Flowers and Forcing Flowers Part 2

This flower opened about 7 weeks from the start of the resting period. August 2020.

The following piece is part of a collection of writings published on the Practical Small Cacti Malaysia site.

Another Round of Resting for Two PClavs

While I get PClav flowers all the time, only one specimen (the big and old PClav) is regularly flowering. The next largest PClav is still eager to produce offsets instead of flowers. In 2018–2019, two more PClavs produced three flowers in total after a bit of 'resting' with their roots bare[1], but they did not continue to flower. Forcing worked on the two PClavs but the effect was only temporary.

For the hot tropical climate I live in, I currently expect PClavs and PMags to be able to flower non-stop when they are of a big enough size and they are fed with enough nutrients. As of mid-2021, one PClav and four PMags are flowering regularly. There is an apparent lack of success with PClavs, because rooted PMag offsets appear to grow a lot faster than rooted PClav offsets and I am reluctant to feed the PClavs too much nitrogen. Around mid-2020, I got tired of waiting for the two PClavs and decided to rest them again.

1 See the Flowers and Forcing Flowers chapter for the details.

Nicknames for Scientific Names

PMag = *Parodia magnifica*	GBald = *Gymnocalycium baldianum*
PClav = *Parodia claviceps*	MGeo = *Myrtillocactus geometrizans*
GStella = *Gymnocalycium stellatum*	GSteno = *Gymnocalycium stenopleurum*

This naming scheme is purely for convenience. Just think of them as webchat nicknames.

Preparing the PClavs for Resting

The two PClavs in early January 2019, just before the last flower opened on the smaller specimen (left). The larger specimen (right) had already produced two flowers back in October 2018.

Resting PClavs is really quite simple. Just take them out of their pots, tidy up the roots, then leave them lying about somewhere sheltered from rain.

The picture above can be compared to the two pictures on the next page. The two PClavs were harvested as offsets in mid-April 2018. The first resting experiment was for about 2½ months. They were then potted up in late June 2018. So at the start of the second resting experiment in July 2020, the PClavs had been growing in those pots for just over 2 years.

The smaller specimen had caught up in size while the larger specimen had stopped getting bigger. It appears that the size of the PClavs were limited by the pots plus the level of care given to them.

The two specimens in July 2018, about 2 weeks after potting up the first time. In this picture, the larger specimen is on the left and the smaller specimen is on the right.

The PClavs in July 2020. The smaller specimen (left) had grown quite a bit. Note the slightly shrunken lower stem of the larger specimen (right). While the PClavs look reasonably healthy, they have been stuck at this size for many months so they are probably pot bound. They won't die on you, but they won't be productive either.

One may then ask, why do we need to take the PClavs out of their pots to rest them? Why don't we just rest them in their pots? Good question – it should be an interesting research topic. These two specimens had been getting uneven care for 1½ years, but the changing conditions did not push them to flower. So resting them in pots may not work reliably. One theory I have is that resting the PClavs with their roots bare simulates serious drought conditions, and this is a stressful event that encourages the plants to mature more quickly and proceed with flower bud production.

The next three pictures show the smaller PClav specimen out of its pot. The specimen ended up with a thick layer of roots near the soil surface, just under the scoria mulch. This is a common problem with cacti in small pots grown in hot tropical conditions. Water evaporates quickly in the small pot, so the plant tries to get at the moisture near the soil surface before it is lost. Unfortunately, the thick layer of roots near the surface hinders water movement, leading to drier conditions under the roots. So spraying the PClavs from above isn't a truly good way of watering them; flooding the pots will probably lead to better root systems.

The smaller PClav out of its pot. Scoria was used as a mulch, and moist surface conditions may have contributed to the inferior root system growth. July 2020.

The soil mixture contains some perlite and LECA balls. July 2020.

The root system of the smaller PClav after cleaning. Most of the fine roots have been removed, since they will crumble away in a few weeks anyway. These thick roots are reinforced; they can survive drought conditions just fine. July 2020.

The larger PClav out of its pot. July 2020.

The larger PClav (picture above and in the following page) did not have the problematic root system growth of the smaller specimen. Also, it appears that I did not have a scoria mulch on this specimen, so on the smaller PClav the scoria may have held moisture longer and contributed to the root growth problems.

This PClav has a more extensive root system and some of its roots are quite long and thick. It is pot bound and the stem has not grown much for a long time and the lower part has shrunk a bit. It's not a very healthy specimen. PClavs will do a lot better if their strong and extensive root systems are given space to roam. To get ideal growth rates, you'd probably need to repot them annually.

As for watering these PClavs to get a healthy root ball, I confess that about the only thing that I do regularly is spraying them with fortified water. Flooding the pots should improve the root system, except I hardly ever do it. In the hot and dusty tropical lowland climate, perfect care for your cacti and succulents require a certain amount of time and effort. I prefer to get things done efficiently in order to economize on time and effort, so I provide less-than-perfect care for my plants.

There are alternatives of course. One is to use deeper pots. Another is to use trays so that many pots can be watered from the bottom all at once. A water-holding layer can be placed as a bottom layer in the pot to encourage roots to move downward in the search for water. And planting PClavs in the ground is also an option, if you are up for the challenge.

Closeup of the root system. August 2020.

The larger PClav after cleaning. Note the long and thick roots. August 2020.

The two PClavs resting on a plastic pot saucer. August 2020.

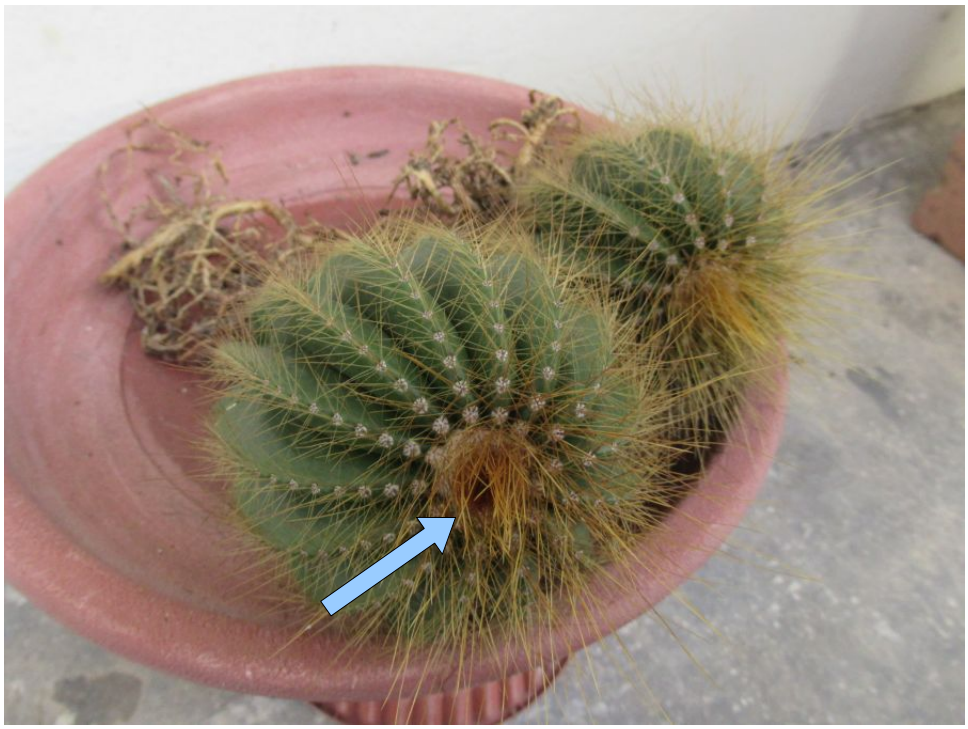
And so the two PClavs were ‘rested’ on a plastic pot saucer. The plants (including the roots) got occasional sprays of water, about once a week. Sometimes they were picked up to be sprayed to remove dust – this is to reduce the risk of spider mite attacks.

In my microclimate, this method of resting cacti has been remarkably effective for forcing flowers in PClavs. I don’t know which aspect of the resting is truly responsible for flower bud production. But resting PClavs this way is something that is easy to do, and it’s hard to make it simpler.

This second resting experiment is also different from the first experiment in one way: In the first experiment, they were rested as *detached offsets* for 2½ months without any root systems. For the second experiment, the two PClavs have root systems. Both attempts worked. It’s interesting that this species of cacti can be so reliably forced to flower.

One Flower Appears While ‘Resting’

After exactly one month of resting, a flower bud was detected on the larger PClav. Prior to this, I thought PClavs start to flower when they are back in their pots, after resting. Well, I was wrong about that. It appears that PClavs, like GBalds, can flower while their roots are bare. Very interesting – a deflating bare-rooted PClav that does not get much water can put out a normal-looking flower.



A flower bud (blue arrow) was first detected on the larger PClav exactly a month later, in early August 2020. Both PClavs have noticeably deflated.

The flower bud just before opening about 2 weeks later in mid-August 2020.

The bud opened into a normal-looking flower. No soil, no problem. (Aug 2020)

Another view of the flower and the two PClavs. All the fine roots have crumbled away. The thick roots that are left are pretty resilient to dry conditions. (August 2020)

A ragged-looking flower, still open after four days. The tips of the petals are beginning to dry out. Compare the shape of the flower in the picture above with the same flower in the picture on the first page, when it was open on the first day. (August 2020)

Unusually, this flower lasted *four days*. Four days for a PClav or PMag flower is an uncommon occurrence for specimens in my collection.

Prior to 2020, PClav and PMag flowers usually last only two days. Eventually I realized that I should give the plants a bit more water. In 2020, this led to many flowers lasting three days; mild weather helps a lot. And on rare occasions, some flowers have lasted four days. On the fourth day, the flowers always look quite ragged with frayed petals.

This flower on a bare-rooted PClav was under shelter and gets quite a bit of shade. So milder conditions may have helped to boost the longevity of the flower. In four days, the two PClavs may have been sprayed with water no more than one time: no water, no problem.

The ribs on the two PClav specimens have narrowed; both plants have lost a lot of water and the stems look deflated. The PClavs would probably not be able to survive the bare-root treatment indefinitely, but I think there isn’t any problem with resting them for two to three months in the tropics.

Potting Up the PClavs

The two PClavs at the beginning of September 2020, just prior to potting up.

Given that the two specimens were now looking obviously deflated, resting was terminated after 2 months. In addition, the larger specimen managed to produce a flower while resting, so they appear to be raring to go.

On both specimens, the thick roots held up well; there was little or no debris in the plastic pot saucer where the PClavs were rested. Such roots would easily survive droughts or the dry seasons in their natural habitat, securely anchoring the plants where they live.

The lack of fine roots is not an issue at all. In the past, there have been a lot of emphasis in literature on the importance of fine roots for water uptake. However, more recent research has shown that thick roots (such as the thick roots of trees) are not impermeable and they do a fine job in the uptake of water as well. As such, the PClavs had no problem in absorbing water and thickening their stems as soon as they were potted up. PClavs are not really fussy about potting mixes, but this time I gave them a layered potting mix similar to what I have been potting my GBalds in.

Potting up the PClavs. The specimens got a multi-layered potting mix – a bit of everything. Sphagnum moss has just been added to the pot on the left. In the other pot, pumice and a piece of non-woven nappy liner can be seen under the soil. (September 2020)

Soil and scoria was added to complete the potting mix, and a final topping of pumice was added as a mulch. (September 2020)

The two PClavs after potting up. The larger specimen (left picture) has a gray stone in its pot (September 2020)

Inflating. Just 18 days later, both stems look noticeably thicker. (September 2020)

Another Successful Resting Experiment

Bingo – another successful resting experiment. Not hard at all. At 18 days after potting up, buds were detected on both PClavs. (September 2020)

The PClavs at 27 days after potting up, late September 2020. Both specimens have inflated further in 9 days; compare the above picture to the pictures on the previous page and the changes are obvious.

The PClavs with buds at 52 days after potting up, or about 7½ weeks. October 2020.

Since the buds were detected 18 days after potting up, the buds must have been initiated very quickly as the PClavs recovered their shape. Also, 38 days elapsed from the detection of buds to the first flowers opening – about normal for PClavs I think. When the flowers opened, they were still at the top or apex of the stem. So generally, the PClavs performed much like the big mature PClav.

This time around, there were many more flower buds: a total of 7 on the larger PClav and 4 on the smaller one. Due to a degree of synchronization[2] among *Parodia*s, most of the buds opened in two flushes. The first flush saw one flower from the larger PClav and 3 flowers from the smaller one (see the pictures on the following pages.) Luckily (or rather, thanks to synchronization), a number of other *Parodia*s flowered at about the same time, and so for two days, there were a total of 16 flowers on 6 *Parodia*s.

Unfortunately, these two PClavs did not continue with flower production. Again, flower forcing via resting had a temporary effect. But with larger plants, this time I got more flowers over a longer period of time. I suppose the two specimens are not large or mature enough to be able to sustain non-stop flower production like the big PClav or the four PMags. But the PClavs appear to be on the right path – now all I need to do is to grow them bigger without applying too much nitrogen.

2 The synchronization is not perfect, but in my spreadsheet data set, the big PClav and the big PMag does this kind of thing too often to be mere coincidence. Synchronization may be due to subtle response to changing weather. Rain lilies (*Zephyranthes*) are very good at this. GBalds do not show any obvious synchronization behaviour.

Flowers opening on both specimens 4 days later in late October 2020.

The two PClavs with fully-open flowers. The flowers on the smaller specimen are a little smaller in size, but this is not unusual when there are multiple flowers. (October 2020)

Six *Parodia*s in bloom. In the tropics, there appears to be some synchronization among flowering *Parodia*s. There are 7 flowers on the big PClav and 3 flowers on the big PMag. There was a maximum of 16 *Parodia* flowers for two days. (Oct 2020)

Another view. The PClav flowers have not opened when this picture was taken. The two PClavs (orange arrows) were offsets of the second largest PClav (blue arrow). They are just 2½ years old at this point, and have already been through two successful rounds of flower forcing via the resting method. (Oct 2020)

A Few More Flowers

A week later, with flower buds growing normally on both plants. (Nov 2020)

Most of the buds opened four days later. At right is the last flower for the smaller PClav specimen – for now. (Nov 2020)

The larger PClav with four flowers in November 2020.

Smaller flowers are produced when a bunch of flower buds open together – this is quite noticeable for PClavs anyway. After these flowers opened, the “flowering season” for the two PClavs are nearly at an end. The larger PClav specimen (picture above) would produce two more flower buds in the next month.

The larger PClav (left) with a burst pod with seeds in early December 2020. The seed pod burst after just over a month – normal timing for PClavs.

Two weeks later, mid-December 2020. Two enlarged areoles on the larger PClav proved to be two final flower buds. The other PClav is done flowering for now.

End of the “Flowering Season”

It took another 1½ month for one of the buds to get to this point (left), so the larger PClav has kind of lost its urge to push out flowers. The other PClav (right) has stopped flowering altogether. Late January 2021.

Two views of the larger PClav with its flower open the next day. The flower petals look a bit abnormal, which I suppose is common for PClav flower buds that take an abnormally long time to grow. Early February 2021.

Posing the PClav specimen with four flowering GBalds the next day. (February 2021)

It has to be said that I am seeing all of this through thoroughly distorted and biased glasses, because my endgame is to get cacti that flowers all year round, all the time, in the tropics. I already have an old PClav that flowers all year round, so my research objective is to fill in the details, especially with regards to flowering behaviour among small or young or purchased PClav specimens.

For PClavs, resting pushes them into seasonal flowering behaviour. This flowering behaviour does not rely on months of cold-weather dormancy, which is great for growers in the tropics. I guess it should not be too surprising, since the native habitat of PClavs is subtropical highlands in South America. I suspect many North American cacti are more attuned to the winter season.

For the past year or two, my working theory is that a significant change of weather from “hot and dry” to “cool and wet” pushes PClavs into flowering in a tropical locality. Resting is thought of as a stressor that amplifies the conditions to push the cacti to flower. Now I think that things are not so simple. After all, my old PClav specimen simply ignores the weather and pushes out flowers all year round[3]. Why is seasonal flowering behaviour abandoned in that case? We will look into a different explanation for PClav flowering behaviour at the end of this chapter.

3 That specimen produced 94 flowers in 2020. Month-by-month data is available in the chapter on Data and Charts.

Two views of the larger PClav with the second (and final) flower open about two weeks later, mid-February 2021. Again, the flower is a slightly abnormal one.

Some *Parodia*s, about 3 months later in May 2021. The two PClavs are back to a boring “growing their stem” mode. Only one PClav flowers consistently and continuously – the old and big specimen.

A closer view of the two specimens in May 2021. Healthy, but boring.

My ultimate target for these two PClavs is to get them to flower all year round. I'm fairly confident that it will work, since I already have two PMag specimens that were grown from detached offsets into cacti that flowers all year round[4]. So this covers PClav development from detached offsets to mature specimens that flowers continuously.

Generally, all I need to do is to grow them larger, which means good nutrition and several rounds of repotting. I believe the primary issue holding these specimens back from growing at maximum speed is the root systems, which is pot-bound for much of the time unless you repot frequently.

As for other PClav-related studies, I have one commodity cacti PClav bought in September 2018. The objective was to grow it from purchased plant to putting out its first flower. This specimen produced its first flower bud in October 2021 and the flower finally opened in late November 2021, so the experiment succeeded after just over 3 years[5]. I also have some PClav seedlings grown from my own seeds; ultimately I should be able to learn more about PClav behaviour from seed to seedling to juvenile plant and finally to a mature flowering specimen.

4 Albeit in a limited fashion, since the two PMag specimens are pot-bound. But towards the end of 2021, they are pushing out flowers somewhat consistently.

5 This is covered in the next chapter, Getting Commodity Cacti to Flower.

Can Tropical Weather Push PClavs to Flower?

Both PClavs have a single bud each in early November 2021, just visible here.

Since these two PClavs failed to do anything interesting from March 2021 to October 2021, I'd say the answer to the question posed above is 'barely'. So what finally made these two put out a flower bud each in November 2021?

Perhaps part of it was due to a short urban heat wave a few weeks before. Another part may be due to increased fortified sprays and nutrition in general in the second half of 2021. Also recall the PClav purchased in 2018 (mentioned on the previous page) has also produced a flower bud at the same time[6]. And so, without resorting to resting PClavs, you may still be able to see a flower or two in the tropics. But I kind of doubt there will be many flowers.

Comparing this kind of treatment and the resting treatment, I would say that resting PClavs more effectively stresses them. The short heat wave may have promoted dry-enough conditions for the PClavs. Remember, heat waves also tends to push maturing GBalds to start flowering. So some kinds of stresses are good for your cacti. Until they start to flower continuously on their own, you'd need to apply stress to your PClavs to make them flower.

Make sure your plan of action involve drying out the root system, because I suspect that's the crux of our problems with getting PClavs to flower. This brings us to a better theory explaining the flowering behaviour of PClavs, which will be discussed in the next section.

6 Three small PClavs that are "reluctant to flower" with buds at the same time? What a coincidence! Another hint of weather effects on *Parodia* flower synchronization, if you ask me.

Normal Growth Blocks Flowering Behaviour

Flower buds popping up – but not growing bigger – on a large GSteno stem that was cut in mid-July 2021. One is marked by the orange arrow. Four can be quite easily found in this closeup. (November 2021)

In a previous chapter, I had threatened to cut my old GSteno into two in order to make the top part grow new roots. I finally did it in July 2021, but the top part had trouble producing roots. In late October 2021, I noticed a few flower buds near the top of the stem – just little nubs that aren't growing much. I don't think the buds will successfully grow into flowers.

Anyway, the point of the observation is this: chopping off the bottom part with the root system causes flower buds to pop up in the top part. With PClavs, we dried out the root system to get them to produce flower buds. Here, removing the root system entirely led to the same result.

What we may be looking at here are the effects of hormonal signalling in cacti. I have been sensitized to hormonal signalling in the course of studying the behaviour of grafted GBalds[7]. For PClav and GSteno, I think hormonal or chemical signals from an active root system blocks flowering behaviour, so we get stem growth most of the time. Dry conditions changes the hormonal signalling, lowering or removing the block, allowing flower buds to form. Large and old *Parodia*s may be sufficiently different from smaller specimens that their root systems can't block the growing points from producing flowers. Perhaps the woody lower stems of old PClavs are a good thing...

This scenario explains PClav flowering behaviour better than talking about dry or wet environmental conditions. I guess I should have just rested the GSteno. Whoops. ♦

7 Several observations are discussed in the chapters on grafted cacti, accompanied by many pictures.

Version Information

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Colophon

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