

# The genus *Clivia*

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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 core of this article was first published in 2002, in the *Bulletin of the International Bulb Society*. At that time activity on the internet and the formation of clivia clubs and societies in various Western countries indicated considerable interest in clivias. Back then, I suggested that the genus *Clivia* looked “set to become a fashionable plant of the twenty first century”. In hindsight, horticultural interest in the genus has largely reverted to being the preserve of a small number of enthusiasts.

The genus *Clivia* is a relatively small genus of six species found naturally only in South 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 by *C. miniata*, originally named *Imantophyllum miniatum* in 1854. *Clivia gardenii* came shortly afterwards in 1855. Eighty-seven years elapsed before *C. caulescens* was named in 1943, and fifty-nine years after that was the discovery of a remarkable new species, *C. mirabilis*. I was involved in the realisation of a sixth species, *Clivia robusta*, described in 2004. With the exception of *C. miniata*, which has upright flowers, the other five named species have pendulous (downward hanging) flowers and their true identities have often been confused in cultivation.

*Clivia miniata* is distributed from Transkei through Natal and into Kwa Zulu. *C. caulescens* is found in the north-east of South Africa from approximately Nelspruit northwards to the Zimbabwe border. *C. gardenii* has an apparently similar distribution to *C. miniata*, although it exploits different ecological niches. *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. *C. nobilis* occurs in a coastal strip from Port Elizabeth in Eastern Cape reaching into Transkei. *C. robusta* has a native range from East Cape Province to KwaZulu-Natal.

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 but one species of *Clivia* are unable to tolerate full sunlight, its current fragmented distribution reflects the progressive destruction of forest vegetation which was formerly much more extensive than it is today.

Traditional botanical classification has been based on the morphology or shape of plants with particular emphasis on floral characters. It is important to remember that a great deal of taxonomic work (classification) has been carried out on dried specimens mounted on sheets of card (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 flowered 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 the Clivia Society, based 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 maturity. First blooms are often poorer than those produced in second and third seasons of flowering. With *C. caulescens* the caulescent stems (i.e., well-developed stems above ground) 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. It is therefore feasible that individual plants of *C. caulescens* with very long stems could be a hundred or more years old. Individual *Clivia* plants are long lived and some specimens of *C. miniata* have been maintained within a family for several generations.

## ***Clivia miniata* (Lindl.) Verschaff.**

*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

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for identification. Leaf shape has been greatly modified in cultivation. German and Belgium breeders started to develop broader leaved forms in the late nineteenth century and this trend has been further developed in the Far East. In Japan the squat broad-leaved Daruma forms have been developed. Much emphasis has been placed on a strict distichous habit (i.e., leaves arranged alternately in two opposite vertical rows), 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 centre 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 clivias slowly became available to more people and in the early 1960s an enthusiasts' organisation 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 organisations, the plant has been exotic, and this is the case with the Chinese Clivia Association.

Although not formalised 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. New Zealanders established the New Zealand Clivia Club Inc in 2003, which ran until the club officially wound-up in 2022 (see [www.rnzih.org.nz/pages/NZ\\_Clivia\\_Club.htm](http://www.rnzih.org.nz/pages/NZ_Clivia_Club.htm)).

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-leaved form of *C. miniata* has been referred to as "species *miniata*". This is widely cultivated 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 international Clivia Society 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 from the wild 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*.

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 intraspecific 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 two to two and a half 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 (Fig. 1A–B), leaf form and leaf variegation, but it is only since the advent of the Clivia Society (<https://cliviasociety.com/>), its offshoot the Clivia Net Group ([www.clivianet.org](http://www.clivianet.org)), and several Facebook groups that there has been an explosion in the exchange of information and plant material.



Fig. 1 *Clivia miniata* flowers. A, orange flowers with green throat. B, bicoloured flowers.

Much mystique has been associated with yellow or cream flowered forms of *C. miniata* (Fig. 2A–B). 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.



**Fig. 2** Yellow/cream coloured flowers of *Clivia miniata*. **A**, landscape planting. **B**, close-up of yellow flowers with green throats.

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 (Fig. 3) remained rare and if they became available for sale, they often fetched high prices, especially in the USA and Japan.

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 F<sub>1</sub> population are sib-crossed approximately 25% of the F<sub>2</sub> population will be yellow/cream. If individuals are backcrossed to a yellow approximately 50% will be yellow.



**Fig. 3** Yellow *Clivia miniata* where the stigma and stamens are an important part of the aesthetic.

Variation 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.

The pendulous flowered species of *Clivia* are not widely grown in comparison with *C. miniata*.

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

Mature stands of *C. caulescens* (Fig. 4) 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 (Fig. 5). This species is now finding its way into collections in cultivation. It is a robust species, which establishes itself quite quickly.



**Fig. 4** *Clivia caulescens* flowers.



**Fig. 5** Long trailing stem of *Clivia caulescens* in the wild.

***Clivia gardenii* Hook.**

*C. gardenii* (Fig. 6) is grown in frost-free areas where it can become naturalised 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 recognised 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 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.



**Fig. 6** *Clivia gardenii* flowers.

***Clivia mirabilis* Rourke**

This species is currently known only to its discoverers and is barely in 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 (Fig. 7) that are most likely pollinated by sunbirds, although there is a good likelihood that the plant is also self-pollinating.



Fig. 7 *Clivia mirabilis* flowers.

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 plant are protected.

#### ***Clivia nobilis* Lindl.**

Although gardening books have tended to identify any pendulous *Clivia* as *C. nobilis* (Fig. 8) it is in fact rare in collections. Almost invariably plants claimed to be *C. nobilis* instead turn out to be *C. gardenii*.



Fig. 8 Two pendulous-flowered species of *Clivia*: *C. nobilis* (left) and *C. caulescens* (right). See Fig. 13 for a hybrid between these two species.

The species is easily recognised, 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 populations in the wild 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* (Fig. 9) was created in Belgium in the second half of the nineteenth century. This hybrid combination was named *C. x 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 F<sub>1</sub> hybrid, which exhibit combinations of characteristics that make them difficult to assign to either parental species. In Australia they are commonly known as ‘Oz Nobilis’.



Fig. 9 *Clivia* ‘Redemption’, a *C. nobilis* x *C. miniata* interspecific hybrid.

#### ***Clivia robusta* B.G.Murray, Ran, de Lange, Hammett, Truter & Swanev.**

Over time different pieces of information in addition to plant macro-morphology 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.

Dr Yidong Ran completed a cytogenetic analysis of the genus *Clivia* as a PhD. Study in Auckland was 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 other 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’. In 2004, we named this as a new species, *Clivia robusta* (Murray et al., 2004).

Ecologically *Clivia robusta* is very distinct from other 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 (Fig. 10). 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 (Fig. 11) 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.



Fig. 10 A natural habitat of *Clivia robusta* in the wild.



Fig. 11 *Clivia robusta* in flower.

With all *Clivia* it is important to realise that different populations of a species growing in the wild may 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, which narrows the range of variation available.

#### Interspecific hybrids

Despite the production of *C. x cyrtanthiflora* more than 150 years ago 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 intraspecific 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 F<sub>1</sub> stage, but breeders in South Africa and Japan are now flowering plants of more advanced generations. I have grown all six species in my Auckland garden and made many hybrids from them.

Primary hybrids between the pendulous species and *C. miniata* (Fig. 12) tend to exhibit characteristics which are intermediate between the parents. Typically, flowers tend to be flared and borne at 'half-mast' in the inflorescences. The hybridisation of winter flowering *C. gardenii* has the potential to greatly extend the flowering season, while *C. caulescens* (Fig. 13) and *C. robusta* hybrids are producing seedlings of considerable vigour.



Fig. 12 *Clivia miniata* x *C. gardenii* interspecific hybrid.



Fig. 13 *Clivia nobilis* x *C. caulescens* interspecific hybrid.

The combination *C. gardenii* x *C. caulescens* (Fig. 14) 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.



Fig. 14 *Clivia* 'Woodland Glory', a *C. gardenii* x *C. caulescens* interspecific hybrid.

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 has gained 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.

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