Repotting Cacti

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

Introduction

This chapter contains selected material related to the repotting of cacti. This includes interesting observations and the growth or behaviour of specimens after repotting. Some material have been discussed in earlier chapters, so the following is also an extension to those discussions, along with many pictures for your reading pleasure.

Repotting the grafted GBald specimen in January 2019. The GBald graft, or scion, finally detached from the MGeo stock in late January 2020. It was grafted in March 2014, so it lasted almost 6 years. The choice was either shrinking or “unhealthy fat stem.” So far, there is no third option available to us growers.

Material on this grafted specimen will be put in a future chapter, as a study of the lifecycle of a GBald-on-MGeo graft. Grafting-specific things has to be discussed, so it is less appropriate for this chapter. Examples: The roots of the MGeo stock plant look more like the roots of a GBald than the roots of a normal MGeo. The MGeo stock had also been cut shorter before this – because its lower stem had *shrunk*.

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.

MGeo: June 2018

Repotting some MGeo specimens. (June 2018)

If you want single-stemmed MGeos, just leave them in small pots. At least, that's the impression I get from growing them like in the above picture. They get fed, so they keep growing longer, but are reluctant to branch out. To create a specimen with a classic candelabra shape, you will probably have to use a large pot or plant it in the ground. Or, you can try giving them lots of fertilizer and water.

A closeup of the outlier pot with the packed root system. (June 2018)

There are a number of possibilities that may have influenced the pot with the extra-dense root system. They will be labeled (A), (B) and so on in the following discussion. There were no nodules on the roots, so it is unlikely a microorganism was involved. Also, I don't believe I singled out any one particular MGeo pot for special treatment when it came to water and fertilizer. The tuft of root jutting out from the bottom is likely because the pots were in an old plastic planter box, and the planter box had a plastic plate at the bottom to help with drainage – so roots had space to grow.

(A) The main growing point had stalled and there is a branch or offset growing at the top. But I have other specimens with branches and their root systems have never surprised me before.

(B) The specimen is unbalanced, forcing it to grow more anchor roots. But other specimens are just as tall and more than one pot is braced against others to stop from toppling over.

I have quite a number of MGeo specimens and I care for them in roughly the same way. This pot is the one pot that had a surprising root system. (A) and (B) are not really convincing theories.

The specimens with some soil removed. The pot with the packed root system had extra LECA balls in it. (June 2018)

When some soil was removed from each of the root balls, we can see that four of the specimens had roughly the same kind of root system. The outlier pot had something extra: when last repotted, six large LECA balls were placed inside the pot along with soil. What did the LECA balls do?

(C) The specimen benefited from extra minerals. This is difficult to justify, because LECA balls are made of fired clay and are quite inert. If it was due to minerals, then whatever that is leaching from the LECA balls must be pretty amazing – I haven't seen any signs of this elsewhere.

(D) The soil in pot was loosely packed due to the LECA balls, allowing roots to grow unimpeded. But then the roots got very tightly packed and they don't seem to mind at all.

(E) There was better aeration, allowing better gas exchange. The roots are able to breathe easily. Perhaps this can lead to optimal root growth. The large size of the LECA balls could have allowed very good aeration. Then again, as with (D) the roots tightly pack themselves seemingly just fine.

A closeup of the packed root system. Compare it to the usual root systems that I get from keeping them in the same small plastic pots. (June 2018)

(F) There is some kind of mechanical feedback action that promoted the growth of such strong roots. This is akin to a root finding its way into a tight crack in a pile of rocks and digging in deeply to anchor the plant securely. The root has to meet something somewhat unyielding and hard, perhaps even texture may be significant, because in the normal root balls, roots are well-packed only at the bottom of the pots. Are those roots feeding on something, or are they structural?

I like the (F) theory best and (E) second best, and I think this behaviour is worth studying. One is reminded of Anceschi & Magli's article about *Parodia*s in the February 2013 issue of *The Cactus Explorer*: There were so many pictures of *Parodia*s hanging from rocky cliffs that one cannot help but wonder whether these plants have evolved adaptations to cling onto those rocky cliffs. Is it possible to encourage those type of roots in a plastic pot in a simple way, without having to build something like a rocky cliff?

At a minimum, it may be a good way of building strong root systems on MGeos. However, given that there is wide variation in cacti behaviour, this may or may not work on other species. But the general concept of using medium to large porous rocks in a soil mix is certainly worth trying out.

This is a different specimen in April 2019. This MGeo has not been in the pot for very long, but there are two long anchor roots going straight down. This is also why MGeo root balls start to pack tightly at the bottom.

It remains to be seen whether we can easily encourage more anchor roots in species other than MGeo. MGeos are very good at making a tight root ball, so it really likes to put out long anchor roots, as you can see in the picture above. The other species, less so. For PMags and PClavs, they may still benefit from having more mineral rocks in the soil mix.

For GBalds, this may not help much with fibrous roots. I have seen the fibrous roots of GBalds all over scoria. By contrast, the LECA balls in the MGeo pot were not attached to roots; they were just embedded firmly within the root ball. I believe more knowledge about the root systems of cacti on a per-species basis would be very useful. As of mid-2020, I have some GBald pots with scoria and pumice in the soil mix – these will be checked at a later date to see the condition of their root systems. Then some of them might be moved to a mix with LECA balls added. Generally I struggle a lot with GBald root systems because they seem unreliable and weak – I will discuss more about this in a later section.

PClav: April 2018

Ready for repotting. The LECA balls on the surface serves as a mulch. (April 2018)

In this example, we will see how a PClav reacts to repotting. This is the second largest specimen that I have. The last time it flowered was in October 2014 – I forced it by accident and it produced a one-time display of 6 flowers[1]. Since then it had not produced any flowers. It was just growing very slowly and I wasn't giving it much in terms of fertilizer either. If it hadn't done that 6-flower thing back in 2014, it would be exactly like a boring, plain-looking cactus plant.

So in April 2018, I decided to repot the specimen to jump-start the thing. Looking at the performance of the large PClav convinced me that this smaller specimen is also capable of flowering, once it gets some fresh soil and proper nutrition.

For some reason, the pictures of this repotting (and the PMag one in the next section) are plagued with incorrect colour correction by the point-and-shoot camera that I have. Never mind which brand it was, because my next point-and-shoot also made incorrect colour corrections on rare occasions. But at least the new one has optical image stabilization – something sorely needed if you are shooting small cactus specimens all the time.

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

The root ball. The specimen was in a plain soil mix with a lot of perlite. (April 2018)

PClav and PMags usually have no bug trouble inside their pots, and this one is no exception. The root ball, as you can see in the picture above, looks bug-free. But the specimen does not have a healthy complement of roots. This is probably due to poor watering and fertilization practices, you know, the usual “growing cacti like desert plants” thing. Old habits are hard to break.

If you look at the specimen, it is green and relatively good-looking. I thought it was in reasonably good health. But from October 2016 to December 2017, the large PClav flowered in 13 of those 15 months. That was an impressive demonstration of what a mature PClav can do, when properly cared for. Of course, the flowering specimens also got more attention and care than non-flowering specimens.

Once it became obvious that a large mature PClav is capable of flowering non-stop in a tropical climate, that becomes the “new normal.” What was normal before – a mature PClav that is green and looks quite good and does nothing but grow slowly – now becomes the abnormal condition.

The two offsets have been removed. Flower forcing was attempted on the two offsets successfully[2]. Both offsets flowered less than one year after being detached, at less than 3 inch in diameter. Both have not flowered again since. (April 2018)

Psychologically it goes like this. My earlier attitude was: “This thing is so tough that it will grow well with just basic care.” That’s not wrong, but you won’t get any flowers that way. With the benefit of more experience with this species, I now think: “How can I care for this thing so that it is healthy and lives to its full potential?”

Looks can be deceiving when it comes to cacti, because as plants that live in locations where grasses and trees fail to thrive, they can withstand hard times for many months and still look good. The root system (picture above) actually looks quite good considering the basic care that it got. So if you treat your PClav in this manner, it will simply grow slowly like a plain-looking cactus plant and it will not give you any hint of what it is capable of.

In order to jump-start growth, I placed a few pellets of goat manure at the bottom of the pot. This was the first (and only) time I tried buried manure on my cactus plants.

It’s not even chicken manure, so what can go wrong, eh?

2 See the chapter on Flowers and Forcing Flowers for more details.

After repotting. Pebbles are used as a mulch. I happen to have some very old stock of pebbles and I just want to use them all up. (April 2018)

If you grow your PClavs *hard* in the tropics, this may be all you will see – a slowly growing green stem. A PClav living in challenging conditons will be quite reluctant to flower unless you do some additional pushing or forcing to mimic seasonal changes.

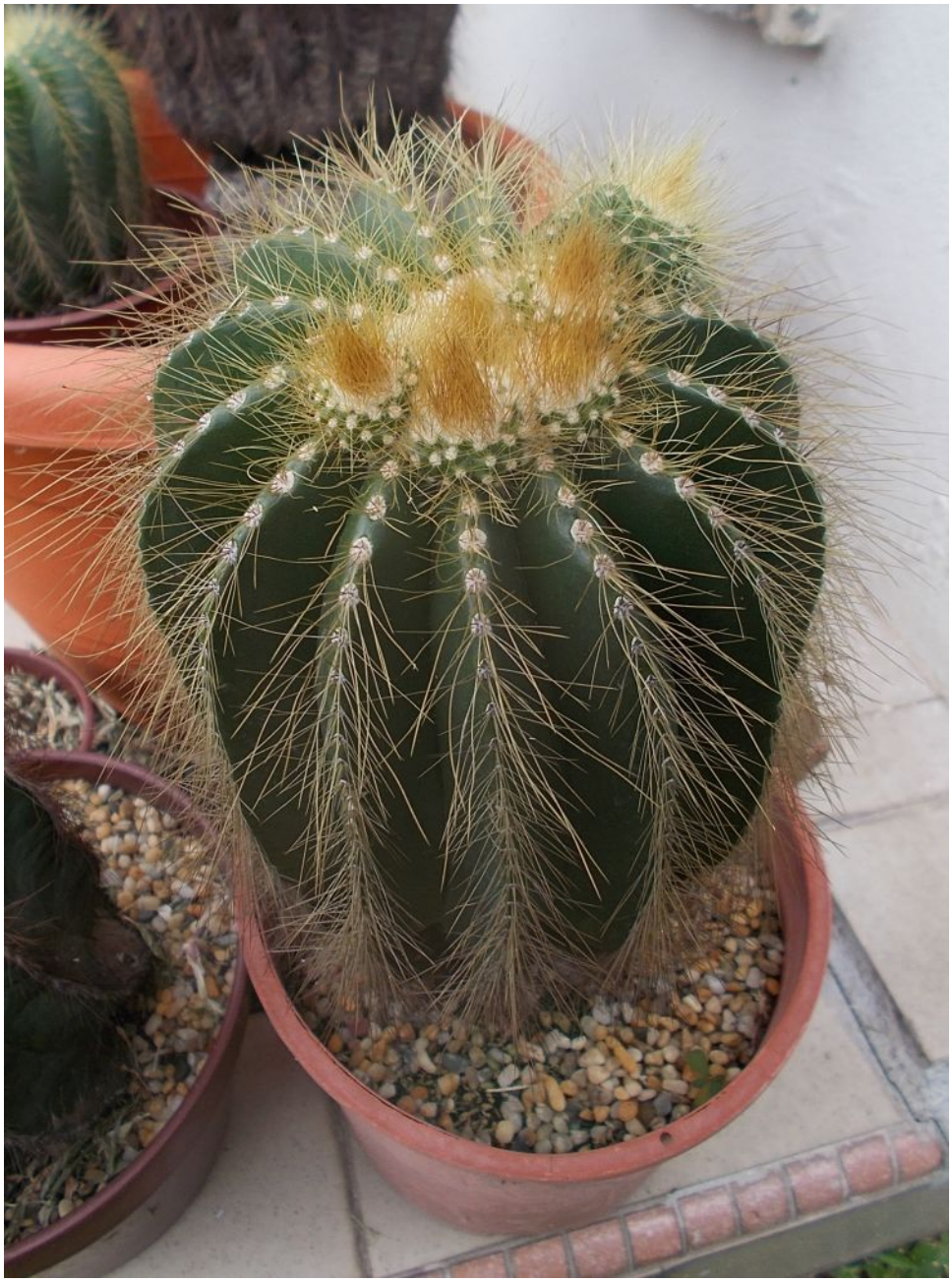
At first, it seemed that I hit jackpot. So easy... (See pictures on next page.)

Jackpot! After just 3 months. (July 2018)

With 3 flowers open in August 2018.

Hey, that’s not a flower bud... (see 2 o’clock position) (August 2018)

After 2 months, October 2018. Uh oh, something’s gone very wrong.



One month later, in November 2018.

After the initial burst of flowers, the PClav may have started ingesting more nitrogen from the goat manure. For many species of cacti, one areole can only produce *one flower or one offset*. A PClav will produce flowers and offsets from new areoles near the growing point at the top[3]. Pumping the plant full of nitrogen means we sacrifice flowers for offsets. You can't have large quantities of both at the same time. The larger PClav specimen only produces offsets on rare occasions.

3 For flowers, this applies to all the *Parodia*s and *Gymnocalycium*s that I have. But on rare occasions, old GBald areoles can be reactivated and a flower might pop out from the side of the plant.

The five largest offsets on the day they were harvested. Another two younger offsets can be seen. (January 2019)

Compare this picture to the one of the plant when it was just repotted 9 months ago and you will see that it has grown substantially. The stem has thickened and filled up. A specimen that gets enough water and fertilizer can grow quite fast.

The PClav in February 2019, about one month later. The two younger offsets have grown quite a bit larger. It's well fed. After one month, the scars from removing the five offsets have shrunken. Such scars will be quite inconspicuous after a few months.

At the 9 o'clock position in the picture is an older areole that has been reactivated and it is producing an offset. Such offsets tend to grow very sluggishly, as if it's an abnormal thing. As you can see, the PClav has decided to produce one flower bud. So nitrogen levels may have changed again. There was one flower in February 2019, one in May 2019, and one in August 2019 – promising but not fantastic. So in September 2019, it was repotted again, with more minerals in the soil mix.

Think of it this way: If a mountain goat (or any good-sized animal in their habitat) takes a dump nearby, to the cactus plant the poop is a treasure chest of nitrogen, right there. As a cactus plant in your natural habitat, you don't get this kind of meal every day. So absorb as much as you can and expand your footprint at the same time. If you are a PClav, you produce offsets instead of flowers. Become bigger when you get the chance so you can better compete with other plants.

So if you ever need to multiply your PClav collection, just feed it fertilizer with lots of nitrogen.

PMag: April 2018

Ready for repotting. Note the wrinkles on the plant. (April 2018)

This PMag was also repotted during the same April 2018 session. This specimen is my second-largest PMag. While it looks to be in reasonable condition, there are some wrinkles on the ribs. Such wrinkles are hardly noticeable on PClav or GBald specimens. On PMags, wrinkles appear when the plant is “toughing it out” in the face of unfavourable conditions. On domesticated specimens, wrinkles means that there is some problem with the care of the plant.

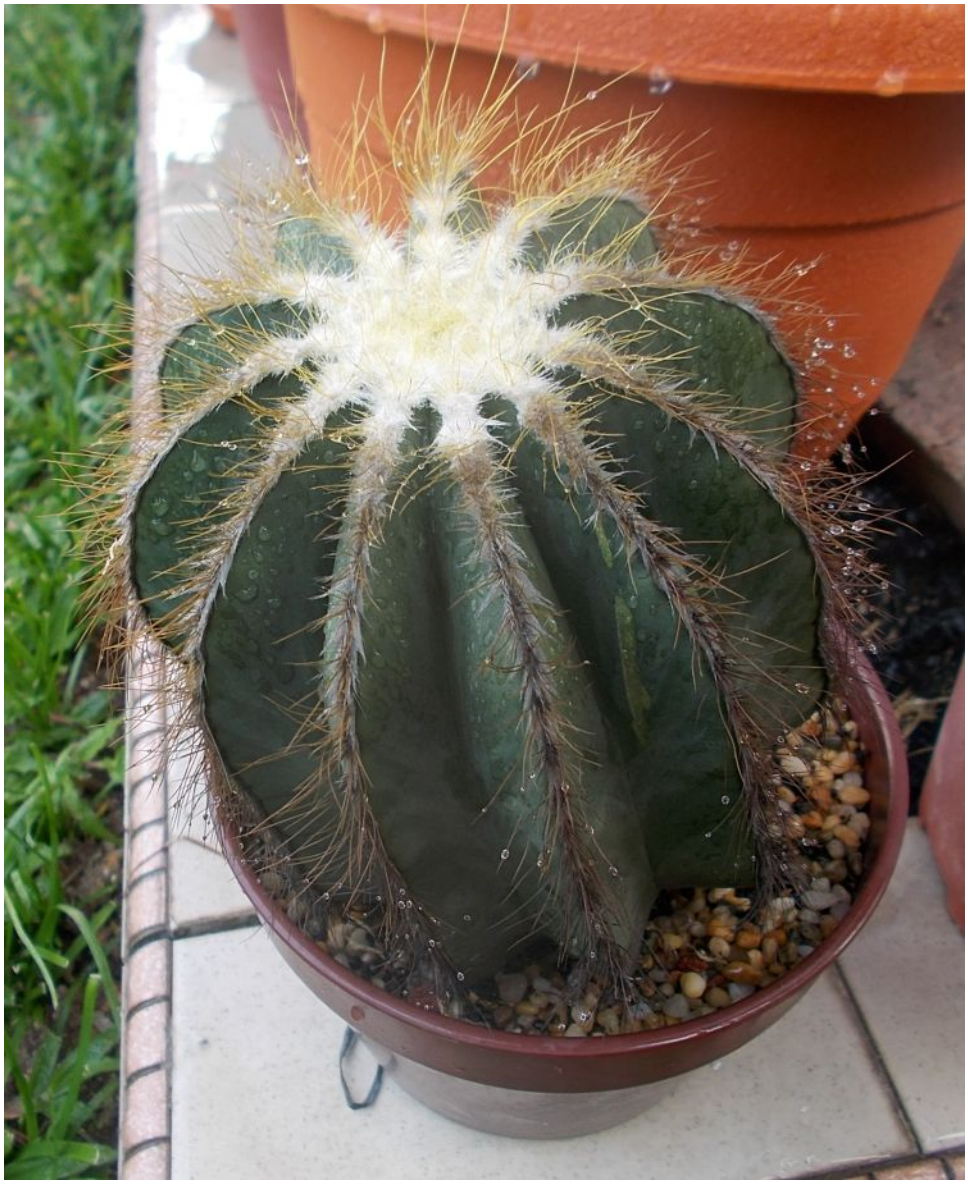
In 2017, it produced 2 flowers while in 2016 it produced only one flower. In any case, this specimen has not been repotted for a long time and is likely to be pot-bound. As you can see in the picture on the next page, it is indeed pot-bound.

This time I removed a lot of roots in order to let the plant grow out new roots (see second picture on the next page.) This kind of treatment does not harm most species of cacti.

The root ball of the specimen. (April 2018)

After removing a lot of roots. (April 2018)

After repotting. Let me repeat that the pebbles are just some old stock I wanted to use. These days I would choose scoria or pumice over pebbles. (April 2018)

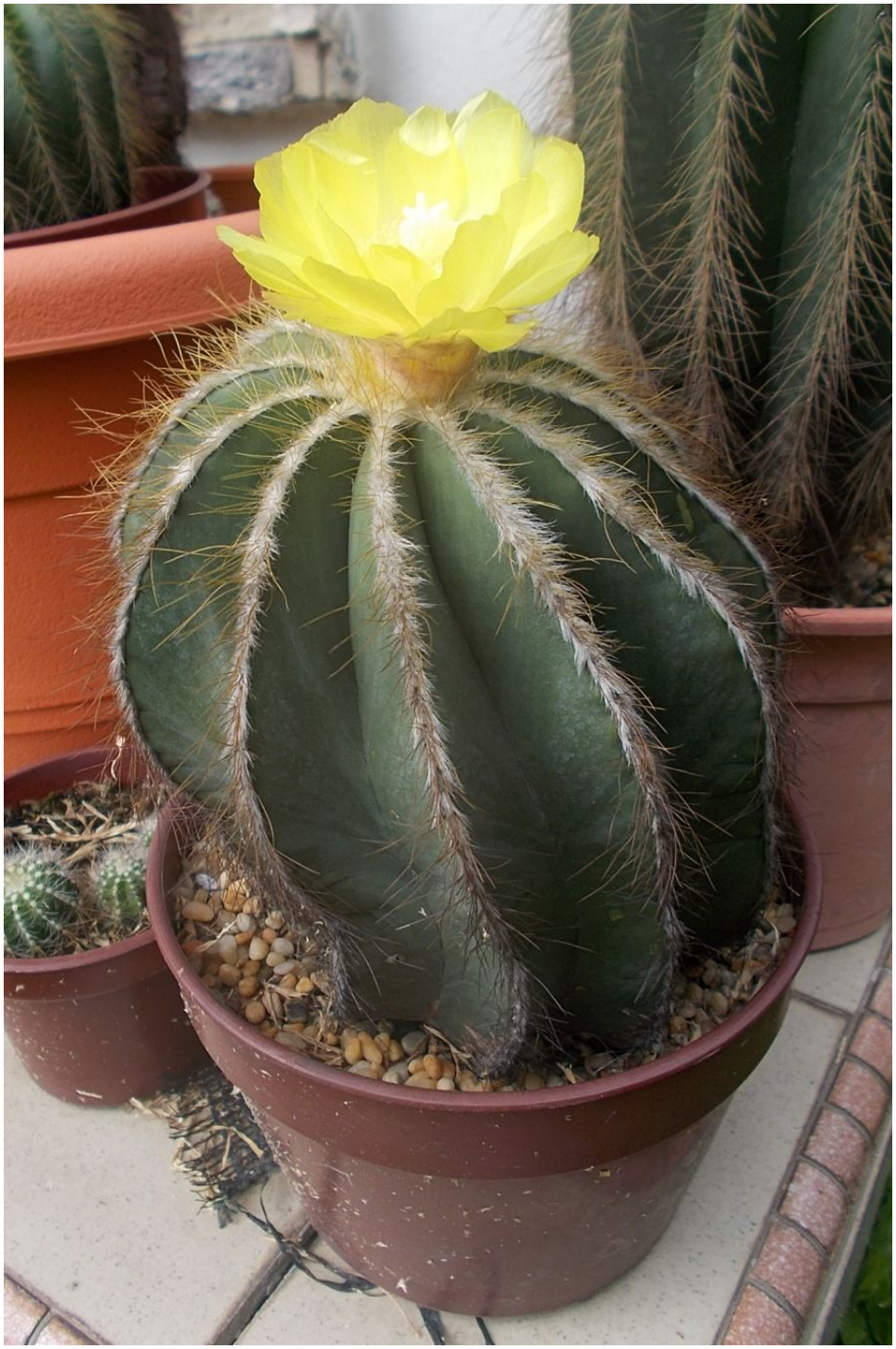


4 months after repotting, with new growth evident. The plant has just been sprayed with water. A densely-packed and wooly apex is a good sign, whether PMag or PClav. (August 2018)

If you compare the pictures of the specimen just after repotting and 4 months after repotting, it is clear that the PMag has grown wider and filled out. Strong growth and the dense and wooly apex are signs of a healthy plant. Also – no more wrinkles! Keep that going and a mature PMag may be quite willing to flower.

7 months after repotting, a flower bud is visible. (November 2018)

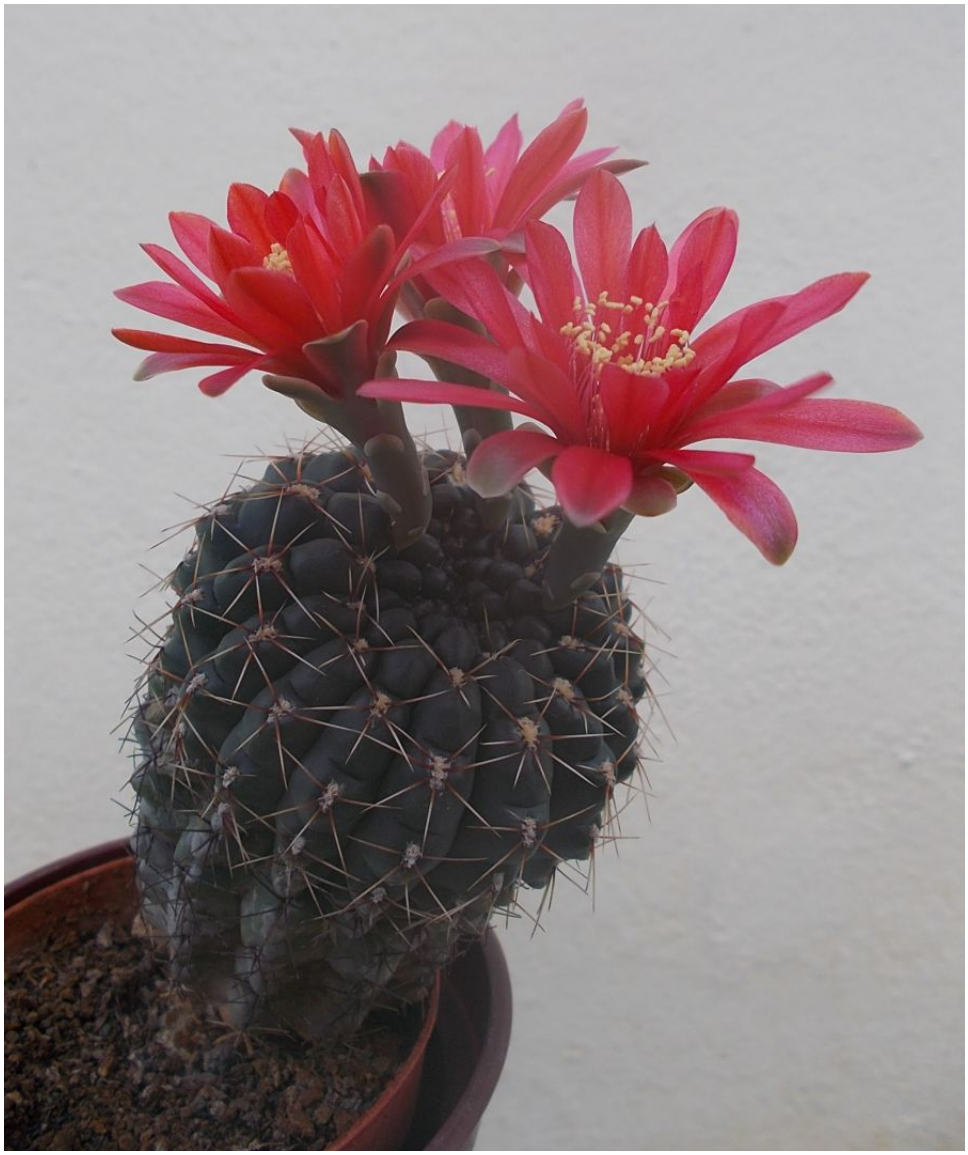
After another 3 months, the PMag finally decided to produce a flower bud. Compare the picture above and the one on the previous page and you will see just how much the apex portion has grown in those 3 months. And if you look at the picture of the PMag just after repotting, you will see that after 7 months, part of the stem is now as wide as the pot and a lot less pebbles are visible. That is plenty of growth in 7 months. This is the kind of growth a healthy plant is capable of. If you can maintain healthy growth consistently, then a good-sized mature PMag is quite willing to flower.



After 25 days from the previous picture, the flower has opened. (November 2018)

Since then, the numbers of flowers per month for this PMag specimen in 2019 were: 1, 1, 0, 1, 1, 1, 0, 3, 1, 0, 2, 3. The total is 14 flowers, and there were flowers in 9 out of 12 months in 2019. During 2019, this specimen also produced some viable seed pods, leading to spilled seeds and some volunteer seedlings among the pebbles. A little sustained tender loving care goes a long way.

GBald: July 2019



The specimen just before it toppled over. (July 2019)

One problem with GBalds in standard plastic pots is that they tend to topple over after a while. The upper stem grows bigger and wider, while the lower stem shrinks and becomes weaker. Often I will brace the stems using rocks to keep them somewhat vertical. It’s a temporary solution. Eventually you will have to either repot or reseat the specimen or it will topple over.

This specimen was repotted because it toppled over while I was shooting some pictures of it. As you can see in the picture above, I placed the pot in another larger pot. Unfortunately, plastic pots are too light to keep the plant from toppling over. I think it fell from a plastic stool; luckily the flowers survived.

The GBald specimen out of its pot. (July 2019)

The shrinking stem behaviour of GBalds is best seen or studied when you can inspect the entire plant. And so it turned out that taking pictures of repotting sessions is a useful activity.

The specimen was in a soil mix of largely black soil, and it didn't appear to have any healthy fibrous roots. No fibrous roots can be seen in the picture above. There are a few thick anchor roots. If you look at the root system, it doesn't look healthy at all. Yet the topmost 1 inch of the stem is still a nice green and there are 3 flowers.

So a GBald can appear to do quite well in black soil, but inside the pot, the root system really isn't in a very good shape. Perhaps this is why GBalds have a reputation of being "easy to grow" – it doesn't need a lot of roots to look good. At first, black soil might look like a viable choice as a soil mix, because the performance of the GBald misleads the grower. But in the long term, black soil may instead lead to more dead plants.

The challenge to the grower is to look at all of this information and figure out what is best for GBalds. Sometimes the story below the soil line doesn't match the story above the soil line.

A similar picture to this one was used in a discussion about the GBalds' shrinking stems in an earlier chapter. The soil mix with the scoria and pumice is the new mix to be used. A layer of scoria was then added above this. Finally pumice was used as the top layer. More experimentation. (July 2019)

Here is another view of the plant. (July 2019)

Closeup of the lower stem and the anchor roots. (July 2019)

Seen above is a closeup shot of the lower parts of the GBald. Magnified, some bits of fibrous roots can be seen at the base of the stem and on some of the anchor roots. It really isn't much to look at. For me, it was quite surprising to see this and 3 open flowers at the same time. But of course, GBalds can produce flowers without needing any roots, by using up its internal reserves.

It's quite possible that GBalds will always have poor root systems because shrunken lower stems are weak. And if fibrous roots are expendable to GBalds, we may have to abandon the concept of permanent fibrous roots. Growing a GBald with a strong root system of its own may be a near impossible goal.

What is the best way to nuture and maintain a weak root system over a long period of time? I don't know. Still experimenting. More data is needed. ♦

Version Information

This is the June 2020 Edition of this document.

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Colophon

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