Propagation Via Offsets

The following piece is part of a collection of writings published on the [Practical Small Cacti Malaysia site](#).

Oops. Due to reduced number of vehicles on the road in Klang Valley, Malaysia, around March and April 2020, there was less pollution. Clear skies and no rain led to hot weather. Hot weather caused these GBald offsets to turn reddish. Specifically, it may have been the high environmental temperatures; these were doing fine for many months under all sorts of lighting conditions. (April 2020)

Introduction

The first two sections details the behaviour of GBalds while they are in the midst of producing offsets. This needs further study because there is always the complication of shrinking involved. Next, there is an example with PClav offsets, which works more like normal cacti. The last section will discuss the progress of a tray of rooted GBald offsets grown in scoria (see picture above.)

Experienced growers have other techniques which I won't discuss in detail because my propagation efforts are only small scale. Cutting a plant into many pieces is one extreme technique. You can also try to damage the growing point in order to stimulate offset production.

Nicknames for Scientific Names

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

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

Offsets on a Grafted GBald

The production of many offsets by the grafted GBald specimen coincided with the shrinking behaviour of a large section of the stem at around 4 years after the initial graft was done.

Take note of the usual characteristics of shrinking by GBalds: the topmost 1 inch or so is still a healthy green; the middle part is turning yellow-green and shrinking; and the lowest part looks somewhat corky. However, the latter cannot shrink completely because of the joint.

For this grafted specimen, the lowest part is instead collapsing because it has greatly weakened and cannot support the heavy upper stem. (July 2018)

For GBalds, mature specimens often produce a burst of offsets from the base when they are a few years old. This is different from the very few offsets that appear during earlier growth. One is reminded of the burst of offsets produced by PMags when they are of a certain age. This is a good time to collect some offsets and increase the number of GBalds in your collection.

GBald offsets can be harvested at any size, but it is best to leave them on the plant for a few weeks so that they are at least ½ inch in diameter. Larger offsets are stronger and will establish themselves faster when set in a soil mix.

Two views of the specimen a few months later, November 2018. Some offsets have been harvested and new offsets have appeared. Scars from removing offsets don't matter in this case, because the shrinking will cause a big mess anyway.

While the top green part has continued to grow and produce flowers, the lower yellow-green portion of the stem has shrunk significantly. This can be clearly seen in the second picture. It is trying to do the shrinking thing but a grafted GBald does not have a normal base with a normal root system. Since this GBald has better spines than the old "fat and juicy" specimen, it is hoped that a grafted GBald will have a better chance of survival. As of May 2021, it is still alive, on its own roots.

A closer look at the base of the grafted GBald. There are round scars due to the harvesting of earlier offsets. (December 2018)

With GBalds, success begets success. A large and strong specimen that grew well will have ample resources to produce many offsets. A grafted specimen will often be larger and stronger than normal plants – MGeo is great stock material for GBalds. Thus the easiest path towards multiplying your GBald collection quickly is to make a number of GBald-on-MGeo grafts.

Other strategies are also possible, for example: rich soil, feeding with lots of fertilizer, hydroponics[1], aeroponics, etc. The biggest problem with such strategies is the weak root system of GBalds. Of course, one can put the grafted GBald in a hydroponic setup, and the MGeo's root system should be able to handle the conditions better. That idea works, by the way.

1 James Pickering's website has a page on "Cultivating Cacti semi-hydroponically Using drain-to-waste methodology" at `http://jp29.org/brculthydro.htm`. You might have to use the Internet Archive's Wayback Machine at `https://archive.org/` to read the material. It sounds more viable than basic deep water culture (DWC).

Closeup of the base area of the GBald. Note the thick roots on the two lowest offsets. GBald offsets sometimes produce roots while still attached. (January 2019)

In the above picture, we get to see the reason for the sudden production of offsets. The two lowest offsets each have one or more roots protruding from their base. Such roots are not uncommon. Evidently, the offsets are to be the next generation of plants – they will have a big advantage over seedlings that germinated from seeds because such offsets can get nutrients from the mother plant at the same time they are growing out their own root system.

Old GSteno offsets also produce such roots. For both GBald and GSteno, often just one stubby root is produced. GBald offsets are usually produced on the lower stem, often in a burst of multiple offsets like PMags. GSteno offsets are uncommon and they are produced on the upper stem much like PClavs. In habitat, *Gymnocalycium* are often half-buried, so the roots on such offsets can probably touch the soil and grow out.

Three days later, the two GBald offsets each with a single stubby root have been removed, along with a larger offset. (January 2019)

As for the mother plant, it will be expendable from this point forward. The growing offsets may put out more roots and they may well end up killing the mother plant at some point. If you search for the phrase "*gymnocalycium baldianum* habitat", you will be able to see some pictures of small clusters of GBalds in habitat. Perhaps some of the plants in a cluster grew up as offsets. But plants in habitat probably cannot produce as many offsets as a well-fed grafted specimen.

This is perhaps the easier way of multiplying your GBalds via offsets. In cultivation, there is a good chance the mother plant will survive. The main risk factor is the inevitable shrinking, but that's something that will eventually happen to your GBald specimens, offsets or no offsets.

Behaviour of a Cut GBald Stem

Left: Cutting up the long and fat GBald, May 2016. That scar has already been mentioned in a discussion about centipedes as a cactus pest. **Right**: The top half in August 2016. The stem with its dried and healed base was potted up in July 2016. Between cutting and potting up, it produced 2 flowers. In the above, one flower is old while the other is new, hence the significantly different colours and sizes.

The rationale for cutting my long and fat specimen into two is to save upper stem from the yellowing lower stem. At that time I have not understood the shrinking behaviour of GBalds[2]. But the yellowing lower stem sure did not look good at all. It was also obviously weak, because it could not hold up the long stem of the specimen.

The specimen was cut on a hot day and left to dry. As you can see in the picture above, the cut surface was moist and spongy, not wet and juicy. This may be the look of internal GBald tissue when it is starting to shrink. Luckily both parts survived without any fungi issues.

2 Shrinking behaviour finally dawned on me when studying pictures for an earlier draft of these chapters. When working with cactus plants, one is often too focused on the task at hand. I learned a lot by studying pictures of cacti over a long period of time with the explicit intention to learn about cacti behaviour. But for that you gotta have lots of pictures. These days I am also better at capturing novel or unusual things for study later.

Left: the lower stem in November 2016. **Right**: the lower stem in December 2016.

After about 6 months, there is shrinking and two offsets have appeared. Thanks to a picture archive, we can observe an interesting behaviour: only one side of the stem has yellowed! The yellowed half has shrunked more.

It is likely that the reserves from one side could not get to the other side. The vascular bundles run from top to bottom, and they have been truncated at the top. Also remember, the tissue of the specimen was moist and spongy, not wet and juicy. Diffusion of nutrients in the plant would be very inefficient with spongy tissue.

So this cut lower stem is facing a problem in moving resources about. When it grows offsets, reserves get used up, and it turns out reserves on the other side cannot get to the offsets. So only half the stem yellows and shrinks.

Left: the lower stem in February 2017. **Right**: the other side of the stem, March 2017.

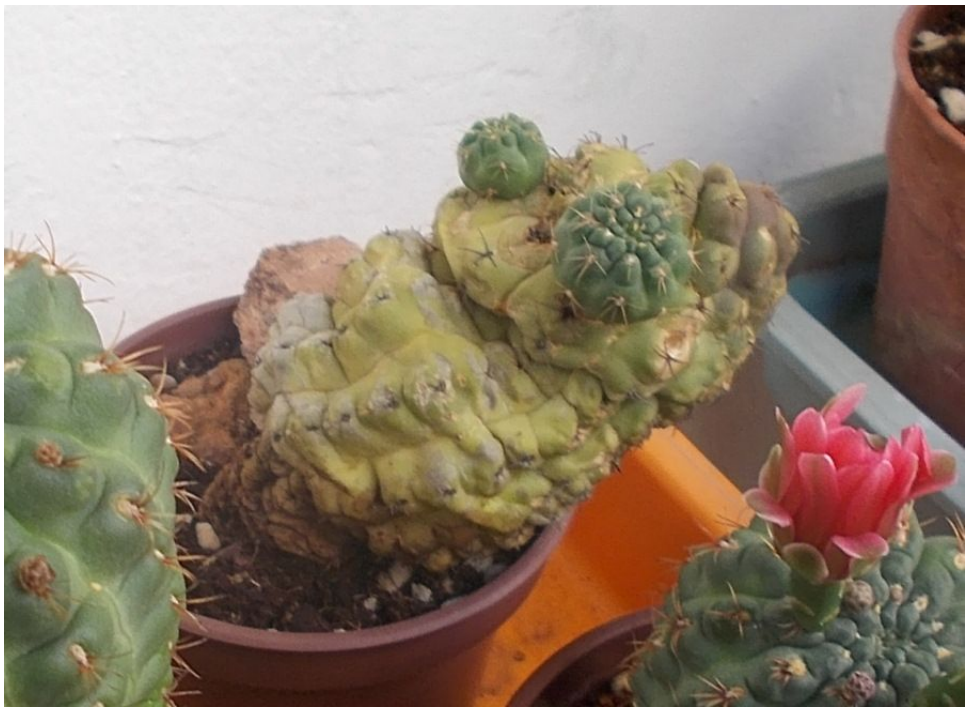
After several more months, both sides are yellowed, because the stem has produced three offsets on the greener side. As far as I can tell, a cut GBald stem cannot stop its shrinking action; hence you cannot use a lower part of a GBald specimen to produce offsets in perpetuity.

You will only get a certain number of offsets, and then the stem will run out of resources. While the stem was green at the start, it was to no avail. It is easy to guess that the cut vascular bundles coupled with the moist spongy tissue leaves the specimen with a nutrient transport capability that is too crippled for survival. If the plant cannot move resources about, it cannot revive itself. For a specimen with the top intact and all, the vascular bundles still work, so the lower stem will only shrink and eventually it will become something of a primitive trunk, kind of a highway for the vascular bundle connecting the root system to the still-healthy parts of the plant.

Getting offsets this way is a temporary thing. The shrinking condition is fatal to the stem. But sometimes you want to cut up old specimens that are long and unwieldy. It is useful to know how the lower stem will behave so that you won't be surprised at what will undoubtedly happen.

But if you have a GBald specimen that *does not shrink, ever*, that's solid gold and I think it will be worth a lot.

The healthier side in April 2017 is looking quite yellow and shrunken now. The offsets have grown at impressive speed.



4 months later, in August 2017. Several offsets have been harvested. The stem has little reserves now and there won't be any more new offsets to harvest. The pieces of broken bricks were meant to prop up the specimen. At that time, I have not understood the weakness of the shrinking stem, hence I was still hoping it would somehow revive itself and turn into a green stem again. Now I know better.

The specimen as seen from the weaker side in September 2017. That’s the last offset.

After about 16 months, the lower stem does not have much more to give. It can no longer produce new offsets. The final offset, as seen in the picture, no longer grows bigger. The stem has become a drying husk that is slowly dying.

To be sure, it’s not dead yet, because as you can see in the pictures on the next page, the husk was still barely alive in April 2018 after another 7 months. It appears that the spongy tissue can hang on for a very, very long time. One wonders whether such cactus plant tissue can be revived or restored to a healthier state using nutrients or hormones.

The specimen, out of its pot in October 2017.

In April 2018, nearly 2 years after the original plant was cut into two. It is now something of a dried husk, but it is not completely dead yet. The barely moist plant tissue inside the stem is really spongy and airy (see next picture.)

The mostly dried husk was cut up in April 2018 as an experiment. The biggest piece, which was the upper part of the stem, is already drying and collapsing.

The two smaller pieces in April 2018, one week later. There is some fungi on the cut surfaces. The two pieces just dried up; there are no more reserves in those stem pieces to do anything. Note the circular pattern of the vascular bundles on the cut surface.

When dealing with the lower part of a GBald that was cut, remember the shrinking complication of GBalds. You will be able to harvest some offsets, but the operation is ultimately fatal and there is no escape. Observing the progress of this particular lower stem has made it clear that such shrinking stems have no capability to revive themselves and become green again.

Harvesting PClav Offsets

The PClav offsets just before harvesting. (January 2019)

5 offsets after being detached by hand. (January 2019)

A closer view of the fresh scars just after the offsets were harvested. Also note the wool shed by newer areoles. (January 2019)

This has been partially covered in the chapter on Repotting Cacti. PClavs can produce offsets naturally, but in practice it rarely happens. To actively multiply your PClav collection, the best options are: (1) pump a specimen full of nitrogen so that it produces a mass of offsets, (2) cut up a specimen leaving the lower part to produce offsets, or (3) harvest seeds to grow seedlings. To get more genetic variation, use seeds or buy new plants.

The 5 harvested offsets represents 5 months of growth – they were only just visible in August 2018. This is the fastest way to make new plants of good size. Unlike a lower stem that has been cut, here an entire healthy plant can help the offsets to grow bigger. Larger offsets are easier to root and they also grow faster. Small offsets may struggle to establish roots. Weak offsets may dry up and die.

However, for PClavs there is a size limit to which offsets will grow on the mother plant. The offsets will not grow so large that the specimen turns candelabra-shaped. If you look at pictures of PClavs on the Internet, you will not see PClavs with branches like large MGeos, or a mound of stems like PMags. You can either leave the offset on the plant forever, or harvest it to increase the number of PClavs in your cactus collection.

A closer look at the offsets. (January 2019)

The concave underside of the offsets. If you buy a cactus plant and the base does not taper, it may be a harvested offset with a concave underside. (January 2019)

The scars, 3 days later. Now the offsets still on the plant are growing quickly. At least one flower bud can be seen in the center. (January 2019)

Scars that are left after you have detached the offsets are almost always never a problem. Fresh, the scars will look rather unsightly, but they will be much less prominent after a few months. Many cactus plants grow continuously – they can keep growing wider, up to a certain point. So the scars will shrink and in time, normal growth will crowd out the scars.

The offsets are left to dry for a few days (see pictures on the next page.) The attachment point will dry and a callus will form. In plants, callus are unorganized cells that form over a wound[3]. Roots will readily form at the callus. Offsets will probably do fine if you place them immediately into a soil mix, but many experienced growers would choose not to take unnecessary risks[4].

Offsets will root faster in a soil mix with a higher fraction of organics. If you use a lot of black soil, avoid keeping the soil wet for long, for that will attract fungus gnats – offsets are tender and might not survive an attack of fungus gnat larvae. For the soil, think “very moist” to “barely moist”. “Dripping wet” is a risky practice. I will often try weird experiments (see second picture on the next page,) such as getting PClav offsets to root in a disposable plastic bento tray with no drainage and with scoria as the bottom layer and black soil as the top layer. This is not recommended practice. You can conduct your own experiments too – experiments are fun and you might end up with useful data or observations.

3 Callus cells are exploited in tissue culture to propagate large numbers of plants quickly.
4 For cacti with *soft stems*, immediately potting up detached offsets is a highly risky practice.

Planting out the offsets 8 days after harvesting. The attachment points of the offsets have dried and callused over. (January 2019)

A disposable bento tray with 5 PClav offsets. (January 2019)

The scars are hardly noticeable after 2 months, March 2019. There was one flower in February 2019. The flower bud seen here led to a flower in May 2019.

As you can see in the picture above, the scars are no longer unsightly after just 2 months. They can still be seen but they no longer detract from the look of the specimen. It's not perfect, of course. The specimen is still growing strongly and the two largest offsets have grown considerably.

In May 2019, the next two largest offsets were also harvested. Two older rooted PClav offsets from the tray were moved to their own pots[5] and the new offsets were planted in their place.

5 Pictures and a discussion of this move can be found in the chapter on Roots in Rocks.

Detaching one offset. This time I wore disposable gloves. (May 2019)

Two detached offsets with the parent plant. The PClav was still producing new offsets – very convenient if you want to multiply PClavs, but a tad annoying if you are looking forward to flowers. (May 2019)

Ready to plant the two new offsets on some new scoria. (May 2019)

The two new offsets were simply placed on the scoria. The older three offsets have been growing in the tray for 4 months. (May 2019)

The tray of PClav offsets after 1 year. The three on the left side are from the January 2019 harvest while the two on the right were harvested from the same plant in May, as we have seen. Note the older top layer of black soil (left side) and the newer scoria top layer (right side). Salt deposits can be seen on the walls of the container. Soil as the top layer tends to promote salt deposits in a hot tropical climate. (January 2020)

PClav offsets are very easy to grow. In the picture above, the rooted offsets are not getting ideal care. They are on a boom-bust watering (or spraying) cycle and fertilizer feeding is irregular. The spines are very nice and dense, but you won't be getting the maximum possible growth speed.

Progress of the GBald Tray

Setting up a tray of small GBalds. No soil was used, just scoria. Bits of sphagnum moss provides extra moisture. There are no drainage holes at the bottom. As for the GBalds: the round ones grew outdoors; the long ones grew indoors. (March 2019)

Since I had a few GBalds that produced large numbers of offsets, my collection of small GBalds quickly increased. At first, I tried growing some indoors near a window, but bugs still managed to attack a few times through mosquito netting thanks to the wind. Also, these GBalds stretched out and grew long while their colour turned into a lighter shade of green – they didn't look hardy at all.

Next, I tried rooting some GBald offsets outdoors in a tray of scoria and LECA balls. These GBalds stayed round with good colour, so I decided to set up a proper tray and fill it with small GBalds (picture above.) Most have roots, as they were the results of earlier experiments. No soil was used, since some of them had earlier grew nice and sturdy root systems in scoria.

The tray pictured just after completion. There are bits of sphagnum moss under each small GBald so their root system won't dry out too quickly. Initially, they were sprayed with fortified water once or twice a week. (March 2019)

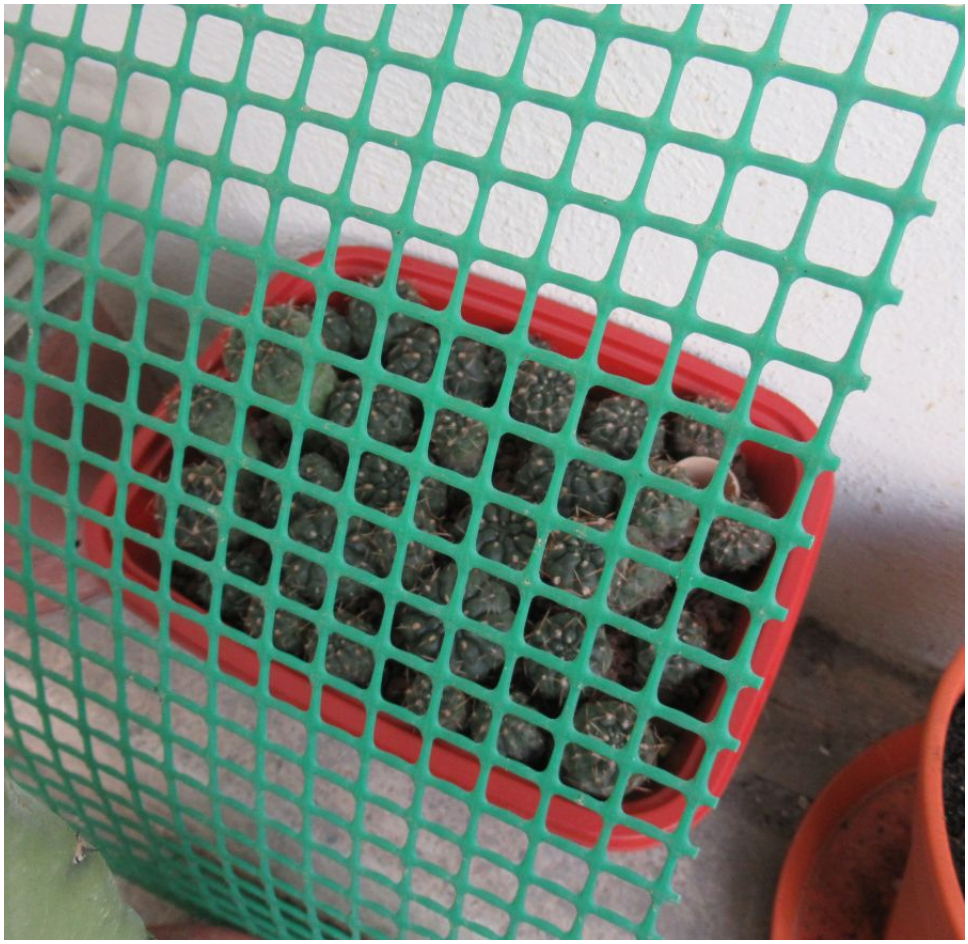
The tray pictured in the following month. The lighter coloured GBalds are plants from indoors, still adjusting to their new environment. The ones that grew outdoors had no problem settling into their new home. (April 2019)

At 2 months after planting, in May 2019. The indoor GBalds have produced dense and spiny new growth, and their colour have improved.

At 6 months after planting, in September 2019. Two weak GBalds near the tall specimen on the right have failed and both were removed. But there are still 30 plants in a single tray. Those that were never indoors look strong and healthy. This is a convenient way of growing a large number of small GBalds in one place.

Around April 2020, a heat wave caused the GBalds to turn red-green in colour. Normal-sized GBalds did not change colour during this unusually hot weather.

With more shade, the GBalds recovered quickly. It’s getting somewhat cramped in there. The green plastic netting also provides some shade. (May 2020)



Another view of the tray in August 2020, just before six of the GBalds were removed to be planted out into their own pots.

After June 2020, my collection was more frequently sprayed so that they can absorb more nutrients. These GBalds probably grew better due to this change in cultivation practice. Apart from a scale insect or two, the tray of GBalds was quite problem-free. Only two small and weak GBalds from indoors failed, leaving 30 good ones. This is a very convenient way of maintaining lots of small GBalds – feed them less and they can be kept densely-packed in a single tray for a long time.

In August 2020, six of the GBalds were pried out from the tray and planted out in 2 inch pots. Their root systems looked excellent – there were thick roots and thin roots and nothing looked flimsy[6]. There were no bugs to be seen among the scoria and roots – no more worries of fungus gnats in soil!

Having seen the results of this experiment, I would never go back to growing GBald offsets in soil. The main point of *The Stone Eaters* is correct, only I have simplified the environment for the small GBalds by using only scoria, applying fortified water sprays, and adding bits of sphagnum moss to retain moisture. Drainage is ignored because the amount of sprayed water dries up quickly in the hot tropical weather. In addition, the moss and the scoria will soak up much of the water, giving GBald roots an airy and moist environment to thrive in. ♦

6 This is covered in detail in the chapter on Roots in Rocks.

Version Information

This is the June 2021 Edition of this document.

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Colophon

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