it is possible that stray pollen was involved.

Group 2 Yellow

A Group 2 Yellow plant behaves differently to a Group 1 Yellow. The most common yellow seen in Australia is the Group 1 yellow.

The Group 2 Yellow bleeds on the petals if they are damaged and is only compatible with other Group 2 Yellow plants. This includes the very green flowers like 'Hirao' which appears to be green but is still classed as a Group 2 Yellow.

A Group 2 Yellow seedling will have a non-pigmented base.

Ghost

A Ghost can be a wide range of colours and exhibits patches on its petals that have a ghosting or Watercolour effect. A Ghost can also be known as a parti-colour or Watercolour. There are cases where a ghost has resulted unexpectedly from crossing an orange or pastel to a yellow. Many ghosts carry a yellow gene so there is a possibility of yellow offspring if selfing a ghost, crossing with another ghost, or breeding to a yellow. No one can guarantee a seedling will flower with ghosting characteristics.

Red

Officially there is no such thing as a red Clivia. All Clivia referred to as red are actually dark orange. Many dark orange flowers appear to look red as the flower ages. Some flowers do actually open with what appears to be red flowers though they are very dark orange.

White

There are no white Clivia flowers. Yellow can have a wide range of depth to the colour. Some yellow flowers are a deep buttercup yellow and there are many that are a very light cream colour with all hues in between.

Bronze

A bronze can be a very dark orange/brownish colour and always with a degree of green in the throat or on the outside of the petals. The dark orange with green gives the bronze colouring. Breeding a bronze to a bronze does not necessarily mean the offspring will be bronze. We hope for bronze but also realise that a percentage may be orange.

There have been some lovely flowers that are the result of crossing colours. Bronze is often crossed with a Group 2 Yellow and there are many lovely bronze offspring from this cross. If the bronze has a Group 2 Yellow gene, then there is also the possibility of a percentage of Group 2 Yellow progeny. Pastel has been crossed with a Group 2 Yellow and produced some lovely pastels with green throats.

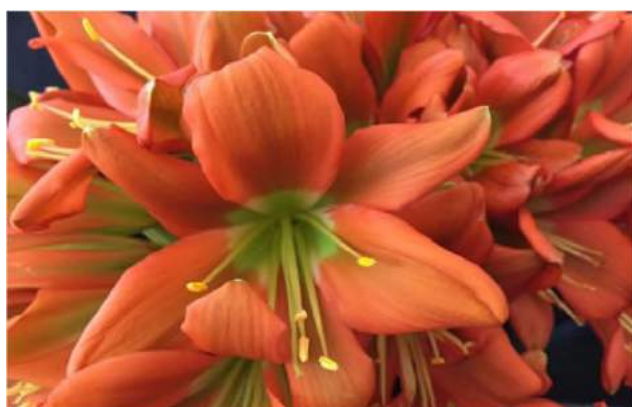
Be careful if buying for colour. It is best to buy a plant that has already flowered or an offset from a plant as you know you are getting what you want. A seedling is always a risk. I have seen more than one large mail-order organisation guarantee a seedling will flower pastel, or red or ghost. As *Clivia* can take around five years to flower, it is a long time to wait and find out your plant is an orange. I have also seen *Clivia* advertised as 'red' or 'white' which is misleading, and seedlings advertised as peach pastel. As peach and pastel are two very different colour types, one with a pigmented base and one without, then I have to wonder what these seedlings actually are.

It depends on the breeding aim as to what to cross with what. It is nice to have an outstanding coloured flower, but the flower shape and form is more important.

Q. I have a question about the colour of the base of a young green Clivia. I was given some seed by someone in our club, claiming that they are going to be green. The seedlings are now 1 year old with strappy (narrow) leaves. The base and the back of the young leaves have slight pigmentation. Since you say that green is actually a Group 2 yellow, would they not also have unpigmented bases?

A. Yes. Plants that will turn out to have green flowers (Group 2) should also have unpigmented bases. If you can see some pigmentation, it sounds like they may not flower green. Don't discard them for this reason. Many crosses from a green parent have lovely green throats and are still stunning plants. regards.

Courtesy of Clivia Market, Melbourne www.cliviamarket.com



Photographing Clivia

I am not going to pretend for a moment here that I am a great photographer or even a remotely good one. I am very pleased with many of the Clivia photographs I take and perhaps that is because I take so many, a few would have to turn out satisfactory. Or, perhaps I have a good eye for what makes a plant look attractive and at its best. I think that is the answer. The most professional photographer in the world may not necessarily photograph your plant to look how you would like it to look.

This article aims to be simple and not get into fancy cameras or settings. I have taken many photos with a simple Nikon camera that has automatic settings, and I have taken some fabulous photos with my iphone6.

When a flower is first opening, it is so tempting to want to photograph it immediately, however the plant will not likely look its best until all the flowers are open. I tend to take a few photos as it is opening and then take more when the flowers are fully open. That way I

am covered should something happen, and I am not able to photograph the plant when it is fully open. An example is a pink flower that opened this season. I photographed the plant as the one flower opened and had planned to photograph the entire flower head in a few days. That night it was extremely windy, and the pot was blown over, damaging all the flowers. I was pleased I had at least that one photograph.

Before I photograph a plant, I gently wipe all leaves to remove dust or marks. Nothing looks worse than a beautiful flower in a photograph with dusty or dirty leaves. If I will be photographing the pot, then I clean that too. Generally, I do not photograph pots.

If there is a spike in the pot to hold a previous flower up, or to hold this particular peduncle up, then I will remove it for the photographs.

I turn the pot around to determine the best angle for the flower arrangement. Sometimes what you consider the front of the plant does not photograph as well as the back of the plant where there may be more flowers. It is important for balance, so it is a good idea to gently swivel the pot in a full 360 degree turn to work out where the best balance is.

The background for me is always a nightmare. I have bought numerous black cloth from stores and have never been happy with it. Somehow it tends to attract light and shine in places rather than be a matt black. I will keep experimenting and hopefully find the right material. I try to have a neutral type of background, whether that be a black material background, a pale coloured wall, or some other surface which is flat and matt.

Photographing a flower with a busy background should be reserved for excellent photographers who are able to blur out the background and focus on just the flowers. I am not one of those.

The lighting is very important. I try very hard to capture the exact colour of the flowers. If I photograph indoors, sometimes the colour tends to look a bit pastel compared to if I photograph outside. Often, I will try a few different locations and backgrounds before deciding what works for this particular flower. The time of the day makes a difference with the lighting.

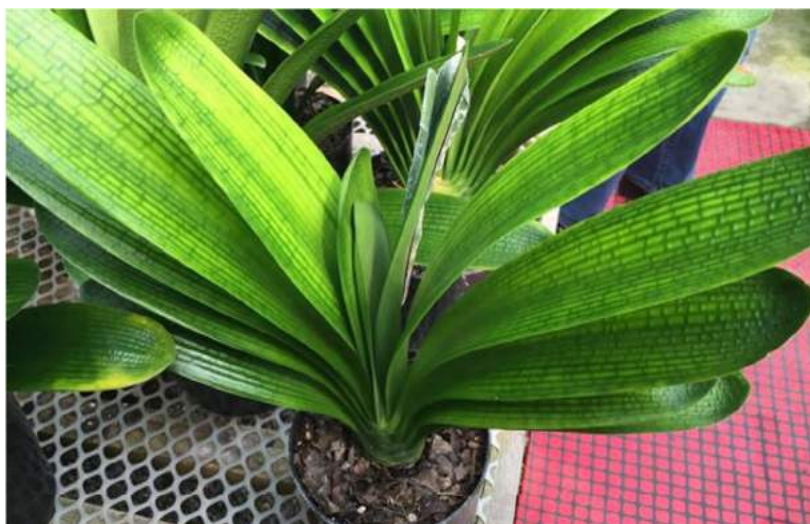
Trying to judge what angle works best with photographing a particular flower takes practice and also just a flair for it. Sometimes positioning the camera low and shooting upward towards the flowers works best, other times shooting at an even level is best and other times, shooting slightly sideward works best. I think beauty is in the eye of the beholder and everyone sees the flower at its best in a different light.

Photographs that frustrate me and are so often seen on Facebook, websites and forums are the ones where the flower is slightly blurry (or highly blurry) and out of focus, the colour is not correct making the leaves look slightly blue, over exposed photographs and over-done photographs where you can't believe they are real as they look too sculptured and manicured.

Good photographs are very important for people who wish to sell plants, or sell seeds from those plants, and also to have a good record of your own flowering. It is worth taking some extra time to get the best possible photographs that you possibly can.

An example of good and ordinary photographs taken with a Nikon automatic camera and an iPhone6 can be seen on the Clivia Market 2015 flowers Flickr album – [flic.kr/s/aHsk895E1N](https://www.flickr.com/photos/cliviamarket/)

Courtesy of Lisa Fox, Clivia Market, Melbourne www.cliviamarket.com



Clivia in China

I was fortunate enough in late March 2016 to visit China and view the greenhouses of several growers. It was interesting to note the growing differences between China and Australia. Unfortunately, we had missed the Clivia show at Changchun by one week.

More notably, due to the extreme cold in winter, the plants are kept indoors, and heaters keep the atmosphere at 25° Celsius. The air is very humid, and it remains this way all year round. I asked how they get flowers as we know Clivia need a certain amount of cold weather to produce flowers. I was told that for several weeks in late winter, they turn the heater off at night, so the plants get a certain amount of cold.

The first group of photos is from the growing area of Mr. Wang, famous for his Wang Dian Chun yellow.



Mr. Wang has two areas similar to a factory structure here in Australia. He grows Group 2 yellows and oranges. The plants are compact, painted face with broad leaves. A mature Wang Dian Chun Yellow sells for the equivalent of US\$2,000.



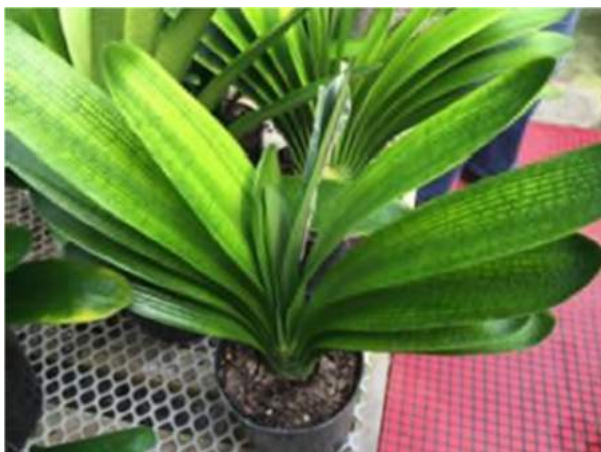
Unlike other Chinese growers, Mr. Wang does put some thought and effort into growing nice flowers, though the leaf structure and shape remains very important.



Over the next two days we visited several growers who specialised in Engineer Clivia. These plants are known for their veined leaves and fan shape. Seeing a huge line up of these plants is certainly an impressive sight.



The next photo clearly displays the veins on the leaves and the fan structure.





All the growers we visited use oak leaf litter for the potting medium. The oak leaves are sifted then covered and left for 6 months to decompose. All plants are repotted twice per year.



We showed the Chinese growers' photos of Hirao and other popular flowers. Their comment was that it was not commercially viable for them to grow anything other than yellow or orange and that the leaves were the most important attribute.

I do love nice fan shape leaves with painted face or veined, but the flower will always be number one for me.

Courtesy of Lisa Fox, Clivia Market Melbourne www.cliviamarket.com





Chinese Clivia

Amaryllidaceae

Clivia (pronounced kly-via) is one of the more primitive genera of the family Amaryllidaceae. Large evergreen perennials with leathery, strap-shaped pointed leaves about 2~2-1/2 ft. (60~85cm) long and 2" (5cm) wide when mature and found in low-lying woodland in South Africa. The plant is named after Lady Florentina Clive, the granddaughter of Baron Robert Clive who founded the British Empire in India. Clivias have neither bulbs nor rhizomes but possess an abundance of thick rope-like roots. Clivias have predominantly orange, red or salmon coloured flowers. The most well-known species is *Clivia miniata*. Clivias are fairly easy to grow and when mature will flower. It produces clusters of 10 to 20, orange flowers on a stout stalk just above the tops of the leaves in the spring and summer. One of the rarer flowers is the aureum (yellow) variety as shown above. The other rare form is the red variety also shown above.



Chinese Clivia
on 3-1/2" pot



typical blooming
size
Clivia miniata v.
aureum
on 9" pot

About 50 or more years ago, the Chinese (Northern Part of China) started a breeding program on perfecting the looks and shape of the *Clivia miniata* and came up with a dwarf plant that do not resemble your typical South African *Clivia miniata*. The Chinese *Clivias* are noted for its short bright broad rigid thick rounded tip leaves shaped like a fan. To resolve any inconsistencies in judging a Chinese *Clivias*, the China Association of *Clivia* in 1999 formulated a standard or guidelines in appraising or judging the quality of a Chinese *Clivia*. Value Points are awarded on the basis of characteristics of the leaves such as brightness (10 pts), fineness (10 pts), rigidity (10 pts), thickness (10 pts), vein (10 pts), colour (10 pts), length and width ratio (10 pts), stalk shape (10 pts), seat shape (10 pts) and Head shape, flower, fruit and others (10pts) for a total score of 100.



Best form
Chinese *Clivia*



Variegated
Chinese *Clivia* Seedlings

Cultivation:

Clivias like to be in bright light with early-morning or late afternoon sun but shaded in between. They grow most actively from early spring through fall. During these months a night temperature above 50 degrees F and a daytime temperature of 70 degrees F or warmer is best. Feed every month and water regularly allowing the potting mix to dry out slightly between deep watering. During late fall (November & December) give them a short rest by withholding fertilizer and watering only enough to keep the leaves from wilting. Try to keep the temperature in the middle forties.

Use a well-drained soil-less mix and put in a pot one size smaller. *Clivia* likes to be pot bound and do not like to have their roots disturbed. Since *Clivias* are top heavy, use a clay azalea pot.

***Clivia miniata* seed sowing instructions:**

1. Prepare a mix of 50% seedling soil and 50% good rotted garden compost.
2. Fill a seed tray half full of the mix and drench with water.
3. Place the seeds on top of the mix and firm down with the palm of your hand. Leave the upper surface of the seed showing.
4. Place the tray in a warm spot that receives good light but not direct sunlight.
5. Water once a week or when the soil mix looks dry with a liquid organic plant food.
6. Germination should take between 4~8 weeks with the root tip emerging first. It will find its own way beneath the soil surface. The first leaf follows a few weeks later. It is important not to move the seedling at this stage as the root is very tender and can break at the point where it emerges from the seed.

7. Re-pot into a 15-cm pot about 8 months after sowing when the leaves are about 15 cm long. Use the same soil mix as for the seeds. Feed regularly as Clivias are hungry plants. Keep plants away from bright light as they like lots of shade.

Propagation:

Preferred method of propagation is by division, or offsets in the late spring or early summer, after the plants have flowered. Clivias have thick roots that can become tangled, so when they are removed from the pots, the roots attached to the different offsets must be separated carefully. The seeds take almost a year to ripen, gradually changing from green to dark red or yellow depending on the colour of the flower. As soon as they are ripe, they are sown singly, in small pots filled with equal parts fibrous loam and coarse grit, with a little leaf mould added.

Pests & Diseases:

Mealy bugs and scale insects may be problems.

Clivias especially the yellow ones tend to be expensive. At one time they were selling for \$1600. A mail order magazine recently was selling it for \$995 blooming size plants. By the same token, Chinese Clivias especially the best ones tend to be expensive. About \$25,000 to \$100,000



The Clivia

Dr. Keith Hammett

Auckland, New Zealand

The growing of ornamental plants is subject to fashion as are other forms of aesthetic activity. Undoubtedly such changes reflect broader collective ideas and conditions within a society.

Until relatively recently fashions might vary widely between cultures, whether it be with regard to the types of clothing worn or plants grown. However, we live in an era that has been termed the communication revolution. This is certainly having as much influence on the decorative plants that we cultivate, as did the industrial revolution of the eighteenth and nineteenth centuries.

The Internet enables rapid exchange of information, ideas and images worldwide and today there is a plethora of special interest groups discussing a bewildering range of topics. Judging by the ever-increasing flow of messages in the group devoted to the genus *Clivia*, it looks set to become a fashionable plant of the twenty first century.

The genus *Clivia* is a relatively small genus found only in Southern Africa and although it is not strictly a bulbous plant it is normally treated as such for literary purposes. The first species to be described was *C. nobilis* in 1828. This was followed in 1854 by *C. miniata* originally named *Imantophyllum miniatum* but changed 10 years later. *Clivia gardenii* came shortly afterwards in 1856. Eighty-seven years elapsed before *C. caulescens* was named in 1943 and at the time of writing, May 2002, the discovery of a remarkable new species *C. mirabilis* has just been published. (Rourke 2002). With the exception of *C. miniata*, which has upright flowers, the other four named species have pendulous flowers and have often been confused in cultivation.

Today wild populations of species occur in relatively small pockets often widely separated from each other and in reality, the genus appears to be in retreat. As all previously known species of *Clivia* are unable to tolerate full sunlight, its current distribution reflects the progressive destruction of forest vegetation which was formerly much more extensive than it is today.

Clivia caulescens is found in the North East of South Africa from approximately Nelspruit northwards to the Zimbabwe border. *C. nobilis* occurs in a coastal strip from Port Elizabeth in Eastern Cape reaching into Transkei. *C. miniata* is distributed from Transkei through Natal and into Kwa Zulu. *C. gardenii* has an apparently similar distribution, although it exploits different ecological niches. Just discovered *C. mirabilis* is remarkable, as its name suggests, in being found 800 km to the west of *C. nobilis* its nearest neighbour in an arid, Mediterranean type climate and apparently able to withstand full sun.

Traditionally botanical classification has been based on the morphology or shape of plants with particular emphasis on the flowers. It is important to remember that a great deal of taxonomic work (classifying) has been carried out on dried specimens mounted on sheets of paper (herbarium specimens) and that for many species the botanist will not have had the opportunity to see living plants. This came about because our ideas on botanical classification are European or Western in origin and much of the work was carried out at one or other of the great botanical institutes in Europe after specimens had been collected from around the world. Only *C. caulescens* and *C. mirabilis* have been named in their country of origin.

It has to be said that until recently it was difficult to identify the pendulous species from the

inadequate descriptions that were available in horticultural texts.

This has been remedied by enthusiasts working with living plants both in collections and in the wild. Such work has been encouraged by the formation of a Clivia Club, lately Society, in South Africa.

Clivias are slow growing plants, especially *C. nobilis*, which in cultivation takes many years before it will flower when raised from seed. In general fruits of *C. miniata*, the most commonly cultivated species, take nine months to mature following pollination. Within populations raised from seed there can be considerable variation in how old a plant may be before it will flower. Some individuals may flower within two to two and a half years from sowing, while others may take ten or more years.

It is important to remember that some characteristics are not fully expressed until a plant has achieved some maturity. First blooms are often poorer than those produced in second and third seasons of flowering. With *C. caulescens* the caulescent stems which can reach several meters in length in the wild are seldom seen in cultivation simply because the species has not been widely cultivated for any length of time. It is a matter of conjecture how old plants with very long trailing stems seen in the wild might be. Individual Clivia plants are long lived and some specimens of *C. miniata* have been maintained within a family for several generations. It is therefore feasible that individual plants of *C. caulescens* with very long stems could be a hundred or more years old.

Clivia miniata



Photo courtesy of Dr. Keith Hammett

C. miniata is the Clivia most commonly encountered in cultivation. Its large upright flowers are showier than the other species and from the time of its introduction to Europe in the 1850s it has been the subject of “improvement” both with regard to flowers and leaves. Its upright flowers alone are normally sufficient for identification. Leaf shape has been greatly modified in cultivation. German and Belgium breeders started to develop broader leafed forms in the late nineteenth century and this trend has been further developed in the Far East. In Japan the squat broad-leafed Daruma forms have been developed. Much emphasis has been placed on a strict distichous habit, broad downward curving leaves and perfect precise interlacing of the leaf bases. These characteristics have been further developed in China following the introduction of this form of Clivia during the 1930s.

The city of Changchun despite an unlikely climate has become the center of development of Clivia in China. This occurred historically because the Japanese installed the last Emperor of China as a token leader following their invasion of Manchuria. Changchun was the seat of power for the Emperor and the Japanese Emperor presented the Chinese Emperor with plants of Clivia for use by his court.

After the Second World War the plant slowly became available to more people and in the early

1960s an enthusiasts' organization was established.

The plant has, however retained its position as a status symbol. Good quality plants are still considered to be an investment despite a period of grossly inflated prices during the 1980s.

There is a strong body of Clivia breeders in China and competitive shows are held. Detailed criteria of perceived excellence have been developed and interestingly 99% of points are allocated to plant and leaf characteristics with only 1% for flowers. Leaf width, shape and surface features are important in determining the value of a plant. This reflects the fact that the plants are always grown in pots and are treated like individual works of art. While the Japanese favour a downward curving leaf, the Chinese prefer them to be more upright.

Almost without exception, whenever a plant has developed a "following" and enthusiasts have formed organizations, the plant has been exotic, and this is the case with the Chinese Clivia Association. Although not formalized until 1992 it is significant that the now international Clivia Society was formed in South Africa where the plant is indigenous, and the people concerned had little knowledge at the time of any developments outside Western Culture.

When a plant develops a following an interest is taken in tracing the history of the development of the plant in cultivation as well as the botany of the genus. Inevitably such histories can only be as good as the fragments of information that were recorded. In Britain, Australia and New Zealand a narrow-leafed form of *C. miniata* has been referred to as "species" *miniata*. This is widely distributed in frost-free areas of Australasia. It seems likely that this is a single accession, probably from Natal, with moderate sized mid-orange flowers. It is easy to fall into the trap of assuming that the broader leaved forms have been developed from this form, possibly initially unconsciously as larger flowers were sought. However, since the advent of the Clivia Club much interest has been taken in viewing the plant in the wild, especially in previously inaccessible regions such as the Transkei. Unlike many cultivated plants, some of these new "wild" accessions have been more spectacular than many plants already in cultivation.

As broader leaved forms of *C. miniata* occur in the wild it is entirely likely that quite a number of unrecorded distinct accessions found their way to Europe and formed the basis of European breeding. In fact, coloured illustrations from horticultural publications from the 1880s clearly suggest that breeders were using accessions distinct from the common form. These were often given names such as *Maxima*, *Robusta*, *Splendens* and *Grandiflora*.

At this time, more work is required to distinguish between the early work of breeders in Germany and Belgium. However, large flowered broad-leaved forms were developed which became known as "Belgian Hybrids" [albeit intra-specific hybrids]. Often the flowers of these had stronger red colouration and tulip shaped flowers. Such plants were grown as houseplants like aspidistras and could become very large and take many years to flower when raised from seed.

After the Second World War the emphasis of European commercial breeding changed to produce a plant with the ability to flower within 2- 2.5 years from seed. Such plants are sold in relatively large numbers as a commodity and are shipped before the flowers are fully open. Such plants are smaller, may have narrower leaves and flower form can be variable.

It is enthusiasts, primarily hobbyists, who have explored the possibilities of different flower shapes and colourings. Often, they have worked in relative isolation from each other, even if located in the same area. Today considerable variation exists with regard to flower-shape, colour combinations, leaf form and leaf variegation, but it is only since the advent of the

Clivia Club and its offshoot the Clivia Net Group that there has been an explosion in the exchange of information and plant material. With the bringing together of ideas and material developed separately in Europe, USA, Australasia, Japan and China the next few years will be very exciting.

Much mystique has been associated with yellow or cream flowered forms of *C. miniata*. The “wild type” orange colour results from water-soluble anthocyanin pigments superimposed over a yellow background of carotenoid pigment contained in discrete plastids. Mutations occur where the formation of the anthocyanins is blocked, resulting in cream or yellow flowers.

Such plants have been found both in the wild and in cultivation. Plants found in the wild have sometimes been maintained in cultivation by several generations of the same family as a living heirloom. Until relatively recently little breeding has been carried out on the yellows and they were most commonly propagated vegetatively. As this is a slow process, yellow Clivias remained rare and if they became available for sale, they often fetched high prices, especially in the USA and Japan.

While there is the suggestion that two distinct forms of yellow Clivia exist, with different breeding systems, the most commonly available yellows will produce 100% yellow offspring if crossed together. If crossed with an orange or red the offspring are 100% orange or salmon. If individuals in the F₁ population are sib-crossed approximately 25% of the F₂ population will be yellow/cream. If individuals are backcrossed to a yellow approximately 50% will be yellow. This all clearly points to a single or the same mutation. As forms with broader leaves and larger flowers have resulted from one and a half centuries of breeding orange and red forms there is a lot of merit in following this route of development.

Variegation of the leaves occurs in some seed lines and superior clones with stable aesthetically pleasing variegation have been established, although these remain rare. In addition to longitudinal variegation the Akebono form where variegation is horizontal has been developed in Japan. The development of this form of variegation appears to be temperature related.

Clivia gardenii



The pendulous species of *Clivia* are not widely grown in comparison with *C. miniata*. *C. gardenii* is grown in frost-free areas where it can be naturalized under trees. It is a relatively variable species in nature and only a few accessions have been widely introduced to cultivation. The species is most easily recognized by the fact that it flowers during the winter, whereas the other species flower in succession from early spring to early summer. The most commonly encountered form of *C. gardenii* has lax leaves with a pronounced central groove and sharply pointed leaf tips. Good diagnostic features are that the undersides of the leaves tend to be a pale whitish green and both the stigma and stamens protrude well clear of the flower tubes unlike the other pendulous species. The flowers are somewhat curved, and are pale orange, sometimes near yellow, tipped with green.



Photo courtesy of Dr. Keith Hammett

C. nobilis

Although gardening books have tended to identify any pendulous Clivia as *C. nobilis* it is in fact rare in collections. Almost invariably plants claimed to be *C. nobilis* turn out to be *C. gardenii*.

The species is easily recognized, as the leaves are stiff with a scabrous, cutting leaf margin. The leaf tips are blunt, often with a concave indentation [retuse – emarginate]. Plants are very slow to establish from seed and even when mature they flower only erratically. Inflorescences contain more flowers than other species. Accessions vary in flower colour and, in my experience, coastal accessions tend to be red while those from further inland tend more to pink.

The identification of plants as *C. nobilis* is further complicated as a hybrid between *C. nobilis*



and *C. miniata* was created in Belgium in the second half of the nineteenth century. This was styled *C. cyrtanthiflora* and has been vegetatively propagated; quite large plantings are found in some Australian Botanic Gardens. Leaves, even on the same plant, can vary markedly with some closely resembling leaves of *C. nobilis*. However, flowers are flared and are much less pendulous than those of *C. nobilis*. It is likely that seedlings have been produced from this F₁ hybrid, which exhibit combinations of characteristics that make them difficult to assign to either parental species.

Mature stands of *C. caulescens* in the wild are perhaps the most spectacular of the genus, not for floral display, but for their very long sinuous stems. These can reach several metres in length and trail over rock outcrops. This species is now finding its way into collections. It is a robust species, which establishes itself quite quickly.

C. mirabilis

This species is currently known only to its discoverers and is barely into cultivation. “It is apparently confined to the Oorlogskloof Nature Reserve in Northern Cape where small groups of plants grow rooted in humus between cracks in the sandstone talus of the rock scree”. The plant has an extensive root system that is large in relation to its aerial parts. This appears to be an adaptation to its habitat. *C. mirabilis* has pendulous flowers that are most likely pollinated by sunbirds, although there is a good likelihood that the plant is self-pollinating.

The fact that the plant is reported to be able to bear full sun will be of interest to gardeners and plant breeders and it will be interesting to discover whether it is able also to grow in shade. With the current interest in the genus it is very important that wild populations of this newly discovered plant are protected.

Swamp Clivia – Now known WEF 2004 as Clivia Robusta



Photo courtesy of Dr. Keith Hammett

Over time different pieces of information in addition to plant shape have been taken into consideration when delineating a species. For instance, chromosome numbers and biochemical data have been used for various genera. Increasingly DNA data are being used.

Recently Dr Yidong Ran completed a cytogenetic analysis of the genus *Clivia* as a PhD. study here in Auckland jointly supervised by Professor Brian Murray and me. As shown in our scientific paper (Ran *et al.* 1999) it is possible to identify the different named species of *Clivia* on the basis of banding patterns that develop when the chromosomes are stained in various ways.

In my collection were some plants originally given to me as seed by Graham Duncan at Kirstenbosch in 1994. These plants were referred to as a robust form of *C. gardenii*. Initially the seedlings looked pretty much like those of any other *Clivia* except *C. nobilis*, but as they became older the plants stood out from anything else. They were very vigorous and with a tall stiff habit and rounded leaf tips quite distinct from the very pointed lax leaves of *C. gardenii*, although they did have the pale green almost white lower leaf surface that one associates with *C. gardenii*.

When Yidong looked at the chromosomes of the “Robust” *gardenii* he found that while the banding pattern was closer to *C. miniata* and *C. gardenii* than to *C. nobilis* or *C. caulescens*, it was distinct from either.

We hear much about DNA analyses and fingerprinting in connection with forensic work and criminal trials. Similar techniques are available to plant scientists and Yidong used two distinct methods, namely random amplified polymorphic DNA analysis (RAPD) and DNA sequencing. Two regions were sequenced, the internal transcribed spacers (ITS1 & ITS2) of nuclear ribosomal 45S DNA and the non-transcribed spacers between the 5S RNA genes. When these methods are combined with appropriate statistical models it is possible to estimate how closely related different species and varieties may be. Our DNA analyses showed that Robust gardenii was distinct from the four species already named but most closely related to *C. gardenii* and *C. miniata*.

Additional collections have been made in an area between Port St Johns and Umtamvuna at Port Edward and a site in Natal. These have proven to have the same distinctive karyotype as the original accession of Robust gardenii.

Ecologically the species is very distinct from the named species of *Clivia*. It is found in patches of Syzigium forest that occur in grassland. These are situated in depressions that fill with water during summer. It also occurs along riverbanks and small streams. The other species are almost invariably found associated with rock outcrops on well-drained soil. Flowering takes place in June and July in South Africa but occurs in April and May here in New Zealand. The flowers are pendulous, tubular and orange-red, and the inflorescences tend to have relatively few flowers. In contrast to *C. gardenii* the stigma and stamens are retained within the flower tube, barely protruding at most.

With all the species it is important to realise that different populations of a species growing in the wild will vary from each other. The longer populations are separated from each other the greater the differences; eventually the differences may be so great that they are considered to be different species. All too often plants in cultivation have all been derived from a single collection or accession.

Interspecific Hybrids



Photo courtesy of Dr. Keith Hammett

Despite the production of *C. cyrtanthiflora* a century and a half ago very little further interest seems to have been taken in crossing the other species until relatively recently. Probably because *C. miniata* has the showiest flowers it has attracted the most attention from breeders. Indeed, the so-called Belgium Hybrids are intra specific hybrids between variants of *C. miniata*. There appear to be no breeding barriers between *Clivia* species and crosses have now been produced between all the previously known species in every permutation. Many hybrids are primary hybrids at the F1 stage, but breeders in South Africa and Japan are now flowering

plants of more advanced generations.

Primary hybrids between the pendulous species and *C. miniata* tend to exhibit characteristics, which are intermediate between the parents. Typically, flowers tend to be flared and born at “half-mast” in the inflorescences. The use of winter flowering *C. gardenii* has the potential to greatly extend the flowering season, while *C. caulescens* and the swamp Clivia are producing seedlings of considerable vigour.

The combination *C. gardenii* x *C. caulescens* has produced populations that have grown quickly and have demonstrated an ability to naturalise, readily suppressing competing weeds. Flowers are produced over an extended season and it is common to have flowers and fruit at all stages of development in a planting. It is possible that such hybrids have potential for the florist trade where both foliage and fruits are currently in demand in addition to flowers.

Considerable scope exists to develop quite new forms of Clivia by sib-crossing, backcrossing and further out-crossing. Already hybrids exist which have input from three and four species.

Propagation

Clivia plants are most commonly propagated from seed. Mature plants produce additional shoots from below soil level, and these can be removed and potted individually. Different plants vary considerably in their propensity to produce side shoots. Because Clivias are slow growing, named clones produced by division are relatively uncommon; the original ‘van Houtte’ form of *C. cyrtanthiflora* and the *C. miniata* yellows ‘Vico Yellow’ and ‘Sir John Thouron’ are examples.

Clivias can be propagated by tissue culture, but cultures are difficult to establish from somatic tissue despite extensive research in various countries. Growth in culture is slow and the explants are small compared to seedlings, where the residual seed provides a reservoir of food.

Summary

Clivia is a genus that is currently gaining an enthusiastic following around the world. They make an ideal house and conservatory plant in areas that experience frosts. In frost-free locations they can be naturalised to produce impressive drifts under trees where few other plants will flower. They are a surprisingly tough plant that can survive a degree of neglect both in pots and the garden. This is an important factor in determining a plant’s popularity in today’s fast-moving world.

From a breeding point of view, they are an exciting plant with enormous scope for further development both as a pot and garden plant. They also have many characteristics, which could make them a good florist flower. I am confident that we are, in reality, only at the beginning of the development of a major ornamental plant.

Courtesy of Dr Keith Hammett, New Zealand

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Clivias by Paula Szilard

“Clivias are undeniably aristocrats of horticulture. They are classed among the most desirable of all connoisseur plants offering not only spectacular flowers, but also interesting variations in both leaf variegation and plant form.”

Professor Harold Koopowitz. Author of the seminal work on clivias, 2002



Clivia miniata

Named after Lady Charlotte Florentia Clive, Duchess of Northumberland, at whose conservatory they first bloomed, clivias were discovered in 1815 by the naturalist and explorer William Burchell in the forests of Eastern Cape Province of South Africa. Additional plants were collected in the same area in the early 1820's by the plant collector and Kew gardener James Bowie. It was Bowie's plants that Lady Clive succeeded in flowering and that botanists used to classify and name clivias.

By some quirk of fate, this plant was simultaneously named by two leading British botanists in separately published articles, William Jackson Hooker and James Lindley, a botanist at Kew gardens. Hooker's name didn't stick, but Lindley's '*Clivia nobilis*,' did. Lindley wrote, "We have named this genus in compliment to her grace, the Duchess of Northumberland, to whom we are greatly indebted for an opportunity of publishing it. Such a compliment has long been due to the noble family of Clive, and we are proud in having the honour of being the first to pay it." That is why, the name is most commonly pronounced as "clyvia" rather than rhyming with trivia.

This was my first excursion into the world of the clivias. I have only grown them since 2008. I had long coveted the orange miniatas I had seen at my local garden centre. Then a friend gave me one and I was smitten. I found another beautiful, large specimen at an estate sale for \$4.00, about a tenth of what you pay for a large plant. Both were root bound and were transplanted immediately, but nonetheless bloomed in late December and early January. I now have collected all of the species except *C. mirabilis*, which has been difficult to come by. When I visited South Africa in 2010, I was delighted to see clivias in the wild, at botanical gardens and even at a flower show.

The Species

The genus *Clivia* consists of six evergreen species in the Amaryllidaceae family. Some are relatively easy to tell apart. With others, the distinctions are subtler, and it helps to have botanical training and use a key. Please note that although the open-faced trumpet shaped *C. miniata* is what most of us know as a clivia, five of the six species have pendant, tubular flowers. The flowers of all species in the genus are borne on umbels, similar to Queen Anne's Lace.

1. *C. caulescens*. This is a species with narrow pendant tube-shaped orange to cream flowers with green edging very similar to those of *C. nobilis*. It was discovered in Limpopo Province in the northern part of South Africa in the 1890's, but was not described until 1943, the first clivia species to be described in its native land. It is the only clivia with real stems, which can grow 6 feet tall. It also has the distinction of being the species most tolerant of sun and is accustomed to the hot, wet summers and cool, dry winters of its native habitat, with an occasional light frost at higher elevations.
2. *C. gardenii*. Native to the Kwa Zulu-Natal Province, *C. gardenii* was named after Major Robert C. Garden, the British plant explorer who found it. It has pendant peachy-orange flowers edged with green. A natural variant with white to yellow flowers has also been found. *C. gardenii* is a sizeable plant, with leaves measuring over two feet long.
3. *C. mirabilis*. Amazingly, this clivia, the newest species in the genus, was not discovered in Northern Cape Province until 2001. Its flowers are more distinctive than those of other pendulous flowered species. It has drooping red/orange flowers and dark red pedicels (flower stems). The flowers sometimes have greenish yellow edging. This plant requires less water than other Clivias
4. *C. miniata*. This is the plant we all know as clivia. It has orange, red or yellow trumpet shaped often flattened flowers that put on a very striking display when they bloom. Native to the Eastern Cape, Kwa Zulu Natal and Swaziland, it is probably the most commonly found clivia in southern Africa. It is also the most frequently hybridized clivia and the plant we commonly have in our homes and see in garden centres. In the northern hemisphere it blooms in the winter, most often in December or early in the year.

This species has different natural forms. In addition to the orange or red flowers, often with a yellow centre, there is a yellow variant, *C. miniata*, var. *citrina* and a nearly white flowered plant with touches of pink, called 'Appleblossom.' "Chubb's Peach is a naturally occurring peachy yellow variant.

5. *C. nobilis*. The actual species named after Lady Clive and the type species for this genus, this plant has pendant, curved tube-shaped orange flowers, but they are tipped in yellow and green. It is found only in the Eastern Cape, mostly along the coastline. Seedlings in this species are extremely slow growers, usually taking more than 5-6 years from seed to bloom. I got mine when it was supposedly near blooming size, but after four years, it is only about 2 feet tall and it still has not bloomed. In nature, this species grows about 1 ½ - 3 feet tall

6. *C. robusta*. This plant passed for *C. gardenii* until 2004 when it was classified as its own species. It looks quite similar to *C. gardenii*: pendant, curved dark to pale orange flowers with green tips. The leaves can be quite long, some measuring over 3 feet. Like others clivias, it has a naturally occurring yellow form: *C. robusta*, var. *citrina*. Its natural habitat is in swampy terrain in the coastal forested areas of northern Eastern Cape and southern Kwa Zulu Natal, so it can handle poorly draining soils while other clivias can't, but it also does well in well-drained soils.

Hybridization

The Clivia Society in South Africa is the name and registration authority for new cultivars. Its Clivia Register and Checklist describes well over 1000 hybrids. Many of these are intraspecific (within a species), but interspecific (between species) hybrids of *C. miniata* have gained ground. Understandably, South Africa has the distinction of producing many of the new hybrids. Historically, there was a substantial amount of breeding and growing of *C. miniata* in Europe. Currently Belgium is the leader in production. Germany, France and the Netherlands also produce large numbers of plants.

California has emerged as the locus of hybridization activity in the United States, no doubt because of its mild climate, yet there are growers in other parts of the country, including Colorado. The focus of American breeding has been on colourful flowers and to a lesser extent on variegated foliage.

China and Japan are also known for their contributions to breeding. *Clivia nobilis* was likely the first species introduced into Japan around 1850, followed by *C. miniata* in the 1870's. The Japanese have excelled at breeding miniature or dwarf hybrids with beautiful short, wide leaves, often variegated. They were much less focused on the flowers than Western breeders. Then during World War II during the occupation of China Japanese officials brought their clivias with them and left them behind when they withdrew. The Chinese were taken with these plants and started to hybridize them. During the Cultural Revolution in the 1960's and 1970's, many unique plants were destroyed, but the industry recovered. Now the breeding of clivias is a multi-million-dollar industry. Like the Japanese, the Chinese focus on the leaves.

Clivias are often thought of as Victorian plants, however, they were not widely grown as houseplants during that time. Because of their high cost, these plants were available chiefly to the well-to-do. As late as 1890, Clivias were still not found in a standard plant reference book of the period. If they had been popular, they would have been discussed there. Surprisingly, clivias are still expensive today. A large specimen of *Clivia miniata* will cost anywhere between \$40-50, probably because the plants are slow growers, especially if started from seed.

Because there are now such a large number of cultivars, let's focus on the ones that are more commonly available. There are some interesting miniatas, especially in pink and peach or bronze. There are a number of yellow cultivars in addition to the natural variant *C. miniata*, var. *citrina*: *C. miniata* 'Aurea,' and *C. miniata* 'Golden Dragon,' as well as a peachy yellow called 'Victorian Peach.' 'Fire Lily' is another attractive red cultivar of *C. miniata*. All have been at various times available from Logee's in the United States. The cyrtanthiflora hybrids are interspecific crosses of *C. miniata* and *C. nobilis*. They have pendant blossoms that are much more open than those of *C. nobilis*. These delicate flowers exist in various shades of orange, peach and apricot.

Clivia Care

When grown outdoors, clivias thrive in subtropical or Mediterranean climates. For those of us in the colder temperate zones, clivias make perfect, long lived houseplants because they like shade and are good indoor bloomers. They are attractive even when they aren't blooming because they have lovely dark green strap shaped leaves, some of which are stacked in two tidy piles like gasterias.

They are quite tolerant of our dry interiors in the winter, but do not locate them too close to a heating vent. They are capable of surviving a lot of abuse, but they cannot tolerate being overwatered. If you are known for a heavy hand with the watering can, you can compensate by adding more sand, scoria, etc. to your potting mix. Still, it's wise to test the humidity before you pour

During spring and summer move your clivias outdoors into light, but not deep shade. Too much sun can scorch the leaves. Water generously and fertilize your clivias once a month but DO let the surface dry out between watering. Use a slow release or an all-purpose fertilizer with an NPK ratio of roughly 20-20-20, and make sure it has all the micronutrients as well. Also, during this time the plant likes warm temperatures. Although books advise you never to let clivias dry out completely, you do need to reduce watering considerably and expose the plant to lower temperatures in the fall and early winter to bring it into bloom. This is sometimes referred to as an early winter rest period, lasting for 6-8 weeks. During this time, give your Clivias temperatures below 50 F, but definitely a few degrees above freezing. Leave them outdoors until the first frost threatens. Then put them in an unheated porch or bedroom. The books say that when plants don't get enough chilling time, they may not flower and if they do, the flower stalks may remain short and stay "stuck" between the leaves.

When I got my plants, I was unaware of this requirement. In the case of my estate sale plant it should already have been chilled before I got it, but apparently it wasn't. It was located in the dining room at its previous home. My flowers, though still beautiful, were indeed "scrunched" between leaf blades. Immature plants, which are not at the blooming stage, do not need this rest period at cooler temperatures.

Place your plants at a window that gets bright light with early morning or late afternoon sun. If you locate them facing west, you may need to move them back from the window. Water generously in the spring and summer. Pot up your plants in a porous, well-draining peat-based mix. For small containers add a little sand, scoria or fine gravel to the mix. For containers larger than 5 gallons, use the proportions 2/3 mix to 1/3 sand or any of the above to make the mix more porous.

Plants can go a long time without being repotted, on average of three to four years. In fact, they seem to bloom better when pot bound. The pot you transplant into should be only

slightly larger than the root ball. Drilling additional drainage holes or enlarging the existing drainage hole will allow for better drainage. Clivias have thick, fleshy roots for water storage with a corky absorbent layer of velamen, similar to what is found on orchid roots. This is thought to help the plants absorb water and nutrients. Topdressing in years when they are not being transplanted is advisable. Scrape away about 2 inches of the mix, being careful not to damage the root system and replace it with fresh mix to which you have added a little bone meal and some slow-release fertilizer. Repotting and top dressing are best done in the late winter.

After Clivias bloom, remove the seed heads unless you're planning start more plants from seed. They will consume too much of the plant's energy and it may not flower in the next bloom cycle. When the cut flower stems turn brown, they are easily pulled out.

Propagation

Propagate your plants by removing the offsets. This is far easier said than done. Offsets should have at least three leaves before they are removed from the mother plant. You must first find where the offset is attached to the parent and cut it with a sharp knife. Then comes the hard part untangling the roots and freeing the offset. The best time to do this is when the plant has finished blooming. Plant the offsets in a 5" clay pots, using a mixture of peat-based potting mix and coarse sand. If you are young enough and very patient, you can propagate plants from seed. Although some growers have grown plants from seed to flowering in 30-36 months, it could take most of us at least 5 years (depending on the species or variety) to get from seed to flowering.

Pests

Apart from mealy bugs and scale, I have not had any pests or disease problems. The Clivia Society website lists mealy bugs, aphids, red spider mites, thrips and whiteflies as potential insect pests. If you do have any such infestations, you will probably not want to expose yourself to the vast arsenal of agricultural chemicals to remedy the situation, especially not in your home. If the infestation is small, you may want to consider strong jets of water for aphids and mealy bugs. In case that does not work for you, sprays of ultra-fine horticultural oil mixed with water will usually do the trick. The oil and water spray is also effective for scale. spider mites, thrips and possibly whiteflies, but hopefully, you will never have to deal with those. Keep in mind that all these pests are difficult to eradicate, and plants will require several treatments. Also, testing the oil spray on an inconspicuous part of the plant is always a good idea.

Clivias are extremely rewarding plants and bloom reliably in the home. They have lovely, arching symmetrical leaves and are attractive even when they are not blooming. They just need a little special attention at certain times of the year and are certainly worth the effort because they bring a cheery brightness to your living spaces when you most need it, in the short, drab days of winter.

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www.northamericancliviasociety.org (has links to American growers)

Courtesy of Paula Szilard, Master Gardener, Arapahoe County, Colorado, USA



Clivia – my favourite plant! Bernard Chapman, Garden Drum

Like parents with their children, gardeners often have a favourite among all the plants that they grow.

Without doubt my great horticultural love is Clivia, most especially the cream ones.



Massed cream Clivia with Belgium hybrid Clivia behind.

They are perennials in the Amaryllidaceae family, related to naked ladies and hippeastrums. There are only six actual Clivia species, the best-known being *Clivia miniata*, mainly the orange one, usually grown in massed planting. They have shiny, dark green strap-like leaves, which grow from a central crown, sending out babies (pups) on the side.



Lots of common Clivia, Clivia miniata.

Here I want to give a very brief history of the plant and, more importantly, some advice on how to grow them based on my own experience. I have been growing them for over thirty years. However, not all I do, I fear, would be sanctioned by traditional Clivia growers and breeders!

Many gardeners know that the Clivia is named after Lady (Charlotte) Clive, the Duchess of Northumberland. The reason the plant was named after her was because, after it was first

taken to England in the early 1800's, she was the first person to produce flowers. There is some confusion as to how to pronounce Clivia. Most commonly, people say cly – vee – aah.



Belgium hybrids massed.

Clivia grow naturally in southern Africa (South Africa and Swaziland), and do well if given shade and are not exposed to extreme cold or humidity. They will not tolerate frosts. Direct sun should be avoided at all costs.

Clivia are incredibly good cut flowers. Some flowers I have cut have lasted almost two weeks in a vase. The berries are also very ornamental and can be used in flowering arrangements, too.



Clivia make an outstanding flower for vases.



Belgium hybrids add a splash of colour indoors and last well after cutting.



Cream Clivia berries.



Cream Clivia.

Lots of variety

The range of colours and sizes is extraordinary. Colour-wise, besides the creams, yellow, pinks, oranges, and reds, there are bicolour flowers, which can be very dramatic. There are also green flowering cultivars. Clivia Nobilis, the first that Lady Charlotte made flower in Britain, has almost weeping flowers that are orange, green and yellow, all on the same flower.



Red Clivia.



Yellow Clivia grouped together.



This is a pink Clivia bought at Bunnings.

The size of leaves and flowers is also quite variable. Some flowers are almost spider like, while others are truly blousy and dramatically large. Leaves can also vary greatly from belt thin to wide with large rounded tips.



Bicolour hybrids in bloom.



I believe this is Col Pitman Clivia.

There are also variegated plants, where their leaves, flowers and berries all share this trait. Even the variegations can vary, on leaves, even to banding, or in the variation of the amount of cream and shades of green they present.



Variegated Sachin Twin Clivia. Photo: © 2017 Pine Mountain Nursery

There is Clivia cultivar called ‘Twins’. It has usually two flowers on the same plant, usually at the same time, and is a dwarf form of the Belgium hybrid.



Twins Clivia.

Clivia miniata is the most widely grown, but the *grandiflora* *Clivia* are also often found in a temperate climate. The showier Belgium or Dutch hybrids are the ones with bigger darker orange flowers, strong leaves and darker berries.



Clivia grandiflora.



Belgium hybrids massed.

Growing conditions

Apart from their hatred of a full sun position and dislike for humidity, Clivia are surprisingly easy going about where they are growing. They are semi-epiphytic (air plants) with roots, at a glance, not dissimilar to cymbidium orchids. I have dug Clivia up, left them in in plastic pots for over four months without compost, soil or potting mix, and they have not only thrived but also flowered, with the addition of just a little water.

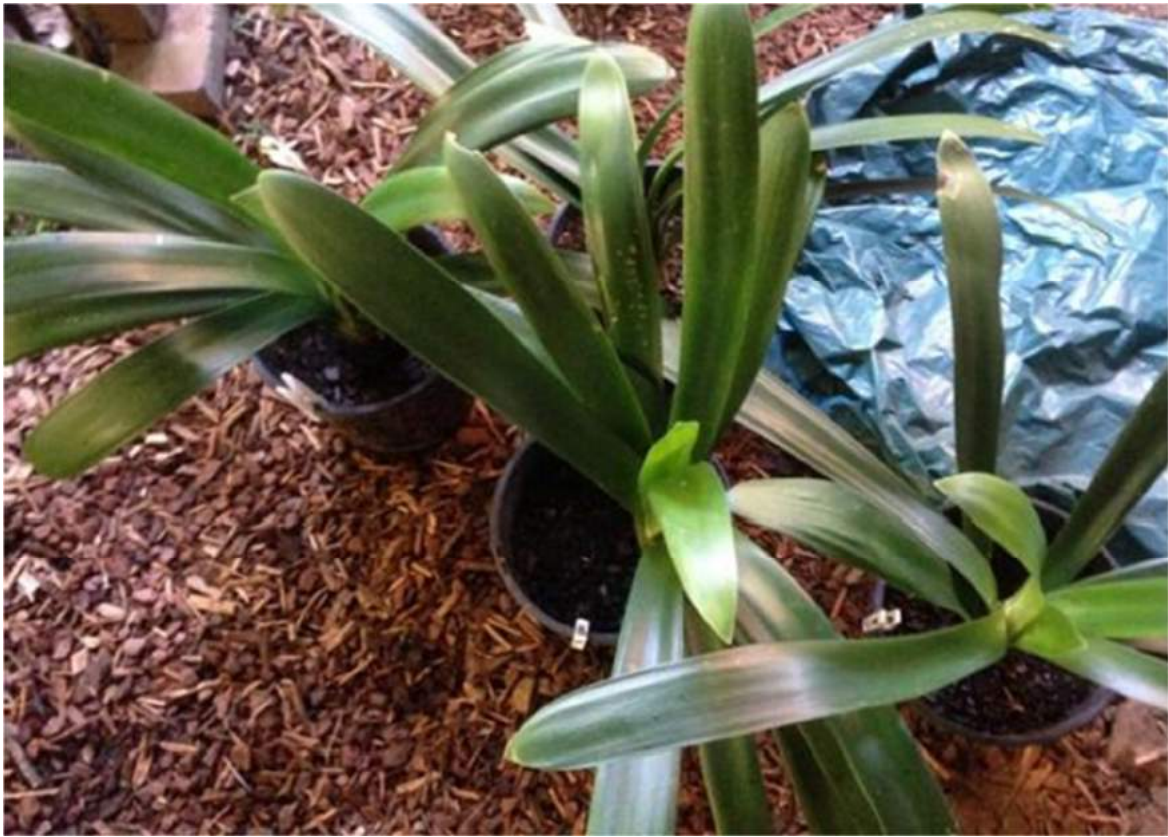


Developing roots when left in a pot without medium.



This pink Clivia has been in this pot for over a year without compost or any other plant media and it is not only growing fine but has also flowered.

When I pot Clivia I never use potting mix, but prefer orchid compost, used with great success. I am unsure how Clivia growers would feel about this, but know it works well for me. I am also intending to trial a Clivia on a tree fern with a pouch of peat moss. At present the drought in Sydney is stopping me!



Freshly potted Clivia in orchid compost.





Clivia growing in pot without medium.

Clivia, when grown in the ground, thrive on compost, leaf litter and mulch. Although they probably would grow happily on concrete, they do need good drainage if planted in the ground, and heavy clay soils should be avoided.

Watering and feeding

Clivia are generally quite a drought tolerant plant and, it has been suggested to me that not watering them, or watering sparingly, in winter will encourage better flowering (probably by stressing them). When established they only need to be watered occasionally and will still grow well enough with neglect.

Feeding Clivia, in my experience, will help flowering. I apply a pelleted feed a couple of times a year, and a foliar feed every couple of weeks. However, I should point out that Ken Smith, a very talented Clivia grower and former TAFE teacher of mine, did a study on feeding Clivia a few years ago and could not find any consistent feeding program that worked.

Pests and diseases

The greatest downfall of Clivia is that it does have some nasty enemies. Mealy bug and aphids can attack them from time to time. However, their greatest nemesis is the lily or amaryllis caterpillar. This can attack any member of the Amaryllidaceae family, but seems, unfortunately, to prefer clivia.



Amaryllis caterpillar or borer, Brithys crini. Photo: Jon Richfield, CC License

The caterpillar prefers dry conditions, so be more vigilant in these periods. The caterpillar is less active in the colder months, too. The moth, about 5 cm across, lays lots of eggs so the damage done can be catastrophic if the caterpillars are not found early after they hatch. If not found, they eat all the leaves down into the crown of the plant. Cutting off leaves that are affected, with the caterpillars on them, can help a lot if the attack is found early.

Propagating Clivia by division

When I got my first cream Clivia, almost thirty years ago, it was expensive and came from South Australia by post. I kept dividing it until I had six and then more. I have been lucky enough to have given a great many away, too. Also, I have bought more over the years, especially to get better flowers (for example, Clivia miniata 'Col Pitman' is a cultivar with a lovely showy flower).

Thus, division is a sensible exercise if you wish for your collection to grow. Also, if plants are left undisturbed for years they can continue to grow, but often will flower less. As with most clumping perennials, division encourages vigour and flowering. In fact, if plants are left undivided for too many years there is a greater danger of them rotting in humid weather.

When you need to divide plants, dig up the clump with a spade or pitchfork. Often there will be two or three good size plants in the clump, plus a few pups (the cute name for the offshoots). With a below ground saw or old kitchen knife neatly trim the roots, cut through the plants, trying to keep as much root attached, and separate the pups.



Cut up Clivia showing orchid-like roots.

The plants can be potted up (and, as I said, I use orchid compost), but watering must be limited if they are potted as there is a great danger the newly potted plants may rot. I always apply seaweed extract and the fungicide phosacid when first watering to help new root growth and general vigour, and to help prevent fungal attack (such as phytophthora). Make sure, too, that you do not put the plants in too big a pot. You can always pot them up when their root ball is more developed.

If you are planting into the soil add organic matter, such as well-rotted compost, eucalyptus bark (or similar), and some pelleted fertiliser. Again, water with seaweed extract and phosacid, and water sparingly after that.



Red berries.

Propagating Clivia from seed

Obviously, Clivia can be grown from seed, but keep in mind that they will not always be true to type (remember Mendel's Law re chromosomes). I have never produced a cream flower when I have grown mine from seed, even though I grow all my cream Clivia together. Indeed, it is a good idea to keep different colours separate to each other to discourage cross-pollination.

Besides their attractive flowers, Clivia also have beautiful berries that colour to suit whichever colour the flowers were. Thus, cream flowering plants have cream berries, variegated ones have variegated fruit, and red ones have red berries and so on.

Inside each berry there are often two to four seeds. I 'squish' open the outside membrane and put the seeds on the top of potting mix, pressing them in very slightly. It can take weeks, even months, for the seeds to germinate so be patient. Water occasionally, but nothing else is required.

Ken Smith once told me, of plants you have germinated from seed, that it is possible to tell what colour their flowers will be up until about a year into the growth. If you are trying to grow cream Clivia, for example, the base of the seedling should be cream. If red or pink, they will eventually flower orange.

After a year apparently, it is impossible to tell what colour the flowers will be, regardless of the colour of the crown base. I have found this to be true. As it can take plants three years until they flower, it is worth knowing this fact.



Almost Red Clivia.



Cream Clivia growing in a clump.

In conclusion, Clivia are attractive, easy to grow plants that produce stunning flowers of an amazing array of colour. If insect attack is monitored this should not be a problem. Their

flowers are good for cutting, but also provide a dramatic display in the garden. Clivia need little water or feeding but must be grown in the shade. Little wonder they are my firm favourite!



Single Red Clivia.



Pink Clivia.



Wow!



About Bernard Chapman

Bernard is a consulting horticulturist and Owner of Garden Drum

Cultivation of Clivia

The basics



SHORT GUIDE TO THE CULTIVATION OF CLIVIAS

Species: There are six species of Clivia which are indigenous to South Africa. One of the species has upright flowers, *Clivia miniata* and the other five species have pendulous flowers - *Clivia nobilis*, *Clivia gardenii*, *Clivia caulescens*, *Clivia robusta* and *Clivia mirabilis*.

Cultivation

The following recommendations apply to all the Clivia species, however here we will concentrate on the spectacular *miniata* species.

Position

In the natural habitat Clivia plants grow in dappled shade, often on top of rocks, obtaining their nutrition from the leaf litter. For the successful cultivation of Clivias we need to recreate the natural conditions for optimal growth. Fortunately, the Clivia, in addition to being drought tolerant and relative hardy, except to severe frost, is very forgiving to a large variety of potting media and garden soil mixtures. Planting in positions receiving the afternoon sun will result in scorched leaves. The early morning sun does not damage the Clivia leaves and is an acceptable position. Dense shade may result in the Clivias not flowering.

Planting Media

Clivia roots need a lot of air around them and they do not like to stand in water. The soil must be well drained. A Clay soil is not suitable for growing Clivia as the water will not drain away from the roots. A sandy soil is also not suitable as there will be too little moisture for the roots. A well composted coarse pine bark mix provides the ideal growing medium. Commercial Clivia mixes are available. Garden soil is very variable in composition and adding good quality compost and coarse potting mixtures for good drainage is the most suitable way of preparing the garden soil for Clivias.

Nutrition

A slow release fertiliser such as 3-1-5 fed in Spring and Autumn is ideal for the Clivia plants.

Watering.

Water liberally in Spring when there is evidence of growth. Decrease the amount of water in winter as the growth rates are slower or have stopped. If the soil in which the Clivia is planted is well drained, watering will not result in a problem, such as root rot.

Seed propagation

Once your Clivias have flowered, you may wish to increase the numbers by pollination. This is an easy way of increasing numbers, but there is a three to four year wait for the plant to flower, usually after it has at least twelve leaves. Clivia miniata flower in September but may flower at any time and even surprise you in winter with a flower. Pollination is achieved by placing the yellow pollen of the anthers on the stigmatic lips of each flower. There are six anthers with pollen and one single stigma in the centre of each flower. Pollinate in the early morning for a few days while the stigma is still sticky and fresh looking. A berry will develop if the pollination was successful.

Leave the berry on the flower stalk/ peduncle/scape until the colour changes from green to orange or yellow. Harvesting the seed before the colour change occurs may be unsuccessful. Harvesting the seed from July onwards in the Southern Hemisphere ensures successful germination.

Germination of the Seed

The berry should be opened, and the seeds exposed. A fine membrane surrounding the seed should also be removed. Wash the seed pulp in a mixture of a teaspoon of dishwasher liquid in a litre of water. This makes the removal of the slimy tissue surrounding the seeds much easier and acts as a "sterilising" agent. After the seeds are clean, wash off the soapy solution and soak the seeds in a freshly mixed up solution (use the recommended strength) of antifungal mixture. Fungi are the main enemy of germinating seeds.

The seed may be germinated in a damp paper towel sealed in a zip lock bag or between paper towels

in a sealed plastic container and should be kept in a warm place, or on top of the fridge. Keep the paper towel only moist and not too wet. The seed may also be pressed down in seedling soil to the depth of half the seed height, then keep the soil moist in a shaded protected area. A covering of oak leaves or newspaper or glad wrap may be used to keep curious animals out of the tray.

Once the radicle projects from the seed or when the root is 2cm long, place the seeds in communal seed trays and keep moist. When the plants have about eight leaves they may be planted in individual small pots. Don't use too large a pot for the transplanted seedling.

While the seedling has the seed attached no feeding of the plant is necessary. Seedling fertiliser or foliar feed may be started once the seeds fall off the seedling. You may add some pelletized chicken manure to the bottom half of your seedling mix, so that nutrients are available once the roots reach that depth.

Multiplying by division

Clivia plants in pots need to be divided when there is no healthy potting soil left in the pot. Clivias in the garden need only be divided when the clumps grow into each other and the overall qualities of the blooms deteriorate.

Lift the whole Clivia plant out of the ground or out of the pot. Before dividing an offset make sure that there are roots attached to the offset. Use a sharp clean knife and divide the offset. The offset may often break off quite easily. Cover the open wounds with an antifungal solution e.g. Chlorothalonil (Bravo.) Don't overwater the newly planted offset.

Pests and Diseases

Pests:

The main pests of the Clivia plant are the Amaryllis caterpillar and the Leaf Miner. The snout beetle does cause a problem in some areas. The leaf miner causes leaf disfiguration. Control the leaf miner with Imidacloprid (Confidor/Kohinor/Bandit). The lily borer/amaryllis caterpillar develops from eggs laid by moths on the underside of the leaves. The larvae of these lily borers burrow a channel down the leaves into the growth stem of the Clivia. The main fan may die, but usually offsets grow from the main rhizome of the plant. The best insecticide for the amaryllis caterpillar is Cypermethrin (Ripcord) or Dimethoate (Aphicide).

Mealy bug is another pest that occurs when plants are overcrowded and there is poor ventilation between plants. This pest is well controlled by imidacloprid (Confidor).

Diseases

The diseases affecting Clivia include viruses, bacteria and fungi. By far the biggest problem here is with fungal infections.

Viral infection of Clivia gives the leaves a mosaic pattern and the flowers may have split colours. As there is no cure for a virus infection, destroy the plant, and prevent further spread of the disease.

Bacterial diseases can cause stem rot. This gives a characteristic foul smell when present. Scrape out the rotten part of the plant. Pour dilute bleach over the area and wait for the area to dry. Keep the soil relatively dry until the bacterial rot has cleared up. Bacteria usually cause damage following on some previous physical injury to the plant. Fungal infections cause brown marks on Clivia leaves. These are particularly common in warm and moist conditions. Remove the damaged and discoloured leaves. Spray with chlorothalonil. (Bravo) or a systemic fungicide. E.g. prochloraz (Octave).



From left to right and from the top downwards:

Clivia nobilis, *Clivia miniata*, *Clivia mirabilis*

Suspected viral infection of leaves, *Clivia gardenii*, *Clivia* flower arrangement with freesias *Clivia robustus*, "Frats" *Clivia*, *Clivia caulescens* *Clivia miniata*, *Clivia mirabilis*, *Clivia miniata* multitepal

By Courtesy of Professor Mark Laing

Acknowledgements

This Reference Book is for the total benefit of the Clivia Beginner in getting to know all about the Clivia species we all know and love. I am 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.

I acknowledge the contributors' expertise and commitment in passing on their knowledge in their particular area for the benefit of others.

*This Reference Book is available **free of charge** electronically through my Facebook Page and Website as described below.*

Gary Conquest JP

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

Facebook: Growing Clivias for Beginners

Email: growingclivias@gmail.com

Clivia Society of South Africa

Clivia Nature and Nurture

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Ray Perks, Melbourne Clivia Group, Australia

Garden Drum – Bernard Chapman, Australia

Melbourne Clivia Group, Australia

Dr Keith Hammett, New Zealand

Paula Szilard, Master Gardener USA

Kev and Petra Whitmore, Australia

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Professor Mark Laing, South Africa

Frikkie Marais, South Africa

The Late Bing Wiese, South Africa

Professor Hannes Robbertse, South Africa



C. Caulescens X C. Nobilis

Epilogue

The Reference Book for growing Clivias for Beginners and Beyond 1st Edition is now complete.

I am now working on the 2nd Edition looking into many other Clivia subjects that will create further interest in getting to know more of the Clivia genera.

The Clivia Society of South Africa under Chairman Glynn Middlewick deserve great appreciation for what they have done to educate enthusiasts on the many varieties of Clivia circa 1992. The Society now has a very large membership especially from many overseas countries.

Membership of a Clivia Club/Society is an important move for a Beginner learning more on Clivias.

I highly recommend joining any of the following Clubs/Societies:

- Clivia Society of South Africa – www.cliviasociety.org
- Toowoomba Clivia Society Inc – www.toowoombacliviasociety.com.au
- Melbourne Clivia Group – www.melbournecliviagroup.org.au
- North American Clivia Society (NACS) – www.northamericancliviasociety.org





<https://www.growingclivias.com>
growingclivias@gmail.com

Mealybugs

A pest of a different scale

Background

Mealybugs are a specific type of scale insect from the family Pseudococcidae. They often secrete a thin covering of mealy wax across their body, hence their common name. Like other scale insects, mealybugs are sucking pests that can be present across all of Australia on many host plant species. Some species of mealybugs are very serious pests of particular plant species, others are not. Some species may feed on a large number of host plant species, others only on a small number. Mealybugs are most often present on leaves and stems, particularly in tight, protected spaces. However, some mealybugs feed on roots. For information on other types of scale insects, refer to the [scale insect factsheet](#) available on the NGIA website.

There are a number of mealybug species that may be commonly encountered in production nurseries; these include longtailed mealybug (*Pseudococcus longispinus*), obscure mealybug, (*P. affinis*), citrus mealybug (*Planococcus citri*), ground mealybugs (*Rhizoecus* spp.) and many others. Some native mealybug species are common problems on native plants, e.g. *Melanococcus albizziae* can kill *Acacia* and *Australicoccus grevilleae* can cause significant damage to *Grevillea*. It is likely that at least one mealybug species will feed on most plant species found in a production nursery, at least from time to time. It is beyond the scope of this factsheet to detail the biology and host range of every mealybug species that could be present in production nurseries across Australia. This factsheet is necessarily general, providing information typical across the group; exceptions will occur. It is recommended to have mealybug species that are encountered in your nursery identified to facilitate the management of the pest more specifically. Identification is particularly important when the infestation is widespread, when management actions have failed or when they reoccur frequently. Furthermore, some species of mealybugs are serious pests overseas, but are not present in Australia.



Fig. 1. Adult, egg masses and immature citrus mealybug individuals, photo by the United States National Collection of Scale Insects Photographs, bugwood.org.

Description

Mealybugs are small, oval, soft-bodied insects that are often covered in a white powdery wax. The powdery wax sometimes extends off the body as long marginal filaments. While most species of mealybugs are white, off-white or light grey, some species are yellow, pink or orange. The mouthparts of all mealybugs are hair-like, being extremely long and thin. If individuals are carefully removed from plants when they are feeding, these mouthparts can be observed under a microscope.

Adult females are similar to nymphs, but larger. Females are often about 3-6 mm in length. Females lay egg sacs or masses that are covered by cottony secretions, similar in appearance to cotton wool. Adults generally have longer marginal filaments than nymphs, however they can be broken off naturally. Eggs within the mass tend to be yellow to orange. However, not all mealybugs lay eggs, longtailed mealybug produces live young (crawlers). In most instances, only females and nymphs will be observed on plants. Males, when they occur, are small gnat-like insects (about 2 mm long), with two pairs of wings.

Upon hatching, first instar nymphs (crawlers) are very small, often less than a millimetre long, and are reasonably mobile. Crawlers have the least amount of wax present on their bodies and are the most vulnerable to mortality from pesticides and environmental conditions.

Life cycle

Mealybugs are slow moving and feed on plant sap. Mealybugs tend to live in aggregations, often on the underside of leaves, on stems around petioles and branches and other concealed areas, e.g. in dense foliage, where fruit are touching or leaves overlap and near flower buds and growing tips. Mealybugs feeding on grasses and grass-like plants are often present under the leaf sheath. Some species may be on above ground parts and on roots, other species are solely root feeding (see section below on root feeding mealybugs).

Unlike most other scale insects, subsequent nymphal stages and adults have functional legs, and are generally able to move short distances. Nymphs are similar to females, but smaller, and will moult through three to four nymphal instars. However, male nymphs can be more elongated than female nymphs and have four to five nymphal stages. Males also have a pupal stage before emerging as an adult.

Generally, mealybugs complete their life cycle in 1-3 months, depending upon temperature and host plant. Cooler temperatures increase the generation time (slow it down), warmer temperatures decrease it (speed it up). Therefore, 4-10 generations can occur each year. Temperatures of about 25°C and high relative humidity are optimal for many mealybugs. Mealybugs tend to be present continuously, but may be less active in relatively cool conditions. Their populations often reach peaks in spring and autumn and it is common to see all stages on a plant at the same time (e.g. egg masses, nymphs and adults simultaneously).

Male mealybugs do not feed and only survive for a few days to mate with females. However, many species of mealybugs do not have males; females reproduce asexually. Females of most species lay their eggs into a waxy mass with at least 50-100 eggs, some species may lay up to about 600 eggs in their life time. Females of some species can survive for 10-20 days without a host plant. Eggs tend to hatch in 5-10 days, but may be

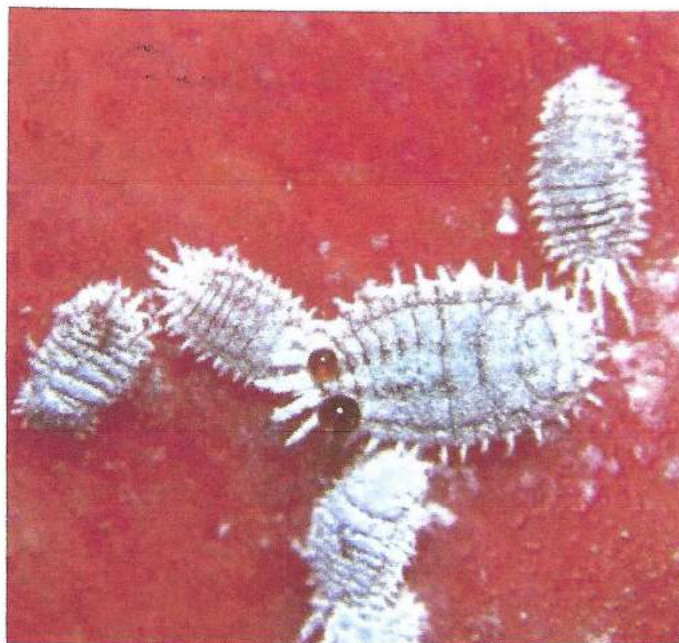


Fig. 2. Citrophilus mealybug (*Pseudococcus calceolariae* - above - photo by USDA ARS, Bugwood.org) and *Pseudococcus* sp. mealybugs on hoop pine.

longer during unfavourable environmental conditions. Crawlers may remain under the egg mass for some time before moving away, perhaps up to several weeks.

Damage

Feeding may occur on all plant parts. High populations slow plant growth and cause premature leaf or fruit drop and twig dieback. At first, plants may appear to lack vigour, leaves then yellow and may drop. Feeding on growing tips and buds can cause distorted growth as they inject toxins into the plant. At high populations plants can completely wilt and die. The white fluffy growth can also cause plants to be cosmetically unsaleable. Furthermore, mealybugs produce honeydew, a sticky, sugary solution, on which black sooty mould grows and can be unattractive. Ants often attend mealybugs to harvest the honeydew. This may cause mealybug infestations to be even more troublesome as it may reduce predation and parasitism by natural enemies.

Root feeding mealybugs

The most common root feeding mealybugs are from the genus *Rhizoecus*, although others occur. They can remain undetected on roots for quite a long time without specific monitoring. These species appear as cotton-like masses on infested roots. Their bodies do not have long wax filaments, like that of many foliage feeding mealybugs. Their biology is similar to mealybugs discussed above, however, crawlers are the main source of spread between plants. Crawlers may move out of drainage holes with water, and they may be dispersed with plant debris and on equipment.

Damage from root feeding mealybugs is similar to those above ground. However, they are often very difficult to detect at low populations and therefore build to high populations. Highly infested plants must often be thrown out. Note that root mealybugs can sometimes be present on weeds in pot plants, but not on the actual nursery plant. Therefore some discernment is required, as such situations do not require plants to be discarded.

Mealybugs as virus vectors

Mealybugs are known vectors of several plant viruses, including *Banana streak virus*, *Grapevine leafroll associated virus* and *Pineapple mealybug-wilt associated virus*, all of which occur in Australia. Other viruses vectored by mealybugs also occur overseas. They are not particularly good vectors as they crawl, rather than fly, from plant to plant, unless they are distributed by wind currents or ants. Consequently, spread of virus from mealybugs tends to be slow; these viruses can be spread through other means.

Host range

As a group mealybugs attack a very broad range of plants including fruits and vegetables, indoor plants and outdoor ornamentals like annuals, perennials, shrubs, palms, grasses and trees. In other words, almost all plant species present in a nursery can be fed upon by at least one mealybug species. Some mealybug species have a very wide host range and are more likely to be encountered in a production nursery. For example, citrus mealybug has been reported across plants from about 50 plant families and can be a pest on

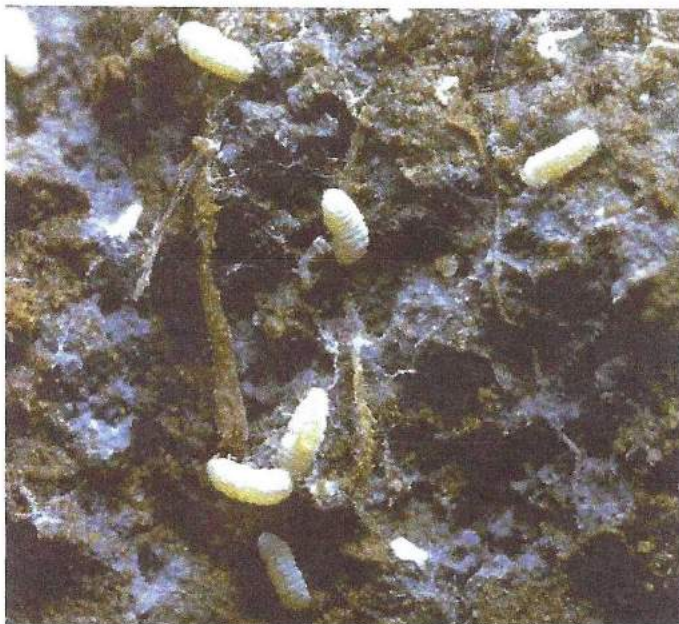


Fig. 3. Mealybug infestation causing stunting of seedling avocado (above) and roots infested with *Rhizoecus* mealybugs (below - photo by USDA ARS, bugwood.org).

begonia, boronia, cactus, calathea, canna lily, citrus, coleus, croton, cycads, cyclamen, dahlia, eriostemon, narcissus, tulip and many other plant species. Long tailed mealybug is reported from about 30 plant families and can be a pest of bromeliad, bulbs, citrus, custard apple, fern, fuschia, grapefruit, grape, hibiscus, Japanese maple, olive, orchid, palm, passionfruit, pine, pomefruit, stonefruit, *Zamia* and many other species. Fortunately, not all mealybugs have a very wide host range. For example, *M. albizziae* has only been reported feeding on *Acacia* spp. and banana.

As stated earlier, it is important to have mealybugs identified. This will allow you to investigate the host range of the species, its biology and information known on specific management of the pest.

Monitoring

Monitoring in nurseries is essential for all pests, diseases and general plant health. Monitoring provides essential information for making management decisions. In any given time, it will detect the presence and numbers of mealybugs, their natural enemies (predators and parasitoids) and other pests and diseases. Regular monitoring can be used to determine the change in numbers, i.e. whether populations are increasing or decreasing. This information is extremely valuable and informs how effective each management action has been.

Monitoring for mealybugs should include visual observations including turning over leaves, looking for black sooty mould and the presence of ants on plants. Plant beating (gently but firmly hitting foliage against a uniform coloured tray) can also be effective for species that can be dislodged from the plant. However, some species may not be monitored effectively in this way. Plants that have mealybug damage or are otherwise unhealthy, should be examined more carefully. Use a x10 or x20 hand lens where necessary and examine areas that mealybugs are likely to hide on the plant (joints between branches and other crevices). Detecting root mealybugs always involves taking plants out of pots and checking root health. This should be completed as part of regular plant health monitoring.

Once mealybugs have been observed, check for the presence of egg masses and crawlers. This is important as it indicates that populations will increase quickly if management actions are not taken. The proportion of different life stages present, most notably crawlers, may also change the exact actions taken; crawlers are susceptible to pesticides, but other stages are more tolerant.

Management of mealybugs

Management of mealybugs should focus on preventing infestations and managing populations before they cause economic loss. Mealybugs are notoriously difficult to control once established as they hide in cryptic areas of the plants and tolerate many pesticides. Fortunately mealybugs can be managed effectively if nursery managers are proactive. These management actions include cultural, chemical and biological control options.



Fig. 4. Pink hibiscus mealybug (*Maconellicoccus hirsutus*) on stems and leaves of hibiscus, photos by Florida Department of Agriculture and Consumer Services, Buwood.org

Cultural management practices minimise infestations by mealybugs (and other scale insects).

- Always inspect new stock carefully, particularly host plant species that are prone to attack from mealybugs (and other pests and diseases). Inspect all plant parts, including roots for any signs of pests.
- Monitor plants regularly, including roots. Plant species that are prone to mealybugs (or other pests) should be monitored more consistently. Refer to monitoring section.
- Remove plants with heavy infestations, taking care to reduce spread of mealybugs while doing so. If infestations are limited to a particular branch and it can be pruned, remove this plant material and monitor closely to ensure the rest of the plant is clean.
- Remove crop debris and disinfest the growing area after removing a consignment of plants that have had mealybugs with a suitable product, e.g. farmcleanse, bleach or similar product. Mealybugs can survive for weeks on crop debris and in egg masses that have fallen off plants. This practice will also reduce other pests and diseases that may be lingering from previous crop cycles.
- When only a small number of plants are present with a low rate of infection, squash mealybugs and egg batches. Squashing large numbers of mealybugs may irritate skin, but can be avoided by using rubber gloves. The presence of a small number of individuals should prompt regular and rigorous inspections of the consignment.
- Avoid movement of infested plant material within the growing area.
- Avoid staff movement in areas known to be infested with mealybugs and other pests. If necessary, disinfest clothing and equipment after working in such areas.
- Provide an optimal growing environment, including appropriate nutrition, water, growing media and other conditions; weak plants are more susceptible to damage at lower populations of pests.
- Control ants as they spread crawlers and protect mealybugs from natural enemies.
- Thoroughly disinfest recycled pots to avoid transferring eggs and nymphs from crop to crop.
- Only propagate from clean mother stock plants. In other words, do not take cuttings from plants that have mealybugs (or other pests) present. Even one crawler on a cutting (which is virtually impossible to detect) will multiply the problem significantly.
- Keep the growing area and surrounds free of weeds.
- Ensure adequate plant spacing. This allows greater air movement and increases pesticide coverage. It also reduces ideal environments for mealybugs to develop and increases the ease of detection.

Biological control

There are a number of natural enemies that can be used to manage mealybugs including commercially available predatory insects and naturally occurring parasitoid wasps and predators. There are also a range of fungi and bacteria that may infect and kill mealybugs, although these are less likely to substantially reduce populations unless they become very abundant. Almost all pesticides will negatively impact predator populations. It is recommended to seek advice from the biological control agent producer prior to releasing a predator for the first time so that their release is optimised. If pesticides have been applied, ensure that a sufficient time period has been elapsed before releasing predators. This information can be found online or from the biological control agent producer.



Fig. 5. *Cryptolaemus montrouzieri* larva (below) feeding on a mealybug (photo by Sonya Broughton, WA Ag, Bugwood.org).

Cryptolaemus - *Cryptolaemus montrouzieri*

Cryptolaemus (pronounced: Crip-toe-lee-mus mon-tro-zere-ee) is an Australian native ladybird that is widespread and feeds on a range of mealybug species. It is commonly known as the mealybug destroyer. Both larvae and adults feed on mealybug, and can be used to control mealybug infestations, hence its common name. Adults are about 4mm long, oval in shape with an orange head and black wing covers. Adults and small larvae only feed on eggs and very small mealybug nymphs; larger larvae feed on larger mealybugs including adults. Larvae are covered with white waxy filaments, making them very similar in appearance to mealybugs, but are more mobile and appear to have banding along their body. When carefully removed from the plant, they can be turned over to see their well-developed legs and chewing mouthparts. Females can lay up to 10 eggs per day directly into mealybug egg masses and up to about 500 eggs over their lifetime. The lifecycle of *Cryptolaemus* takes about 4-7 weeks from egg to adult, depending upon temperature and food source. They will also consume some soft scales when more preferred food is not available. It is commercially available from Bugs for Bugs.

Green lacewings - *Mallada signata*

The green lacewing has a relatively wide host range, feeding on aphids, spider mites, various scales, mealy bugs, moth eggs and small caterpillars as well as whitefly species. Pollen and nectar can also be ingested. Larvae, but not adults, are predacious. Adults have a green body and hold their transparent wings tentlike over their body and feed on pollen and nectar. Females live for 3-4 weeks and lay up to 600 eggs. Almost all lacewing species are predators and often lay their eggs on thin white stalks with a bulbous white egg at the end; most species lay multiple eggs in the same area, most often in a straight or roughly straight line or in a horseshoe arrangement. Green lacewing larvae grow to nearly 1 cm in length before pupating and typically place the remains of their prey on top of spines protruding from their back. In fact, research suggests that green lacewing larvae with trash-packages are more active and forage more efficiently, while those without trash-packages are more likely to become inactive. After about 12 days, larvae pupate and emerge as adults about 9 days later. Females must be about 7 days old before laying their first egg.

Green lacewing is well adapted to relatively warm conditions and very sensitive to persistent and or broad spectrum chemical applications, although reduced risk pesticides have a relatively minor negative effect on this insect. Green lacewing is commercially available from Bugs for Bugs.



Fig. 6. *Cryptolaemus montrouzieri* adult (above - photo by Dan Papacek), green lacewing adult (middle - photo by Sonya Broughton, WA Ag, Bugwood.org), green lacewing larva (below—photo by Dan Papacek, Bugs For Bugs).

Citrus mealybug parasite – *Leptomastix dactylopii*

Originally from South America, this small brown wasp (about 3mm long) has distinctive, long antennae, similar in length to the rest of its body. It is a parasitoid wasp, laying its eggs in citrus mealybug only. This species is extremely efficient in finding and parasitising citrus mealybug, even at low densities, but will not attack other species of mealybugs.

Adults live for about a month and can lay about 80 eggs over her lifetime. Females lay their eggs in large mealybug nymphs or adults that have not started to lay eggs. Larvae develop inside mealybugs, which probably stop feeding and will not lay eggs to be laid once parasitised. Eventually, the mealybug changes to a 'mummy', being oval, bloated and legless. Adults wasps emerge from mealybugs after about 2-3 weeks, starting their life cycle over again. This species is available commercially from Bugs for Bugs.



Fig. 7. *Leptomastix dactylopii* adult

Chemical control

Mealybugs are difficult insects to manage using pesticides alone. Contact products tend to slough off their waxy body and they may be tolerant to systemic products. If pesticides are to be used to manage mealybugs it is recommended to apply contact products only when there is a high proportion of crawlers present. Crawlers are very susceptible to many pesticides, including oil-based products. If high populations of large mealybugs are present a systemic product will be required, perhaps combined with an oil or detergent-based product if this will not cause a phytotoxic reaction to the plant. Also, consider modifying the way that pests are managed, such that monitoring is conducted more frequently; increase the use of cultural management options.

Consecutive weekly pesticide applications will almost always be required if using pesticides to manage mealybugs. Even then, total control may not be achieved. It is always recommended to rotate between active ingredients from at least three different mode of action groups. This will reduce the likelihood of inducing pesticide resistance substantially.

Pesticides will almost always significantly reduce predator populations. Some products can be active against predators for months after application, but have limited or negligible impact on pest populations after the initial application. Therefore, carefully consider whether it is necessary to apply pesticides, particularly when they have a long residual impact on predator populations. *Cryptolaemus* and green lacewing are very effective predators that should be considered instead of applying pesticides.

With that said, there are a number of insecticides that are registered against mealybugs relevant to production nurseries. Some products have a general nursery stock registration, others may only be registered on a subset of species grown in the nursery production sector. Table 1 summarises products specifically registered against mealybugs. However, mealybugs are scale insects. Therefore products registered against scale insects may be legally applied to mealybugs (refer to the [scale insect factsheet](#) available at the NGIA website). Always ensure that you read the label and that it fits your exact situation; not all active ingredients listed in Table 1 are registered in all states or on all nursery plants. Refer to the nursery [pesticide application best practice manual](#) for more information.

Further reading

Llewellyn, R. (Ed). 2000. *The Good Bug Book*, second edition. Integrated Pest Management Pty Ltd., Richmond, NSW.

Goodwin, S., M. Steiner, R. Parker, L. Tesoriero, G. Connellan, E. Keskula, B. Cowper, A. Medhurst, and C. Rodriguez, C. (2000) *Integrated Pest Management in Ornamentals: Information Guide. Horticulture Series: Agrilink, your growing guide to better farming*. Manual. Agrilink Series QAL0004, Queensland Horticulture Institute. Brisbane, Queensland. Available at: <http://era.daf.qld.gov.au/2208/6/005-ipm.pdf>

Table 1. Active ingredients registered against mealybugs relevant to Australian production nurseries. Also see general registrations against scale insects in the scale insect fact sheet.

Mode of action group	Active ingredient	Example product name	Registration information	Mobility ¹	Toxicity to beneficials ²
1A	Carbaryl	Bugmaster	Mealybugs on raspberry only	C	H – 4+ weeks residual
1B	Chlorpyrifos	Lorsban	PER14547 Pseudococcus mealybugs on persimmon only; PER14240 all mealybugs on bananas; mealybugs on apples and pears, coffee, duboisia, pineapple, cucurbits and grapes, citrus mealybug on citrus. Labels vary.	C	H – 2-4 weeks residual
1B	Diazinon	Diazinon	All mealybugs on nursery plants.	C	H – 2-3 weeks
1B	Fenthion	Lebaycid	All mealybugs on ornamental crops.	S	H – 2-4 weeks, probably longer
1B	Methidathion	Suprathion	All mealybugs on ornamentals, trees and shrubs in nurseries, also selected fruit crops.	C	H – at least 3-4 weeks
1B	Methomyl	Lannate	Citrus mealybug on citrus only.	S	H – at least 1 week, probably much longer
1B	Omethoate	Folimat	All mealybugs on selected ornamentals and native plants.	S	Probably H, probably with a moderate to long residual period
2B	Fipronil	Regent	PER12983 Root mealybugs on non-food nursery stock. Drench or granular formulation.	S	H – at least 2 weeks, probably longer
3A	Beta-cyfluthrin	Tempo	Mealybugs on azaleas, hibiscus, pelargoniums and roses only	C	Probably H with at least 2-4 weeks residual
3A	Bifenthrin	Fivestar	Longtailed mealybug on Carnations and other ornamental plants and pears; labels vary	C	Probably H with at least 2-4 weeks residual
4A	Acetamiprid	Crown	Citrus mealybug on palms, orchids and other ornamental plants; PER13831 Mealybugs on date palms only as drench or foliar application	S	H – probably for 2-4 weeks, perhaps longer
4A	Clothianidin	Samarai	Longtailed and tuber mealybug on apples and pears.	S	H – probably for at least 3 weeks.
4A	Imidacloprid	Confidor	PER13794 all mealybugs on date palms and ginger only; all mealybugs on shrubs, plants and ornamental trees; citrus mealybug only on ornamental plants. Labels vary.	S	Foliar spray: H – at least 2-4 weeks Drench: L – no residual
4C	Sulfoxaflor	Transform	Certain mealybugs on citrus, grape and pome fruit.	S	Not known
9C	Flonicamid	Mainman	Tuber mealybug on apples only.	S	L – no residual
1b	Buprofezin	Applaud	PER14769, all mealybugs and scale insects on nursery stock and non-bearing fruit trees	T	L-M – 2-3 weeks residual for <i>Cryptolaemus</i> , no residual for green lacewing or <i>Leptomastix</i> .
NA	Paraffin/petroleum oil	Various	Specific mealybugs on particular crops. Labels vary.	C	L-M – no residual
NA	Potassium salts of fatty acids	Natrasoap	All mealybugs on most nursery plants	C	Not known, probably L-M with a short residual period

¹ C = contact, S = systemic, T = translaminar; L = low, M = moderate, H = high.

² Information was obtained from the [Kopert](#) and [Biobest](#) side effects website and Llewellyn (2000).

This document was prepared by Andrew Manners and John Duff (Agri-science Queensland, Department of Agriculture and Fisheries, Ecosciences Precinct, GPO Box 267, Brisbane QLD 4001) as part of NY11001 Plant health biosecurity, risk management and capacity building for the nursery industry in 2015. Thanks go to Lindy Coates for helpful comments on previous versions of this factsheet. Photographs in this factsheet have been taken by DAF staff unless otherwise acknowledged.

NURSERY PAPERS

SEPTEMBER 2010 Issue no.8

Will any growing media suffice to grow the best plants possible?

In the growing of plants there are fundamental aspects which need to be fulfilled to allow the plants to grow and develop to their optimal genetic potential:

- light (typically sunlight as a source of energy for photosynthesis)
- temperature (suitable range for plant type)
- space (density to allow air, light and growth and development of the plant)
- Carbon dioxide (for photosynthesis)
- water (for essential plant processes)
- oxygen (supplied to root zone for optimal root function)
- nutrients (growth and development), and
- the provision of a growing environment devoid of plant pests, pathogens and weeds.

The challenge for any commercial nursery person involved in the production of plants is to provide a suitable balance of the above aspects in order to achieve the most optimum result with the least use of resources and economic outlay.

In this month's Nursery Paper, NGINA Industry Development Officer, Michael Danelon provides an overview of growing media and the importance of selecting the most appropriate media to achieve optimum plant performance.



Windrows of pine bark undergoing composting at NIASA and EcoHort accredited Grange Growing Solutions, NSW

Will any growing media suffice to grow the best plants possible?

In many situations an emphasis is given to the appearance of the plants' tops (stems, leaves, flowers, fruit) ahead of what occurs below the surface in their roots and the properties of the material they are growing in. The management of the root zone environment which is herein referred to as the "growing media" is a critical one to achieve successful plant production.

The selection and importance of an appropriate artificial growing media in relation to plant performance is an area often neglected or taken for granted by nursery managers, those managing potted plants for sale and the general public when they are growing plants in containers.

Growing media are not soils and soils are not potting mixes

Artificial growing media are commonly called potting mixes. In no way should growing media or potting mixes be considered as natural soils. Unlike soils, the performance of an artificial growing media has been engineered to perform in a containerised environment to optimise the root zone environment for plants.

It is not that long ago (1940 to 1970's) that a containerised growing media consisted of composted organic manures, sand, soil and peat in various ratios under the UC Davis System. We have progressed considerably since then due to plastic containers, the growing need to dispose of organic waste products like pine bark and the advent of the Australian Standard for Potting Mixes AS 3743, 2007 whereby we can reliably determine the physical and chemical properties of growing media. The professionalism of growing media manufacturers/suppliers and the Nursery Industry Accreditation Scheme of Australia (NIASA) Best Management Practice Guidelines have also assisted in raising the standard of the growing media supplied with hygiene and consistent quality.

Growing media have many different properties with these grouped into physical, chemical and biological properties. These properties interact and it is the knowledge of treating and blending appropriate growing media ingredients which provides the basis for the ideal root zone environment.

Key physical properties

Air-filled porosity (AFP)

The AFP is the proportion of air occupying the growing media when it has been subjected to multiple wetting and drying cycles. The AFP is determined in a 12 cm high container and hence will vary within the actual height of the container used whereby gravity and head can displace much of the water in larger containers.

A generally acceptable level for AFP is > 13%. However while a high AFP can optimise air supply to the roots it can compromise the water holding capacity (WHC) and therefore the ability of the growing media to retain sufficient available water for plant growth.

Ultimately the desirable AFP needs to be put in perspective and the application or use considered, (i.e. propagation, 140 mm pots and advanced containers > 330 mm pots.) Most media suppliers can provide a mix with any desired AFP and growers need to know what ratios give the best results under their conditions.

Water-holding capacity (WHC)

The opposite of AFP is WHC which is the relationship of water retained to the amount of air. It is possible to provide both a high WHC and available water for plants with an AFP up to 20% by using coir fibre and finer grading of composted pine bark and peats.

Wettability

Organic particles may suffer from water repellance as they continue to decompose and dry out from wetting and drying cycles under irrigation practices. A wetting agent should be included in organic mixes where growing media are likely to dry out.



Specialist growing media for plugs is essential in comparison to general use for 140 to 200 mm containers.

Biological properties

Freedom from disease-causing organisms

The use of composting which exposes the organic material to a minimum of 55°C for at least 3 consecutive days should ensure freedom from plant pathogens. The value of composting products which are likely to contain pathogens can be three-fold - the removal of pathogens, potential for disease suppression of certain pathogens and the opportunity to address nitrogen consumption.

River sand should be assumed to be contaminated with pathogens unless proven otherwise by testing whilst quartz sands may be clean.

Phytotoxicity

Composting and maturation will ensure freedom from toxicity for pine bark and eucalypt sawdusts. Toxicity may be associated with microbial activity, chemical or combinations of both attributes.



Clean storage of growing media and growing media components is critical to assist in avoiding contamination from weed seeds and pathogens.

Chemical properties

There are a number of chemical properties considered under the AS-3743, 2007:

Optimum pH range

There is no ideal pH for all plants, however a suitable pH range of 5.6 to 6.3 should suffice for most plants. Specific plants which have adapted to acidic soils or alkaline soils will need to have the pH adjusted to suit.

The key consideration here is to test growing media at receipt and during production to determine the net reaction to your irrigation water and fertiliser practices.

Salinity or electrical conductivity - EC

For most growing media tested to AS-3743 2007, the upper limit at potting is about 2.5 dS/m. For seedlings it should be less than about 1 dS/m and for seedlings that are intolerant of salinity, less than 0.6 dS/m.

Nitrogen drawdown

In most cases, some drawdown is inevitable, and desirable. With pine bark based mixes some drawdown indicates continuing microbial activity and indicates continued disease-suppressive activity.

Growers are advised to liaise with the growing media manufacturer/supplier to establish a basis for nitrogen requirements that support both the microbial activity and stability of the organic materials present.



Growing media can be adapted to suit a wide range of situations, however customisation to suit the container size, irrigation system and plant type can pay dividends.

Which ingredients to utilise

There has and will continue to be evolutionary change in the type and quality of ingredients which have been made available to us.

Mixtures of many materials in different ratios can be used to formulate artificial growing media from completely organic (composted or boiled pine bark, composted sawdusts, coir fibre), combinations of organic and inorganic (composted pine bark, sand and ash) or completely inorganic (rockwool and hydroponic systems) components.

In all cases it is the delivery of water mixed with the right ratios of nutrients, living organisms and air which must be managed by the nursery operator and the person growing/maintaining plants to produce the optimum plant. Smart operators will utilise the very best growing media available to allow management to be focused in other areas of plant production.

Composted pine bark

In the production of composted pine bark the raw bark from plantation trees is "milled" to reduce particle size. The milled bark may be composted in the form that it comes from the mill, or it can be screened to a range of size gradings such as minus 5 mm, 0 to 8 mm, 5 to 10 mm etc. before each is separately composted.

With careful control of composting conditions, a bark processor is able to repeatedly produce composted bark of consistent quality which can also offer suppression of *Pythium* and *Phytophthora* sp. The most important property in quality is nitrogen drawdown rate and successive batches must be similar in this property if growers are to be able to use the same fertiliser program with successive batches.

Boiled bark

Commercial growers whose mixes are based on 'boiled bark' have been producing good plant production as the pine bark is quickly detoxified by extraction with hot water. This process can also kill all microbes, both pathogenic and beneficial to plants. The absence of any pathogen suppressive properties (i.e. beneficials) requires good hygiene to be adopted.

Peat

Peat is a widely used component of plug mixes and many other mixes used in small growing cells. Some peat products are too

fine for use as the main component and the more fibrous peats break down fairly quickly. High peat based growing media may have high total WHC, however they may lose water more rapidly by wicking than aggregated bark-based mixes and this may lead to shrinkage of the growing media in the container.

Coir fibre dust

Some early importations of coir fibre were very salty and inconsistent in physical properties. The rigorous control of suppliers has eliminated high salinity as a cause for concern.

Coir fibre dust is generally not water repellent and has a high WHC. Research work supported by the container nursery level indicates inclusion of 10-15% by volume in a bark based mix will increase the WHC of that mix, but growers should check this against the effect of an increase in the percentage of fine composted bark.

Over the past couple of years, coir products composed of chopped coconut husks have become available which can allow production of growing media with light weight, adequate air supply and high WHC.

Hardwood sawdust

Unfortunately composted hardwood sawdust is still being used as a budget component to more suitable composted pine bark, coir fibre and peat. The challenge

in producing consistent products with low nitrogen drawdown should be considered sufficient to limit using this sawdust or avoid its use completely.

Softwood sawdust

Suitable grading of fresh pine sawdust can be used in growing media however the decomposition (breakdown) is more rapid than pine bark and may cause significant changes in the AFP and volume within the container.

Composted green-waste

Some Australian nurseries, notably where composted pine bark is unavailable or is too expensive, have used composted green-waste as a component with success. If using composted green-waste there may be potential issues with pathogens, weeds, water repellence and decomposition leading to changes in physical properties.

Sand

The inclusion of sand in growing media has been widely used in the past; however the removal of sand from growing media is widely happening. Sands are used to provide ballast and offer an inert material which limits the chemical properties that influence the conditions for plant growth. Sands may be a source of pathogens (disease, weed, nematodes) and this needs to be considered prior to selection and use.

Future availability of pine bark

As an industry we seem to struggle identifying and securing quality products which can be used to manufacture growing media with the appropriate physical, chemical and biological properties at a suitable cost. There is some concern the nursery and garden industry has become so reliant on composted pine bark as the primary

ingredient to commercial growing media that we may be under threat from some of the larger corporate players who would like to access our valued pine bark.

Removal of the pine bark exterior from trees of *Pinus* sp. is somewhat of a waste product to companies more interested in the worth of the timber and pulp. The pine bark wood chip has offered

the industry a product which can be harvested, processed, composted and then used as a base of commercial growing media. Part of the threat is this material can be burnt to generate energy and do so in a relatively clean and environmentally friendly manner in comparison to extracting energy from coal and other non-renewable forms.

In addition, the strong demand for timber may not allow the plantation forests to mature resulting in less volume and potentially different quality of barks becoming available. Even if this does occur, the growing media manufacturers/suppliers are aware of the need to supply consistent volumes of composted pine bark and are meeting this potential challenge.

The utilisation of appropriately screened and well - composted pine bark by industry has seen significant benefits to plant production and is not going to change quickly. Some of the benefits are:

- short term disease suppression
- uniformity and grading of particles to allow consistent physical properties
- optimal AFP to supply air to the root zone
- optimal drainage
- water retention and
- lightweight mixes (handling).

With the increased demand for pine bark there may also be a shift both in the quality of the raw material available in some areas of Australia and consequently

how this product should be handled when included in a growing media. Again the astute growing media manufacturers are aware of this and responding to these changes by producing products which are uniform in characteristics and response once used in a container.

The source, age, storage and treatment of pine bark will influence the end product and this as an industry (suppliers and users) is something we need to be aware of. Some pine barks may need to be composted quickly to achieve a reduction in toxins at certain times of the year, whilst others may be aged or composted over longer durations and have lower residual nitrogen levels with potentially less demand for nitrogen.

The carbon nitrogen cycle is important and the residual nitrogen which may be present in various forms due to the type of nitrogen used (ammonium, nitrate urea) to stimulate composting should also be considered. NIASA accredited growing media suppliers are audited every six months and their composting data assessed to minimise the risk of supplying sub-optimal products and maintain a

level of consistency to the end user.

Another area to consider in growing media is the variation of products from supplier to supplier. It is quite common for growers to request a growing media supplier to reproduce their existing recipe without any consideration of the variations in the chemical, physical and biological properties of the ingredients being used from different suppliers. Unless components are from the same source and treated identically, the type, size (screen), age, and composting etc will determine the end product.

As a grower it is important to request your growing media meets a specification and fits within a tolerance to serve your needs. At least be aware of the minimum standards of the Australian Standard for Potting Mixes and the requirements of your plants, infrastructure and management. It is an opportunity to be proactive, review what you currently do and whether there is scope to improve the response of your growing media by making some modifications to the formula or your management.

At the end of the day it is grower who grows the plants not the growing media.

The grower must exert control and take responsibility for what they have requested from the onset and then test the performance to ensure it falls within their acceptable limits. In any other industry this is simple risk management, however for nursery and garden industry it seems to be taken for granted that all is perfect. Attributes of organic materials change over time and it is important that growers measure and monitor the performance of their growing media via a simple pH and EC test and then adjusting management to suit.

The growing media helps to form the solution or soup which is present in the root zone so don't take it for granted.

Excessive irrigation can cause leaching of specific ions of calcium and magnesium which are often used to buffer the pH so pH declines and performance is affected. Getting the formula right (recipe and management) from the onset is up to you as a grower so liaise with your supplier to seek their support in optimising the response of the growing media and the products you grow.

Supporting References

- Issue No 1996#011 - Improving nitrogen management in woodwaste based potting mixes
- Issue No 1997#002 - Testing your potting media is being kind to your wallet
- Container Media Management, Bodman K, Sharman K. V. Queensland Department of Primary Industries 1993
- Growing Media for Ornamental for Ornamental Plants and Turf, Handreck K and Black N – 7th edition 2010

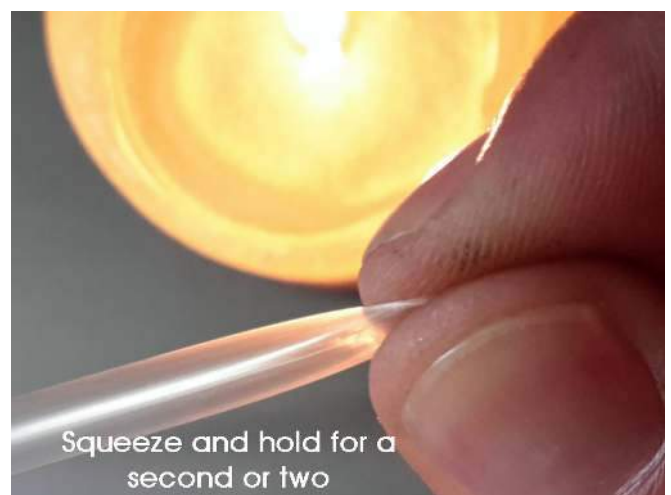
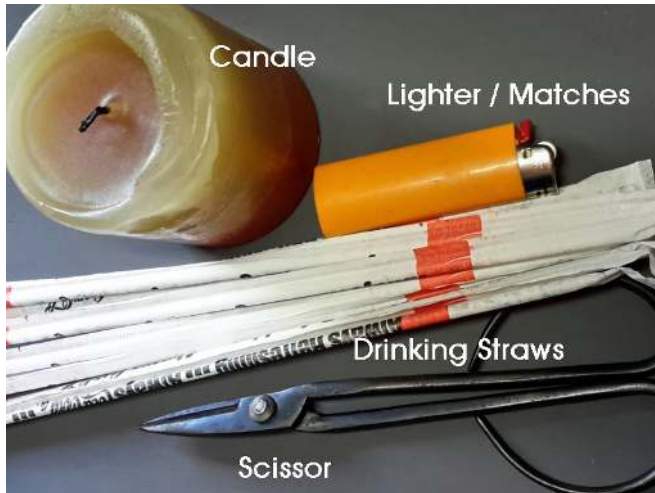
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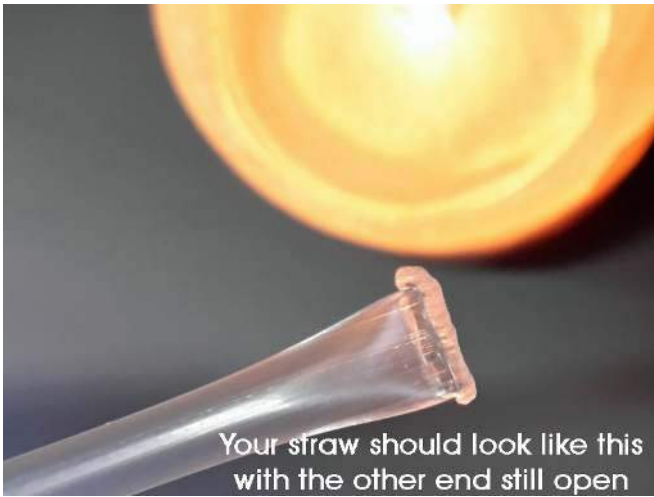


How we Pollinate our Clivia





How we Pollinate our Clivia





How we Pollinate our Clivia

Ideal to be removed at this stage

v
v
v
v

Once they have opened you risk self pollination

v

v



Now cover the stamper with a straw and wait +- 1 day for it to become receptive to pollen



Stamper not 100% receptive to pollen note the green colour of the tips



Stamper now receptive to pollen, note the white colour of the tips

v
v



Using a self tie label mark the date of flowering, flower count etc. Also note the pollination to be done, we use black & white paint markers



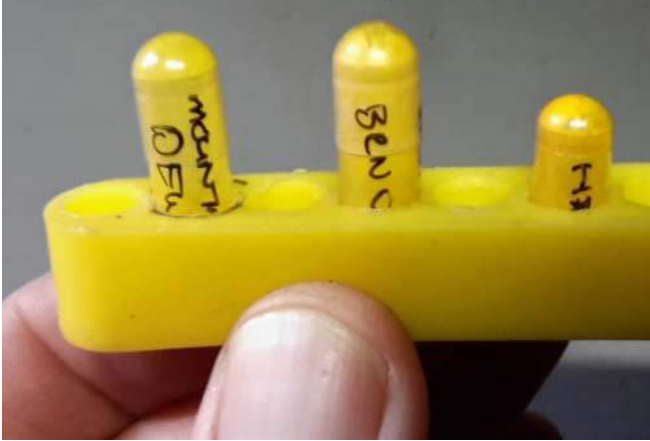
Tie the label around the penduncle of the flower



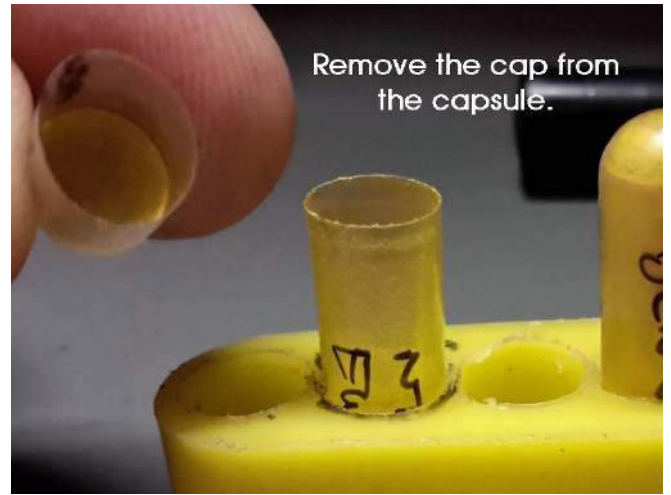


How we Pollinate our Clivia

Stored Pollen in gel capsules



Remove the cap from the capsule.



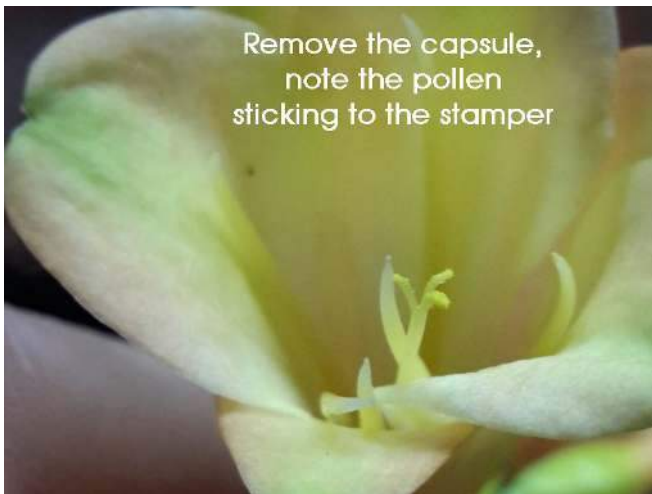
Slide over the stamper so it makes contact with the pollen



Twist and turn the capsule a few times, be gentle



Remove the capsule, note the pollen sticking to the stamper

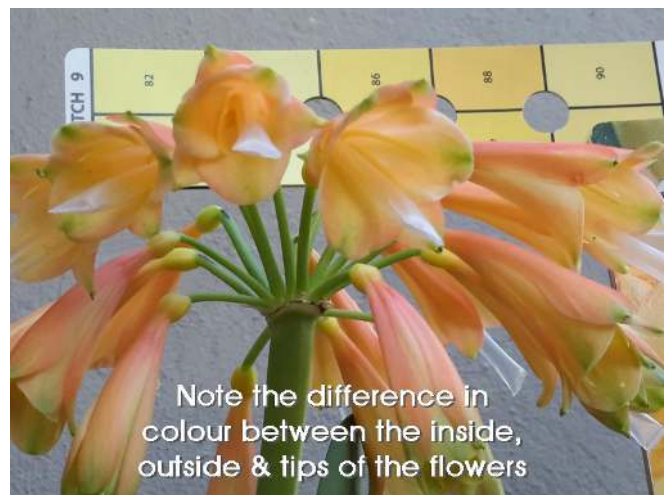


Mark the flowers that have been pollinated with the relevant code / colour





How we Pollinate our Clivia





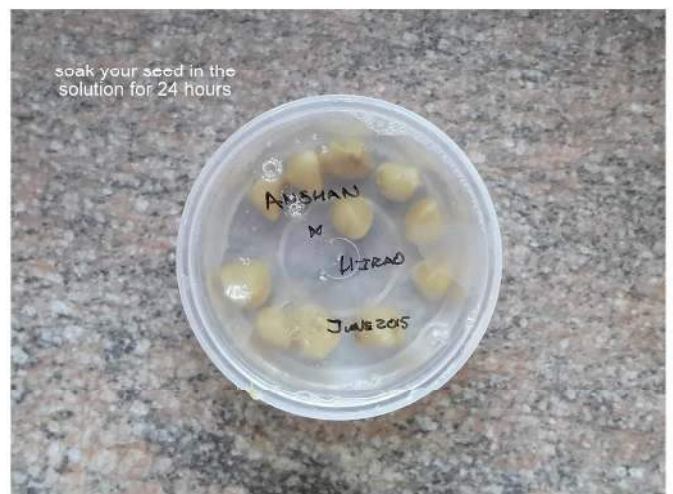
Dragonfly Clivia

Cleaning, Germinating & Sowing Clivia Seed





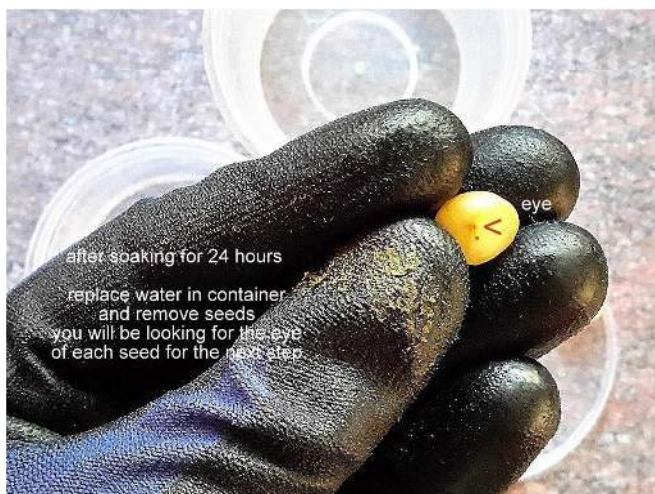
Cleaning, Germinating & Sowing Clivia Seed





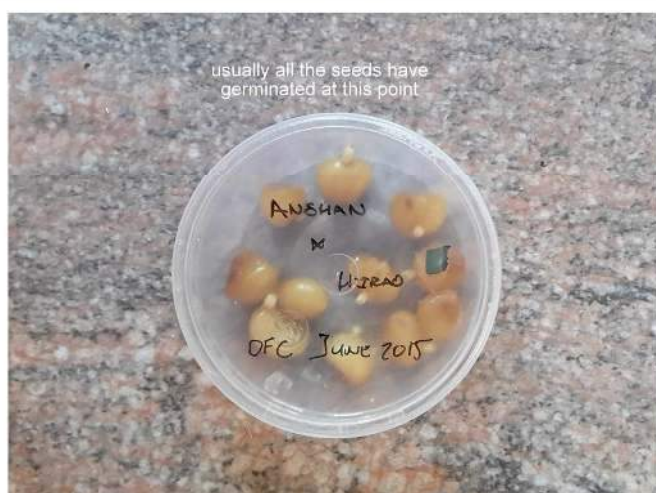
Dragonfly Clivia

Cleaning, Germinating & Sowing Clivia Seed





Cleaning, Germinating & Sowing Clivia Seed





Dragonfly Clivia

Cleaning, Germinating & Sowing Clivia Seed

