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Clivia News

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From the Editor

A big thank you to those members that submitted articles for this copy of the Clivia News. Included are some extra special photographs for all members to enjoy.

The Covid virus pandemic continues to cause chaos with our social lives as well as with the postal system. This edition will be released in the digital form and the printed copies will be delivered at a later date.

Included in this copy of the Clivia News are tributes to two members of the Society who passed away in the recent months. The two are Rudo Lotter and Roger Dixon. The Society offers our condolences to their families.

Our personality profile for this edition is Hilton Atherstone of Tzaneen. Cora de Kock has given us some practical advice on how to prevent frost damage to our clivias. Pieter Saayman has written two articles. The one on 'Meltzer's Picotee' displays Pieter's interest in the history of the clivia plants. His other article on the 'Splash' plants and the '777' breeding provides interesting reading. Dawie Strydom gives us insight into his successful interspecific breeding. Interspecific flowers have increased in popularity and hold a lot of appeal because of diverse range of colours now produced, mainly in the third and fourth generations. I have included the original article of Wessel Lotter explaining the differences between the Group A and B yellows as they were then known. Our usual cartoon from Helen Sanders is included. Helen says she intends to produce a booklet of all her cartoons in the near future.

The difficulty of producing a Clivia News publication continues to be a problem. There is so much knowledge and experience available from our clivia hobbyists, however there is a reluctance to write about it. Fortunately, our next publication will follow the 'virtual shows', so images and reports from the various clubs will be available.

Glynn Middlewick

COVER: Winning entry in the Yearbook photographic competition for *miniata* images. Photographer Carrie Kruger.

BACK COVER: Dawie Stryom's interspecific 'Versi-Wonderland'.

From the Chair

Most of the clivia shows this year have been cancelled and the members have adapted and produced 'virtual shows'.

The 'virtual shows' provide us with an opportunity to view our fellow breeders and collector's plants. Most shows require a photograph of the umbel with the submission. To ensure that the photographs are recent, a label with an unique identity number of the entrant and the class entered is included in the image. The photos are not always clear and the colours don't always accurately reflect the appeal of the flower. Judges have the added challenge of not been able to assess the whole plant.

Fortunately, the judging committee has provided us with a new scoring system to be used in assessing the flowers. There will also be a Clivia Society Virtual *miniata* Show. This show will take place from the 24th August until the 2nd of October. Entries may be submitted by any member of the Society – all clubs and interest groups. The idea is to include the various flowering times in the different geographical areas. Any class may be submitted on any day. There are 20 different classes that the judging committee has decided upon. Submissions may be made by WhatsApp or email. Further details will follow.

A special welcome must be made to Lisa Fox of Melbourne. Lisa has taken over the administration of the Clivia Society website. After 18 years, the Society now has their own direct ownership of the domain name and the contract from the service provider. We wish to place on record our thanks to Gideon Scheepers for the service provided to the Clivia Society. The Clivia Society website address is: www.cliviasociety.com and contact may be made with the Clivia Society at email address: infocliviasociety@gmail.com

The galleries of the various 'virtual shows' may be viewed under 'galleries' on the website or directly at cliviasociety.com/gallery

Glynn Middlewick

IN MEMORIAM
A tribute to ROGER DIXON


Roger Dixon

6 June

Francois Bekker – translated from his Facebook article which was written in Afrikaans.

I noticed on Facebook, last week of your hospitalisation for a procedure and I expected a quick in and out. I hoped for the best.

On Wednesday I received a whatsApp message from your son, David, notifying me that you were very ill. The prognosis was poor. I 'phoned David to find out the truth. What I learned from him was unreal. It couldn't be true, but it was.

One of my treasured memories of you, was the evening when you and I went to see the Finnish film 'The man without a past'. This was in 2003 during the European film festival at the Cinema Nouveau. For years thereafter we could not stop talking about this film. It was an exceptional event as we actually agreed on the artistic appreciation of the film. We usually disagreed on everything. As you said to me, I always drag you along to a film so that you can explain the film to me.

You the scientist, me the media person, met in the late nineties when we worked together at the Police's Forensic Science Laboratory. You the factual man, me the newspaper man with the task of polishing the laboratory's image. We eventually both left the employ of the Police Laboratory. We met many times at your smallholding for a visit. We managed to keep in contact with each other.

The first election, in 2011, was where I stood as a candidate for ward counselor. You agreed to act as an agent, helping with the vote count at one of my voting stations. This entailed you having to stay on after the closure of the voting stations, to oversee the vote count. This was not a pleasant task. What time did you finish counting that night? I think it was two o'clock in the morning. Thereafter, without exception, you acted as my vote counting agent for both the local and national elections at the Waterkloof voting station. At that time you were living at your smallholding, north of Pretoria. Only true friends would do that for a person.

As a respected geologist, you have undertaken many journeys around the world. I enjoyed listening to your accounts of overseas visits. One that stood our for me, was your visit to Moscow. I think that it was one of the highlights of your life! I still cherish the lapel pin from the Kremlin that you gave to me.

You were a great reader and traveller. No, you were never one for materialistic things. As you said to me during one of our last visits, only you and I were sitting around the 'braaivleis' fire at your new house in Pretoria, 'to experience things makes life worthwhile'.

I found it difficult to entertain a wine and food connoisseur like you. Your rule for good food was that it should be 'pure and simple'.You could easily be cynical and critical. Not everyone liked this. A perfectionist with high standards for both yourself and others. Once you really got to know Roger, you would stay with him. The Roger I knew was an old-world gentleman.

The last time we saw each other was when we ran into each other at the Lynnwood Bridge shopping centre, a few days before the 'lockdown'. We had a beer together.

We should have visited each other more often.

What is left for me to say is thank you for an exceptional and interesting friendship over the years. A friendship which meant a lot to me. I will always value and remember discussions we had on life, art, literature, politics and language (you with your Oxford English). I also remember how we could laugh at ourselves and each other.

Rest in peace my friend.

Tribute to the Late RUDO LOTTER

Rudo Lotter

Gary Conquest

Rudo passed away on 11 November 2019. For many of his life years Rudo was a great lover of Clivias, especially his beautiful, colourful Interspecific *Clivia* hybrids. Rudo's passion for Interspecifics led him to gain the registration of 19 individual plants with the Clivia Society's Clivia Register.

Recognition of his love of Interspecifics spread throughout the world's *Clivia* community with his knowledge being sought after by many breeders and growers. Carrie Kruger from Utopia Clivias is one of these breeders who, to this day, breeds many of Rudo's hybrids to pass on to the *Clivia* community.

Rudo's plant of choice was a versicolour Interspecific he named 'Chanel', after his daughter Chanel.

His passion and interest in passing on his knowledge led Rudo to write many articles for

'Virna'

'Simone'

'Rosy Cheeks'

'Romantic Lanterns'

'Pink Sensation'

'Olympic Torch'

the Clivia Society's Clivia News and the Clivia Society Yearbooks.

Included in his expertise is a well renowned presentation on the Breeding of Interspecifics. His purpose was to introduce the *Clivia* breeder to the wonder of Interspecific breeding which he did so well.

Rudo Lotter, RIP

Protection of *Clivia* plants from frost damage

Cora de Kock

The winter of 2020 in South Africa will be remembered for the extensive frost damage to *Clivia* plants. *Clivia* lovers in the central parts of the country were particularly hard hit by the frost, with temperatures dropping to -3°C in Welkom, -6°C in Kimberley and -9,6°C in Bloemfontein.

Plants that have evolved in warmer climates suffer damage when the temperature falls low enough to freeze the water in the cells that make up the plant tissue.

'Black frost' is not strictly speaking frost at all, because it is a condition seen in crops when humidity is too low for frost to form, but the temperature falls so low that plant tissues freeze and die, becoming blackened, hence the term 'black frost'. Also known as 'killer frost'.

What follows are observations and practices applied to prevent frost and cold damage to our *clivia* plants. These comments include feedback from several *clivia* growers in the colder parts of the country.

FROST CLOTH

Even at a low temperature of -9,6°C some Bloemfontein growers had very little damage to their plants. There successful prevention of frost damage was by using thick green frost cloth draped over wire supports to prevent the cloth touching any of the leaves. Should the cloth touch any plant parts, damage is caused to that part of the plant.

Frost damage to *clivia* plants.

Hennie van der Mescht covers up his plants at the end of May and usually leaves the cover on until mid-August. The decreased light intensity under the frost cloth may be a problem and this affects the flowering of the plants. The cloth may be removed on warm days to allow for the plants to receive a better light intensity.

I live on the banks of the Vaal River near Kimberley and use a thin white layer of frost cloth to protect my *clivia* plants under the trees. The only frost damage in these areas was when the

Heavy thick quality frost cloth covering the plants – but not resting directly on the leaves.

A single layer of shade cloth used to protect the outdoor plants.

A fan heater used to warm the shade house.

frost cloth was not securely fastened around the plants, leading to damage of the exposed leaves. Nevertheless, frost damage was reported in Welkom this year where the less dense cloth was used in shade houses. In general frost cloth is suitable as a cost effective means of frost protection. Varying thicknesses of the frost cloth are available and doubling of the frost cloth may provide better protection.

PLASTIC TUNNEL COVERING

Adding a layer of plastic over my plant tunnels has prevented any frost damage to my plants.

It is however important to remember that the plastic covering does reduce the light intensity and does affect the flowering in spring. Ideally the plastic should be rolled up in the day time and down again in the evening. This rolling up and down is not easy when the shade houses are large. I have now installed chain hoists to help with this task. During the summer, the plastic remains rolled up.

Frost damage has however been reported by some growers in the Bloemfontein area despite the use of a plastic covering.

HEATING

Depending on the predicted night temperatures, I sometimes use a small fan heater in the area where I have my precious plants. This increases the temperature slightly and creates some beneficial air circulation to prevent cold spots developing.

MICROCLIMATES

In Bloemfontein plants are grown under frost cloth but without the benefit of shelter from trees and buildings, suffered severe damage when temperatures dropped to -9,6°C.

In Welkom Stefan Ferreira observed that plants on benches 1 meter above the ground suffered more frost damage than those plants on the ground.

Severe frost damage with the healthy new buds making their appearance.

In his book 'Grow Clivias', Graham Duncan writes that Clivias can tolerate temperature of zero degrees centigrade for a day or two, but are damaged by prolonged exposure to low temperatures.

The influence of microclimates created by walls, trees and overhanging eaves of the roof, make it possible for us to grow Clivias successfully in an area where the surrounding temperatures are below zero degrees centigrade.

SOURCE OF THE CLIVIA PLANTS

One of our fellow growers brought young plants from a frost-free area just before winter. Those plants suffered severely from frost damage, whereas the locally grown young plants displayed no damage. Extra care should be taken with plants that are not accustomed to the local cold spells. Growers have also reported that certain hybrids are more frost tender than others.

WATERING

Some growers water less often in winter, to avoid frost damage, while others believe that withholding water leads to stress and lessens the plant's ability to deal with frost conditions. I water my plants once a month in winter because I live in a dry climate. Other growers believe that the *Clivia* plant is evergreen and in winter continues to grow at a slower rate, so does need water, but perhaps less often.

WEATHER APPS

Excellent weather apps. make life much easier to prepare for cold fronts. These forecasts often change and monitoring of the predictions are necessary for the grower to be able to prepare for poor weather conditions. I used heaters during our cold winter this year when I knew there were predictions of temperatures below zero.

CONCLUSION

I often say that the number of Clivias I keep is limited by my ability to provide my plants with adequate protection against frost damage. The *Clivia* is a resilient plant and unless totally frozen, will recover in the following growth season. Many gardeners and *Clivia* collectors grow Clivias under conditions that are far from ideal, but they should nevertheless not be discouraged from growing these rewarding plants in colder regions.

PERSONALITY PROFILE
Hilton Atherstone

Hilton Atherstone is well known *clivia* grower often seen at various Clivia Shows. He grew up on a farm in Tzaneen. The farm at the time grew mainly timber with a few avocado pear trees.

After attending school in Johannesburg, Hilton attended Stellenbosch University and the Cedara Agricultural College. He then returned to join his father on the family farm in Tzaneen. The timber production was scaled down and the avocado pear farming increased. Avocados on his farm produce fruit from March until July. His family is made up of his wife Lisa, four children and one grandchild.

Hilton with 'Peach Strobe'.

Hilton was first exposed to the large variety of *clivia* available, by visiting Bertie Guillaume's farm in 1998. What appealed to Hilton at the time were the broad-leafed plants and the variety of colours that were available. Bertie exposed Hilton to his first Clivia Show in 2000 at the Northern Clivia Club. He increased his stock of broad leafed *clivia* plants by buying seed from China and Belgium through Louis

Sunbird on an interspecific flower.

'Leprachaun' of Hilton Atherstone.

'Playgirl' x 'Klein Erda' – Hilton Atherstone.

'Rolys Tulle' x 'Rolys Viole' – Hilton Atherstone.

Swanepoel and James Abel. Hilton often successfully displays his small compact Chinese plants on the show bench.

On one visit to Bertie, Hilton purchased a batch of twenty yellows and found one exceptional yellow plant which he kept back. He named this superb yellow 'Howling Moon'. In addition to including this plant in his breeding programme, Hilton also liked the appearance of 'Klein Erda' and the offspring it produced. The large white throat and light pink edges are also found in the next generation of plants.

In 2004, Hilton visited Margaux McNeil at the Lekgalameetse Nature Reserve and purchased three different clones of 'Four Marys'. These all had narrow tepals. He has been working with these to improve the umbel and the width of the tepals. In 2010 Margaux McNeil approached Hilton to look after about 1000 of her plants. One of these is 'Gordonia', a much improved form of 'Four Marys'. At one stage Hilton bred bronzes acquired from Coromandel, the farm of Sydney Press. Much of the stock there was from Belgium. More recently he has become interested in the interspecifc *Clivia* plants.

Fortunately for Hilton, he has no limit to the amount of space necessary for his clivia hobby. At present he has more than 50 000 plants and his collection continues to increase the numbers!

'Chameleon' – Hilton Atherstone.

'Cloud Nine' of Hilton Atherstone.

'Wintersong' – breeding with 'Meltzer's Picotee'

Pieter Saayman

"In Miriam Meltzer's vast collection of some 50 000 orange clivias, mostly grown from seed, there were two or three with orange flowers and yellow berries. It is not surprising that in this vast collection three yellows flowered, but with a difference. One of them has orange midribs on the outside of its tepals, the other one is a picotee as illustrated in the Clivia Review 1998 and the third one is a clear yellow with orange berries." – *Clivia Mutations and Colour Variation by Wessel Lötter.*

A paragraph and a small picture from an article on colour mutations by Wessel Lotter resulted in a long search for me. After reading about these unusual colour mutations of Miriam Meltzer, I started my journey tracking down these unusual clivias. In early 2010 I visited Rudo Lotter's collection. My interest in these unusual plants intensified when I spotted an interesting yellow flower among a batch of plants destined for sale to a nursery. The label on the plant read Natal Yellow x 'Meltzer's Picotee'.

Natal yellow x 'Meltzer's Picotee' – it had a pale yellow flower with just two thin lines of pink on the back of one of the tepals. Rudo did not hold much hope for it saying it was probably a selfed Group 2 and the markings were just typical of colour bleeding when damaged. When we asked how the rest of the crosses had turned out, Rudo stated that most of the siblings had been orange with just a few other yellow plants that had already been sold to the nursery trade. We took our new purchase home and carefully re-potted it.

That weekend we took a trip to KwaZulu-Natal to visit some of the growers. On our return home we were greeted by the most stunning pink and white clivia which had developed from the pale yellow plant we had purchased from Rudo.

We contacted Rudo for more information on 'Meltzer's Picotee' and Wessel, his father, steered us in the direction of an article he wrote on the yellow mutations. Unfortunately, by this time Miriam Meltzer was no longer involved with clivias and not much was known of the fate of the original plants.

Fortunately, through the help of Pikkie Strumpher and Tino Ferreira, we were able to track down two out of the three original mutated clones.

Tino had managed to acquire an offset of the one with the 'orange midribs' while Keith Rose had an offset of the of the picotee type one. The third plant – the yellow with orange berries we were unable to track down.

The plant we acquired from Tino had narrow long leaves which he had had for many years but which had rarely flowered for him. In the ten years we have had the plant, it has flowered only a couple of times. Through the breeding results, I was able to determine that this particular clone seems to form part of the 'splashed' group of mutations. Crosses with 'Andrew Gibson' and 'Fairytale' plants have resulted in unpigmented seedlings which flowered with similar 'splash' colouring but have a poor flower shape.

The second clone however has proven to be the more interesting plant, 'Meltzer's Picotee B' which turned out to be the pollen parent of my seedling from Rudo, is a stunning pale. near white flower that develops the most beautiful deep cerise pink blushing/bleeding on the tips of the tepals as it ages. It is also reluctant to flower, and I have only had two flowers from this plant, so I have not been able to work much with this original plant.

The seedling we had acquired from Rudo, that started all this research, however does not seem to have its parents' reluctance to flower and over the years I have been able to try several different crosses with it. We named it 'Wintersong' (the title of a favourite song of Michaels at the time) which seemed appropriate for the near white with pink blushing.

Breeding with this plant was a challenge at the time as there were not many plants around with

'Winter Stewart' – 2 umbels.

similar colouring. The only plant with a similar appearance was 'Lady Jane', a 'Four Marys' related clone from Bertie Guillaume.

I crossed 'Lady Jane' and 'Wintersong' and the resulting seedlings have had larger flowers than 'Lady Jane' but unfortunately the same narrow petals as 'Lady Jane', the colouring however was inherited, pale cream blushing pink with age on the tips.

A couple of years ago on a trip down to KwaZulu-Natal we visited Roy and Val Thurston and she showed us a habitat plant of hers that was in flower at the time called 'Little Stewart', when I saw this plant it immediately reminded me of 'Wintersong' and its pink blushed petals. After asking very nicely, Val agreed to let us have some pollen in exchange for some of the seeds in return. The pollination was successful and after sending half the seeds to Val we were left with eight seeds to plant. These seedlings have flowered for us over the past two years and have surpassed my best expectations.

'Wintersong'

'Meltzer's Picotee'

'Little Stewart' is quite a robust plant and it has improved the leaves of the seedlings as well as providing broader tepals. All eight seedlings flowered with the same pale cream colour that then develop the pink blushing with age that intensifies to a cerise pink by the time the flowers fall off. It has a stark colour contrast that can be seen in the picture with two umbels, the first umbel is about a week older than the second. We have called this group of plants 'Winter Stewart' and have done some sibling crosses.

I have tried to recreate the original cross that resulted in 'Wintersong' using 'Hirao green' as a berry parent with the original 'Meltzer's Picotee' pollen hoping to introduce some green into the flowers but those are still a couple of years away from flowering. Other crosses that I am still waiting for include crosses with 'Hantie' and 'Four Marys'.

Leading on from an incidental finding of a 'yellow' destined for the nursery trade, has provided me with an incredibly rewarding path of discovery and breeding.

'Lady Winter'

'Splashed Series of *Clivia* plants', with a focus on '777' breeding

Pieter Saayman

At the start of our interest in clivias, a plant that attracted our attention, was 'Andrew Gibson'. In a time when peaches were rare, this plant with its red splashes on the reverse side of the tepals, was something otherworldly. We got to know Brenda and Etzel Nuss and from them we eventually got an offset of the original plant Etzel received from his business partner Andrew as a 'yellow'. Andrew originally collected the plant from the natural habitat.

Owing to the reference to yellow from Andrew, Etzel's early breeding attempts with

'Seven Heaven'

'777 Angelfire'

'Seven Delight'

'Andrew Gibson' were focused mainly on crossing with Group 1 and Group 2 yellows. Much to his disappointment these crosses gave pigmented seedlings and when they flowered, they were oranges. A large number of the seedlings flowered with large white throats, which is often seen with 'Andrew Gibson' crosses.

We decided to self our offset when it first flowered. We got no seeds from that first pollination. With later attempts a few seeds were produced. These when germinated gave us unpigmented seedlings and when they flowered, they had the typical Andrew Gibson colouring. Some of these selfed seedlings produced improved flowers, both in size and shape.

At the time we bought our 'Andrew Gibson' offset we also got one of the orange F1 seedlings from Etzel's 'Andrew Gibson' x yellow group 1 cross. Crossing this with 'Andrew Gibson' again gave a percentage of unpigmented stems and knowing the results Etzel got,we realized these would not be yellow flowering plants. We have had some of the seedlings flower and they all given us the typical 'Andrew Gibson' colouring.

Shortly after we got our Andrew Gibson plant, Sean Chubb released his 'Splash' series which were bred out of 'Andrew Gibson' and a similar coloured plant called 'Candy Stripes'. We managed to get a 'Splash' and when crossing it with 'Andrew Gibson' we found that the resulting seedlings were unpigmented. Subsequent flowering of these seedlings also produced plants with the same type of colouring with varying flower shapes.

At that time, two habitat plants that were available, namely 'Msubo Wow' and 'Msubo Nguni'. Both plants have small yellow flowers with a speckling of red on the back of the tepals. From these crosses with 'Andrew Gibson', Val Thurston bred her 'Fairytale' series. Seedlings of these

'Emerald Rouge' x '777'

'Naudes Peach F2' by '777'

crosses are also unpigmented.

Shortly after this Liz Boyd released her Royal Gala series of plants which were bred using 'Andrew Gibson' and 'Naudes Peach'.

From our own breeding results and those of other breeders, we realised that these group of plants were 'compatible'. (Compatible – when crossed with each other they give green stemmed seedlings and flower with 'splashed' type flowers). They all seem to form part of the same mutation type which we loosely call the 'Splashed Group'.

Over the past decade or so I have been collecting various 'splashed' type plants and have identified a number of these plants that are compatible and breed 'true' when crossed with each other. These include 'Andrew Gibson', 'Msubo Wow', 'Msubo Nguni', 'Naude's Peach', 'Splash', the 'Fairytale' series, 'Royal Gala' series, 'Rumpelstiltskin', 'Dilly Dally', 'Ruby Stewart', 'Johnsons Blush', 'Strawberry Cheesecake', one of the two 'Meltzer's Picotees', 'Waterkloof Blush', 'Discovery' and of course the cream of the crop Pikkie Strumpher's '777' series.

The '777' plants appeared in Pikkie's 'Bronze' breeding plants. A few unpigmented seedlings from the mixed bronze seedlings had similar flowers to the 'splashed' types of flowers. These seedlings flowered with an improved flower shape, broader leaves and intense green throats. Pikkie Strumpher has been line breeding these plants for more than ten years. He has been rewarded with some exceptional flowers for his efforts.

From our own breeding using '777' ('777 Angelfire' and '777 Envy') we have flowered several crosses with the other splashed types with varying results. In general, we have found that unless '777' is used as the berry parent the green throat does present strongly in the next generation, unless the berry parent being used with '777' pollen, also has a green throat.

'Emma Charlotte' x '777'

'Msubu Wow'

We have flowered 'Msubo Wow' x '777', unfortunately the poor flower shape and small flowers of the 'Msubo' genetics had a strong influence on the offspring, but the typical 'splash' colouring was evident.

We have also flowered two different crosses using the 'Naudes Peach' F2 plants we have, the one is a splashed type with no green throat and the other we call 'Emerald Rouge' as it does have a green throat. Seedlings from the non-green throated one have had little to no green throats while the ones using 'Emerald Rouge' have produced plants with excellent green throats.

Another cross we have flowered was using a plant from a local grower Petra Pietersen we have called 'Pietersens Blush' (also known as 'Waterkloof Blush'). Again, the berry parent has no green throat, so the green did not appear, but the splashed colouring was evident and very prominent even though the berry parent had minimal colour.

One cross that did surprise us was using the 'Fairytale' we have, with a very slight green throat, but which has produced good green throats in the seedlings. Pikkie has also flowered a number of seedlings with 'Andrew Gibson' as the berry parent where the green throat has come through in the seedlings however not as intensely as it is on the '777' plants. The reverse cross has resulted in much better green throats in the seedlings.

Using '777' as a pollen parent on plants outside the mutation group has had varying results. Similarly, to 'Andrew Gibson' it seems that if it is used on plants with large white throats, it carries through that characteristic – see the pictures of 'Seven Delight' and 'Seven Heaven', both from a 'Hattori Blush' crossed with '777'.

We have also tried using '777' in our interspecific breeding with mixed results. 'Jingle Bells' (a

'Fairytale' x '777'

'Pietersen Blush' x '777'

versi-colour interspecific) crossed with '777' has produced only orange plants with a hint of green in the throat, however using '777' pollen on 'Emma Charlotte' (a large throated interspecific from Charl Malan) has produced a pleasing result with open small miniata like flowers with a large lime green throat.

Some breeders have reported green stems from crosses of yellows x '777', however we have only had pigmented stems out of these crosses using Group 1, Group 2 and Group 3 yellows and all of these have flowered orange. We have used one of these orange plants from a Group 2 yellow cross that had a nice green throat and we have managed to recover some '777' type flowers. We pollinated the orange-green throated F1 with '777' pollen and then flowered the unpigmented seedlings. An example of this is '777 Raai'.

We still have a number of other crosses made with the various 'splashed' type flowers and look forward to sharing some of these breeding results with you in the near future.

'Jingle Bells'

Interspecific *Clivia* Propagation

Dawie Strydom, Clivia Select, South Africa

INTRODUCTION

This article is based on my experience with crosses between the pendulous and *miniata* Clivias. The plants resulting from such a cross are known as interspecific Clivia. A wide range of the natural colours and flower shapes of the pendulous species presents an ideal opportunity for the development of unusually coloured interspecific flowers.

Most of the interspecific flowers used in my breeding, were grown by myself and belong to me. Some were acquired from growers, both locally and abroad. I have already had some exciting results, but I believe the best is still to come.

Figure 1. Dark orange with magenta spots – '*caulescens* X Aurea yellow *miniata*' – group 1.

HISTORY

I believe that Yoshikazu Nakamura of Japan was the forerunner in terms of interspecific plant propagation. Many of my plants were grown from seeds received from him as far back as 1998.

My early crosses were mainly between *miniata* and *caulescens* species.

It has taken a long time to produce anything worthwhile. Many of the crosses were orange and the flower shapes were disappointing.

Some good results have appeared from the second generation and onward.

Figure 2. Light orange, flared shape '*caulescens* X orange or yellow *miniata*'.

Many questions remain, but here are some guidelines to address the production of good quality interspecific flowers.

OBJECTIVES

When breeding plants for colour and flower shape, the following questions need to be answered:

- Does known 'compatibility' found with *miniata* breeding, play a role in interspecific propagation?
- Does a broad base of genetic material, from differenct species, benefit the breeding program?
- Is it advisable and beneficial to cross first and second generation interspecifics flowers back to *miniata*?
- Is line-breeding a better method of ensuring the inheritence of certain features in future crossings?
- Is it a good idea to acquire new interspecifc crosses to improve your results?
- How important is the breeding plan to include compact broad-leafed plants?

This article will focus on the above questions and give examples of some older crosses, first generation crosses, and how to test for colour 'compatibility'.

OLDER EXAMPLES OF GENETIC CROSSES

The following examples: Figure1. My own original interspecific propagation, between *caulescens* and

Figure 3. 'Yellow Drops 1' – Out of 1998 seeds - Yoshikazu Nakamura (*miniata* X *gardenii* X 'New hybrid'). Narrow leaf, compact plant.

Figure 5. 'Moondrops Yellow' – probably a F1- 'Moondrops' out of interspecific seed from Rudo Lotter.

Figure 4. 'Yellow Drops 2' – Out of 1998 seeds – Yoshikazu Nakamura (*miniata* X *gardenii* X 'New hybrid'). Long leafed plant.

miniata crosses (Figures 1 & 2), 2. Versi-coloured plants grown from seed received from Yoshikazu Nakamura (Figures 3 & 4) and 'Moondrops', a yellow interspecific from Rudo Lotter's interspecific propagation (Figure 5).

'COMPATIBILITY'

One of the best ways of moving forward in testing for colour 'compatibility' is crossing the plants from the original genetics with group 1 and group 2 yellow *miniata* plants or crossing them amongst themselves. Some plants were genetically compatible, producing examples of nicely shaped yellows and pinkish interspecific out

Figure 6(a). 'Yellow Slippers' from 'Moondrops Yellow' progeny.

Figure 6(b). Pink flowers from 'Moondrops Yellow' progeny.

Figures 6(c) – Pink flowers from 'Moondrops Yellow' progeny. These represent the next generation flowers out of ('Moondrops Yellow' X group1 peach).

Figure 7. 'Oortjies' a striped interspecific from Ansie le Roux.

Figure 8. 'Striped Yellow Drops' out of a cross between 'Oortjies' and 'Yellow Drops 1', illustrating that these two plants were 'compatible', because of the nice striped nature and prominent versi-colour produced.

Figure 9. 'White Lips' *miniata*.

of 'Moondrops Yellow' crossed with a group 1 peach *miniata* – Figures 6(a), 6(b) & 6(c).

Another example of 'Yellow Drops 1' crossed with an orange striped interspecific called 'Oortjies', producing a beautiful striped versi-colour flower – Figures 7 & 8.

Another example of an un-suspected compatibility in the 1st generation was between a 'White Lips' and 'Yellow Drops 1 '(Figures 9 and 3). The outcome produced more compact plants with a nice pinkish colour (Figures 10 and 11).

Figure 10. 'Sparkle', a compact pinkish colour out of 'White Lips' (figure 9) X 'Yellow Drops 1' (figure 3).

Figure 11. Recurving pinkish interspecific – 'White Lips' (figure 9) X 'Yellow Drops 1'(figure 3).

INTERESTING COLOURS RESULTING FROM THE INCLUSION OF THE DIFFERENCT PENDULOUS SPECIES IN THE PARENTS OF AN INTERSPECIFIC CROSS

Interspecific crossings may give interesting softer colours such as light versicolour-tones and also some pink blushing as the flower ages, adding a dimension of multicolours displayed on the same flower head.

Figure 12. 'Dance' – (*miniata* X *caulescens*) from Bertie Guillaume.

Figure 13. 'Touch!' – top quality versi-colour with pinkish tepals. ('Dance' X 'Yellow Drops 2').

Figure 14. 'Koike Green Face' out of (*gardenii* X *miniata*).

Figure 15. 'Yellow Bell' out of orange (*caulescens* X 'Giddy'/ Natal Yellow) – group 2 yellow.

Figure 16. 'Golden Blush' interspecific from ('Koike Green Face' X 'Yellow Bell').

The first cross under discussion is between 'Yellow Drops 2', a (*miniata* X *gardenii*)X 'New Hybrid' (Figure 4) crossed with 'Dance', a (*miniata* X *caulescens*), from Bertie Guillaume, (Figure 12). A result from this cross is a soft versi-colour called 'Touch!' – ('Dance' X 'Yellow Drops 2'), (Figure 13).

The second cross was between 'Koike Green Face' – (*gardenii* X *miniata*) from Koike, Japan, (Figure 14) and 'Yellow Bell' (F2 – orange *caulescens* X Giddy/Natal Yellow – group 2 *miniata*) from Ray Topp, (Figure 15). The result is a gold green flower blushing with a soft pink with age, (Figure 16).

The third cross was between an orange with magenta spots, (red *caulescens* X 'Aurea' yellow miniata), (Figure 1) and 'Green Yellow Drops', a 'Yellow Drops' – (*miniata* X *gardenii*)) X ('New Hybrid' X 'Yellow green face') - group1 *miniata*), (Figure 17). The result is 'Star Burst' a green versi-colour blushing to a soft pink with green stripes as the flower ages, (Figure 18).

INTERESTING COLOURS DEVELOPED FROM LINE BREEDING INTERSPECIFIC PLANTS

Line breeding using 'Yellow Drops 1', (Figure 3), resulted in a clear underlying versi-colour with an open flower.

This example is based on 'Yellow Drops 1', crossed with a broad leaf variegated plant (broad leaf orange variegated *miniata* X 'Aurea' yellow *miniata*) X ('Yellow Drops 1') and secondly with an orange multi-tepal plant (orange multi-tepal X 'Yellow Drops 1'). The first generation gave an upright multi-colour orange flower,(figure 19) and a light orange multi-tepal flower. (figure 20). Both flowers start

(Figure 17). 'Green Yellow Drops' – (*miniata* X *gardenii*) X (New hybrid X 'Yellow Green Face) – group 1 *miniata*).

Figure 18. 'Star Burst' from ('Magenta Spots' *caulescens* X *miniata*) X ('Green Yellow Drops').

Figure 19. Upright multi-colour interspecific – (variegated *miniata* split for 'Aurea' yellow X 'Yellow Drops 1').

Figure 20. Multi-tepal 'Yellow Drops' out of an orange multi-tepal *miniata* X 'Yellow Drops 1'.

Figure 21 (a). Early colours of 'Versi-Wonderland'.

Figure 21 (b). Later colour development of 'Versi-Wonderland'.

Figure 22. 'Green Bell' from 'Yellow Drops' progeny – ('Green Yellow Drops' – Figure 17 X 'Green Yellow' group1 *miniata*).

with light orange tones that darken with time, probably reflecting the underlying versicolour characteristics.

The second generation cross between these two orange flowers resulted in an unexpected versi-colour flower blushing to pink with age, called 'Versi Wonderland' – Figures 21(a) and (b). The lesson learned here is that you should think twice before discarding first generation flowers!

Figure 23. Yellow interspecific flower out of the versi-coloured 'Daydream' series – Yoshikazu Nakamura.

Figure 24. Versicoloured multi-colour flower. Pierre de Koster via Connie Abel.

TOP QUALITY HYBRIDS AVAILABLE FOR FURTHER INTERSPECIFIC BREEDING

Some examples of interspecific flowers with unusual special colours and forms are currently being tested for compatibility with interspecific and *miniata* plants of my collection.

These plants are relatively new and no results are available for further breeding generations. The plants have been developed from 'Yellow Drops' progeny and from purchased plants. Some of the plants have been grown from purchased seeds. The parents include 'Daydream' a multi-colour from Pierre de Coster, 'Star Green', Stanmore , 'Emmadale' – and *mirabilis* progeny.

CONCLUSIONS AND THE WAY FORWARD

- 'Compatible' plants make it much easier to propagate predictable colours in the later generations of the interspecific plants.

Figure 25. Versi-multi-colour flower. 'Star Green' versicolour from 'Star Green' progeny bred by Charl Malan.

Figure 26. 'Green Starlets' from 'Star Green' progeny – (*Robusta* X 'Star Green') – seed from Carrie Kruger.

Figure 27. 'Green Fingers' grown from seeds from Stanmore, Australia.

Figure 29 (a). *Mirabilis* progeny from (*mirabilis* X *miniata*) X unknown – Clayton Jonkers.

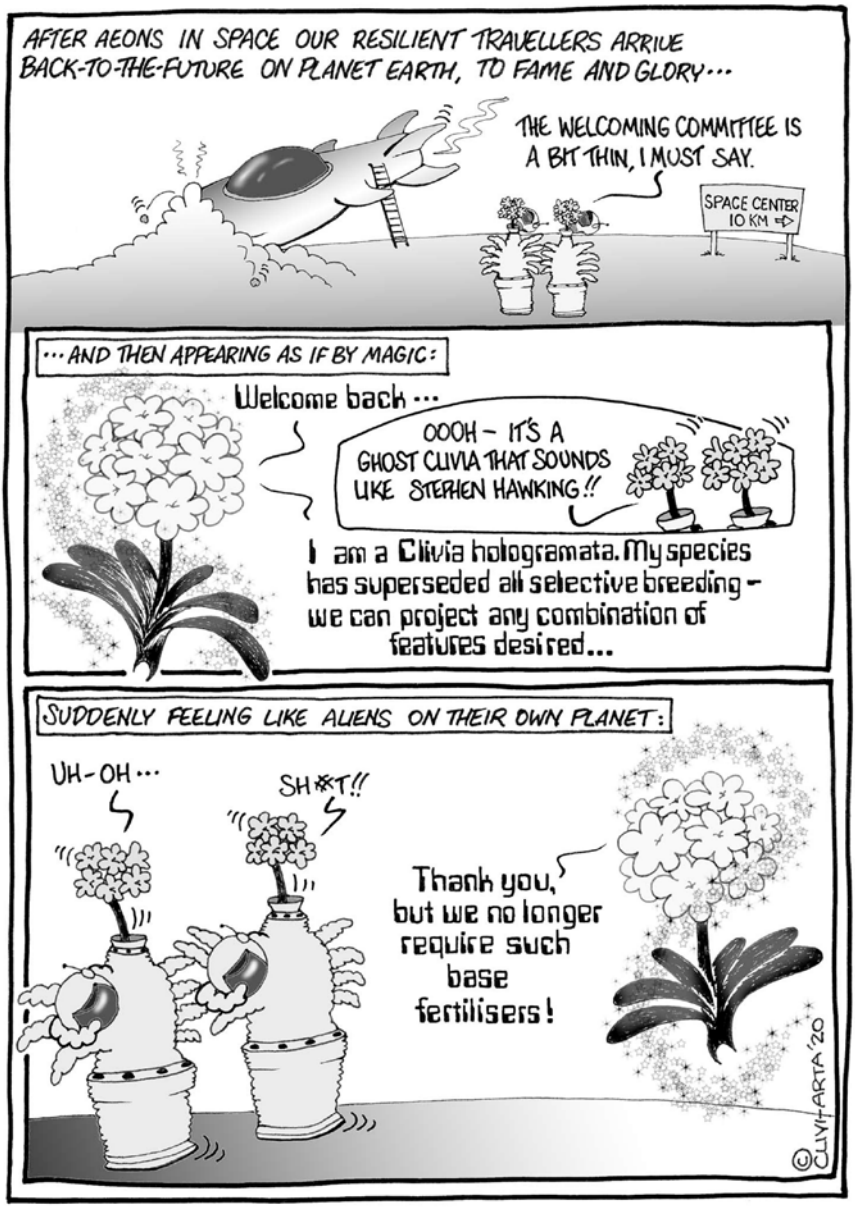
Figure 29 (b). 'Spotlights' – *Mirabilis* progeny from (Kirstenbosch Yellow X *mirabilis*) X (New hybrid) – John Winter. This is a tall, broad leaf triploid plant, pollen tested by Aart van Voorst.

Figure 28. 'Emmadale' an offset from Leroy Dale.

- 'Compatibility' also works with the latest *miniata* colours, producing different interspecific colours and more compact plants as shown in 'Yellow Drops 1' crossed with 'White Lips'. It is probably a good idea to stay away from oversized, miniata-like flowers unless you want to produce unusual miniata colours.
- The inclusion of different pendulous species in both parents of an interspecifc cross, gives successful results e.g. attractive flowers away from the dominant orange flowers and also gave prominent pink blushing.
- Line breeding of versi-colour 'Yellow Drops 1' is more successful in the 3rd and probably later generations, producing full, recurving versi-colours with some pink blushing.
- When buying new plants or seeds, try forming a balance between availability, price and look for plants that are 'compatible' with your own plants. A good option is high quality seed crosses.
- When pollinating, select carefully, label pots carefully and be patient.

Clivi-Arta

Helen Sanders



Clivia Mutations and Colour Variation

Wessel Lötter

1. DEFINITIONS AND TERMINOLOGY

Flavonoids: Pigments dissolved in the cell sap, such as anthocyanidins, which are red or blue, betaxanthins, which are yellow and anthoxanthins which are yellow or cream.

Carotenoids: Pigments in plastids within the plant cell, namely carotenes, which are orange and xanthophylls, which are yellow.

True yellow: For the purpose of this article, true yellow shall be a clivia, which displays a complete lack of anthocyanin in its flowers, berries and seedlings.

Par-yellow: This plant is still able to produce very little anthocyanin, which sometimes shows up as spots or streaks on the flowers and / or berries.

The seedlings however are unpigmented. It has only recently been identified as a second mutation. The term "par" is not my creation but an already established term in some bird mutations e.g. blue and par-blue, which are not equal in colour but equal in its inheritance (recessive over the normal green colour). Further in birds where the colour is equal and the inheritance differ, the mode of inheritance is used to differentiate between the two e.g. sex- linked yellow and recessive yellow. The par-yellow clivias are definitely not freaks or rogues but merely a mutation of another gene in the anthocyanin pathway (Figure 1). Natal Yellow A and B are examples.

True breeding: A phenotype can only be true breeding if it is homozygous. This means that a true yellow of the genotype aaJJ or a par-yellow of the genotype AAjj will be true breeding if selfed or crossed with its own genotype. A true yellow of the genotype aaJj is heterozygous (carrying factor for par-yellow), and if selfed will produce three different genotypes. Genetically it will not be regarded as true breeding even if its phenotype remains unaltered. The three different genotypes are aaJJ, aaJj and aajj. The latter can be crossed with true yellow or par-yellow producing 100% yellow progeny, true yellow or par-yellow, as the case may be of the genotypes aaJj and Aajj respectively. If these two genotypes are crossed 25% orange will be produced as will be demonstrated in the concluding section of this article. The term true breeding can only be used if both parents are known to be of the same homozygous genotype.

2. COMBINED MUTATIONS

At the meeting on the 14th February 1998, I demonstrated three different methods to indicate how I arrived at my prediction as set out in item 10 of my article (Newsletter vol. 7, Jan. 1998, p.13). I was asked to do an article on this for the newsletter, but I was reluctant to do so, as I had no literature to substantiate my views. I was fortunate enough to receive an article by R.J. Griesbach of the United States Department of Agricultural Research Service, Beltsville, Maryland, 20705, under the heading "Genetics and Biochemistry of Anthocyanin Albinism in

Paphiopedilums and I quote:

"Most plants are diploid and have two copies of every gene. For discussion purposes, Paph. faireanum fma. alba's genotype could be designated AABBCCDDEEFFGGHHjj.

The two copies of the "j" anthocyanin gene are non-functional and anthocyanin is not produced. On the other hand one could designate Paph. bellatum fma. alba's genotype as aaBBCCDDEEFFGGHHIIJJ. In this case, the two copies of the "a" anthocyanin gene are non- functional. The hybrid Paph. x Iona, would have one gene from each parent and would be designated AaBBCCDDEEFFGGHHIIJj. In Iona, there would be at least one functional copy of each anthocyanin gene, which would result in red flowers. Two copies of each gene are not needed for anthocyanin production. When Paph. x Iona is selfed, one would find that 7/16 or 44% of the progeny are alba (Table 1)

Table 1. Genetics of diploid Paph. x Iona (AaJj) = Paph. faireanum alba (AAjj) x bellatum alba (aaJJ). Parents F1: AaJj x AaJj Sex cells:

25% AJ 25% AJ

25% Aj 25% Aj

25% aJ 25% aJ

25% aj 25% aj

Progeny F2:	AJ	Aj	aJ	aj
AJ	AAJJ	AAJj	AaJJ	AaJj
Aj	AAJj	AAjj	AaJj	Aajj
aJ	AaJJ	AaJj	aaJJ	aaJj
aj	AaJj	Aajj	aaJj	aajj

Alba genotypes = AAjj, Aajj, aaJJ, aaJj, aajj.

Figure 1: Anthocyanin biosynthetic pathway showing the action of ten genes (G. Stotz, *et al*.,1985. Theor. Appl. Genet.70:300).

P – coumaric acid –A- Chalcone -B- Naringenin -C -Dihydrokaempferol / Eriodictyol

-D- Dihydroquercetin- E,F,G,H,I,J- Acylated Anthocyanin.

Table 1 by Griesbach as set out above was one of the methods demonstrated by me at the meeting on the 14th February 1998, with the only difference being the symbols I used. Apart from the 7/16 or 44% (to the nearest) albino progeny, Griesbach did not give a full analysis of all the genotypes and their percentages. For convenience I shall use his symbols for our yellow clivias i.e. P-generation: aaJJ for true yellow. x AAjj for par-yellow.

F1-generation: AaJj F1-orange

These F1-orange parents will give rise to the following genotypes in the F2-generation.

F2-generation:

1. AAJJ 1/16 6.25% Orange
2. AAJj 2/16 12.5% Orange split par-yellow
3. AaJJ 2/16 12.5% Orange split true yellow
4. AaJj 4/16 25% Orange split true and par-yellow
5. AAjj 1/16 6.25% Par-yellow
6. Aajj 2/16 12.5% Par-yellow split true yellow
7. aaJJ 1/16 6.25% True yellow
8. aaJj 2/16 12.5% True yellow split par-yellow
9. aajj 1/16 6.25% True yellow and par-yellow combined.

Genotypes 1-4 are orange and represent a total of 56.25%. Genotypes 5-9 are yellow and represent 43.75% in total.

Phenotypic ratio of 9:7

The genotype in item 9 above is true yellow as well as par-yellow, but its phenotype is true yellow only. The reason for this is that the anthocyanin pathway is totally blocked by the genes responsible for true yellow and thus the phenotypic expression of the genes responsible for par-yellow is suppressed. This is called epistasis or masking. There are several forms of epistasis. They have one thing in common and that is that they change the normal expected phenotypic ratio of breeding results considerably. The British geneticist Bateson discovered this particular form involving the inter-action of two different recessive gene pairs, early in the 20th century. He crossed two true breeding sweet peas with white flowers. To his surprise this resulted in purple flowers only. This F1-generation was allowed to self and out of a total of 651 F2-plants, 382 produced purple flowers and 269 white flowers, a ratio of 9:7. The following table was used to demonstrate the interaction of the genes and the 9:7 ratio.

P-generation: aaBB (White) x AAbb (White) or alternatively: AABB (Purple) x aabb (White) Gametes: (sex cells) aB and Ab

F1-generation: AaBb (Purple)

F2-generation: AaBb x AaBb

Gametes	AB	Ab	aB	ab
AB	AABB	AABb	AaBB	AaBb
Ab	AABb	Aabb	AaBb	Aabb
aB	AaBB	AaBb	aaBB	aaBb
ab	AaBb	Aabb	aaBb	aabb

F2-generation: Phenotypic ratio of 9 purple and 7 white.

This deviates from the normal expected phenotypic ratio of 3:1 in the F2-generation when a single recessive gene pair is involved.

Example (as for clivias)

AA (orange) x aa (yellow) = 100% Aa F1-orange.

Aa x Aa = 25% AA (orange), 50% Aa (orange) and 25% aa (yellow). F2-generation = 75% orange and 25% yellow a ratio of 3:1

3. ABERRANT YELLOW FORMS

A Clivia is variable in many respects and colour is no exception. For example it may be able to produce anthocyanin in the normal way, but the intensity of the colour as well as the extension thereof, wherever it may occur in the plant, may vary considerably. In Miriam Meltzer's vast collection of some 50 000 orange clivias, mostly grown from seed, there are two or three with orange flowers and yellow berries. It is not surprising that in this vast collection three yellows arose, but with a difference. The one has orange midribs on the outside of its petals, the other one is the picotee as illustrated in the Clivia Review 1998 and the third one is a clear yellow with orange berries.

Further more Nick Primich produced a yellow from a normal orange plant. He selfed this yellow and I know he does this meticulously, but the seedlings were all pigmented. Hopefully we will now be able to see whether some of these pigmented seedlings will produce yellow flowers. Miriam Meltzer's seedlings from her yellows are also all pigmented. I myself used the pollen of the picotee on a yellow with faint red tips to its petals, but the progeny are all pigmented. I am now more than ever before convinced that a plant with normal functioning anthocyanin can produce yellow flowers in as much as an orange flowering plant can produce yellow berries.

4. DILUTE

This is another phenotype, which is closely related to our yellow mutations. In a dilute the intensity of the pigmentation is so diluted that very pale flowers result. Chubb's peach is a good example of this.

By analyzing the breeding behavior of a plant, its genotype can be deduced. The following breeding results were obtained from Chubb's peach:

(a) Natal Yellow B x 'Chubb's Peach' = 100% orange flowering plants.
(b) True yellow x 'Chubb's Peach' = 100% unpigmented seedlings.

This implies that the defect, which is responsible for Chubb's peach, acts on the same gene as that which is responsible for true yellow. Experience with other genera of plants has proved that a normal plant is dominant over both dilute and albino, but that dilute in turn is dominant over albino. As Chubb's peach originated in an orange flowering population where no yellows occur, the genotype A'A' could be designated to it. A'A would be orange flowering as orange is dominant over dilute. The genotype of the progeny in (a) above would therefore be A'AJ (Orange). The genotype of the progeny in (b) would be A'a, and

therefore all dilutes, as A' (dilute) is dominant over a (true yellow). If the dilute of the genotype A'a, is crossed with a true yellow (aa), 50% dilute and 50% true yellow would be produced.

Example:

	a	a
A'	A'a	A'a
a	aa	aa

50% dilute and 50% yellow

The origin of Naude's peach is unknown and so is its genotype. Preliminary experiments indicate that it could be of the same genotype as Chubb's peach, but further research is necessary to confirm this. Few of the ten genes in the anthocyanin pathway give rise to viable mutants for reasons as set out in the next section dealing with white. We already have two of the ten genes responsible for clivia mutations i.e. one for true yellow and Chubb's peach and one for par-yellow. The possibility of a third gene being involved is therefore unlikely. The allelic relationship (being different forms of the same gene) of Naude's peach with par-yellow has been ruled out. The following breeding results confirm this and suggest a relationship with true yellow and Chubb's peach:

(a) Natal yellow x 'Naude's Peach': 100% pigmented seedling.
(b) Natal Yellow x 'Chubb's Peach' (F1-orange) x 'Naude's Peach': 5 seedlings – 3 pigmented and 2 unpigmented.
(c) (True yellow x Natal yellow B) (F1-orange) x Naude's peach): 18 seedlings – 12 pigmented and 6 unpigmented. This deviation from the expected 50% may be due to the fact that one third of the flowers of the seed plant were already open when pollination with Naude's peach commenced.

Meg Hart unintentionally and without knowing which the parents were, bred three dilutes. Either she must have an orange flowering plant of the genotype A'A, which selfed or a peach which is so diluted that it appears yellow.

Dilute should not be confused with pastels, which are very pale orange forms. Pastels can be crossed with any colour within the orange spectrum producing a variety of shades. It is not yet known whether Meyer's Peach is a dilute or a very pale pastel. If pollen can be made available, the necessary experiments will be done to determine its genotype.

5. THE MYTHICAL WHITE

Griesbach defines an albino as follows: "An albino will by definition display a lack of anthocyanin pigmentation, but will contain chlorophyll and carotenoid pigments". Our yellow clivias are therefore already albinos. The yellow colour of the flowers is mainly due to carotenoids, which are also present in the leaves. Without this the plant cannot survive. It not only protects the chlorophyll, but is also involved in the absorption of certain rays of the sun. Further more, the vast majority of albinotic mutations are blocked at the same step in the anthocyanin pathway. The reason for this is that the ten genes in the anthocyanin pathway are also involved in other flavanoid pathways, which are essential for growth and protection from the harmful effects of ultra-violet irradiation. Admittedly yellow pigments are not essential in the flower and it may be possible to produce a white by selective breeding.

The *clivia* with the white and green center as depicted on page 6 of the Clivia Review 1998, preferably as a mother plant, would be an excellent choice.

By crossing this plant with yellow you may get whites or nearly so, with green in the center in the F2-generation. If I had a choice for a yellow as pollen plant, it would be one which already has green in the center, like that on page 8 of the Clivia Review 1998.

The reason why this breeding should not be done the other way round (yellow as mother plant) is because yellow is said to be maternal and may be a dominating factor if you have white in mind.

6. COLOUR

Colour in the *clivia* is the combined effect of the presence of anthocyanin in the epidermis and xanthophylls in the mesophyll (underlying tissue). Removing the epidermis of an orange flower can prove this. The epidermis will be red and the exposed mesophyll will be yellow. If this red epidermis is placed on any yellow surface, the colour will change to orange. The different shades from pastel to red are the result of the ratio of cells in the mesophyll, containing leucoplasts that are colourless, chromoplasts that contain yellow xanthophylls and the concentration of anthocyanin (red pigment) in the epidermis.

Example:

A flower with few chromoplasts and a high concentration of anthocyanin will be red.

A flower with few chromoplasts and a low concentration of anthocyanin will be pink.

A flower with leucoplasts only and no anthocyanin will be white. (No photo available).

A flower with chromoplasts in abundance and a low concentration of anthocyanin is salmon.

The epidermis of a yellow clivia flower contains no anthocyanin and is transparent. The yellow colour is displayed by carotenoids in the mesophyll underneath.

The colour of the berries is influenced by an additional factor namely: chlorophyll, which is retained in the mesocarp (pulp) of some plants.

Example:

Orange – red berries have yellow pulp and a high concentration of anthocyanin in its epidermis.

Yellow berries have yellow pulp and a transparent epidermis. Pale green berries have green pulp and a transparent epidermis.

Purple berries have green pulp and a red epidermis. If the epidermis of this berry is removed and thoroughly washed it will be red. Place it on a green surface, press it well down and it will appear purple again.

7. CONCLUSION

This study has proved that there is not a pair of genes for red and a pair of genes for yellow as previously accepted. Yellow is due to a gene,

which is responsible for one of the enzymes necessary for the production of anthocyanin, being non-functional. In the case of dilute the gene is defective. Furthermore the theory of the hidden red gene can now also be explained. We may already have yellows of five different genotypes namely: aaJJ, aaJj, aajj, AAjj and Aajj.

Not all of these would produce 100% yellow progeny. We already know that true yellow (aaJJ) x par-yellow (AAjj) produce 100% orange, but aaJJ x Aajj would produce 50% orange and 50% yellow, whereas Aajj x aaJj would produce 25% Orange and 75% yellow progeny.

Example 1:

P-generation: aaJJ x Aajj

Gametes: aJ aJ Aj aj Progeny:

	Aj	aj
aJ	AaJj	aaJj
aJ	AaJj	aaJj

50% orange and 50% yellow Example 2:

P-generation: Aajj x aaJj Gametes: Aj aj aJ aj Progeny:

	aJ	aj
Aj	AaJj	Aajj
aj	aaJj	aajj

Yellow genotypes Aajj, aaJj and aajj = 75%. Orange genotype AaJj = 25%

8. BIBLIOGRAPHY

Eicker, A., Claassen, M.I., Reyneke, W.F. & Grobellaar, N. 1979. Botany: Genetics and Cryptogams. Durban: Butterworths.

Fereira, Dr. D.I. & Gaum, W.G. 1993. Plant Breeding (PLB141TA). Technicon S.A. Griesbach, R.J. 1988. Orchid Digest, April-June,1998, p88-92, Orchid Society, America.

Grobellaar, N., Robertse, P.J., van Greuning, J.V. & Visser, J.H. 1979. Botany: Anatomy and Physiology. Durban: Butterworths.

Reyneke, W.F., Coetzer, L.A. & Grobellaar, N. 1979. Botany: Organography and Cytology. Durban: Butterworths.

Reyneke, W.F., Kok, P.D.F. & Grobellaar, N. 1979. Botany: Practical Botany. Durban: Butterworths.

Stace, Clive, A. 1985. Plant Taxonomy and Biosystematics. London: Edward Arnold Publishers.

Van der Schijff, H.P. 1987. General Botany. Pretoria: J.L. van Schaick Publishers.

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