Seeds and Volunteer Seedlings

The big PClav with two seed pods that have burst open[1] in September 2018. A small part of the pods are still connected to the plant, so the pods hinges upwards when they burst open, spilling some seeds on the soil down below.

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

Introduction

PMags and PClavs may set seed pods on their own. Sometimes pods contain very few seeds; sometimes pods were full of seeds. Spilled seeds from the two pods in the picture above probably led to the appearance of volunteer seedlings among some pots of *Parodia*s a few months later.

1 I think the correct botanical term is dehisced (from *dehisce*), but I'll just use plain English here.

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.

Cactus Seedlings and Challenging Microclimates

This chapter covers some of my experiences in growing cactus seedlings outdoors in the hot and humid tropical urban lowland climate of Klang Valley, Malaysia. It's not a very good microclimate for growing tiny cactus seedlings. Luckily, I have plenty of *Parodia* seeds to experiment with.

I am not a very diligent gardener. If you are like me, you can expect to suffer considerable seedling losses in the urban Klang Valley microclimate. It's a concrete jungle with the occasional extreme conditions. A heat wave, for example, will quickly dry out a small container that is located outdoors. If the container has a cover, your cactus seedlings will be baking inside as the potting medium dries out. But with some adjustments and more diligent care, I'm sure it's possible to successfully grow lots of cactus seedlings in a challenging microclimate.

The two harvested PClav pods with many seeds. The pictured plastic tray is not actually a good container for seed cleaning as seeds will often cling to certain types of plastic containers due to static electricity. (September 2018)

Volunteer Seedlings for Outdoor Experimentation

A volunteer seedling (arrow) was found in the big PClav pot in December 2018.

Closeup of the above. (December 2018)

A volunteer seedling is a seedling that germinated and grew on its own. It's not something you intentionally grew from seed. Volunteer *Parodia* seedlings are unavoidable, because when seed pods work as intended, they burst open to spill some seeds out onto the ground below. In a hot urban tropical climate, most of these seedlings will not survive very long – one hot spell and they are done for. They need to be rescued if you want to see any grow into mature cactus specimens.

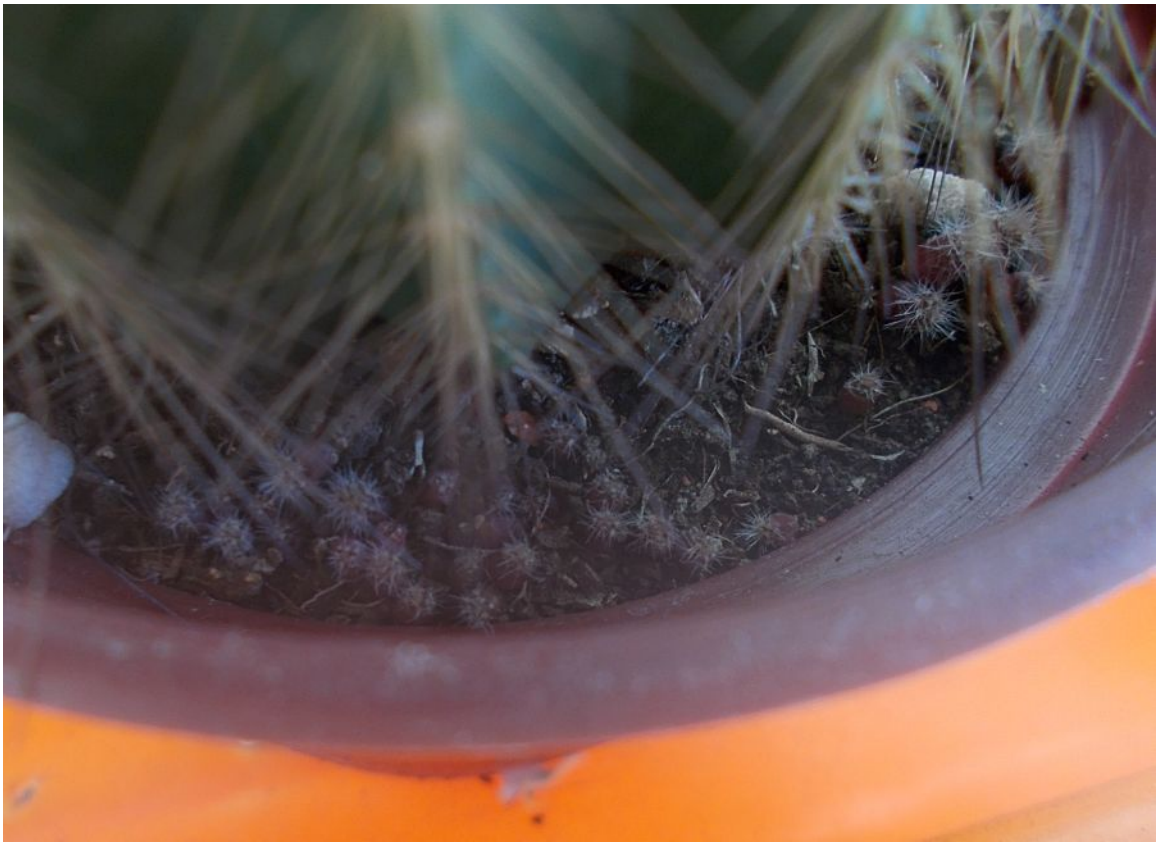
PClav seeds spilled into other pots. Here is another volunteer seedling. (Dec 2018)

Closeup of the above. It's red in colour, poor thing. (Dec 2018)

The volunteer seedling on the previous page is red in colour because it is stressed. In December, the sun's track is to the south, and my *Parodia* specimens get the maximum hours of full sun per day for the year. A lot of seedlings probably did not survive, and those still alive are stressed.

After a search, tens of seedlings were found on these two PClav pots. They had been positioned below the main stem of the big PClav. These seedlings are largely in the shadow of the PClavs, so conditions were slightly more benign. (December 2018)

Closeup of one pot, showing numerous PClav seedlings. (December 2018)



Closeup of the other pot. These are stressed cactus seedlings. (December 2018)

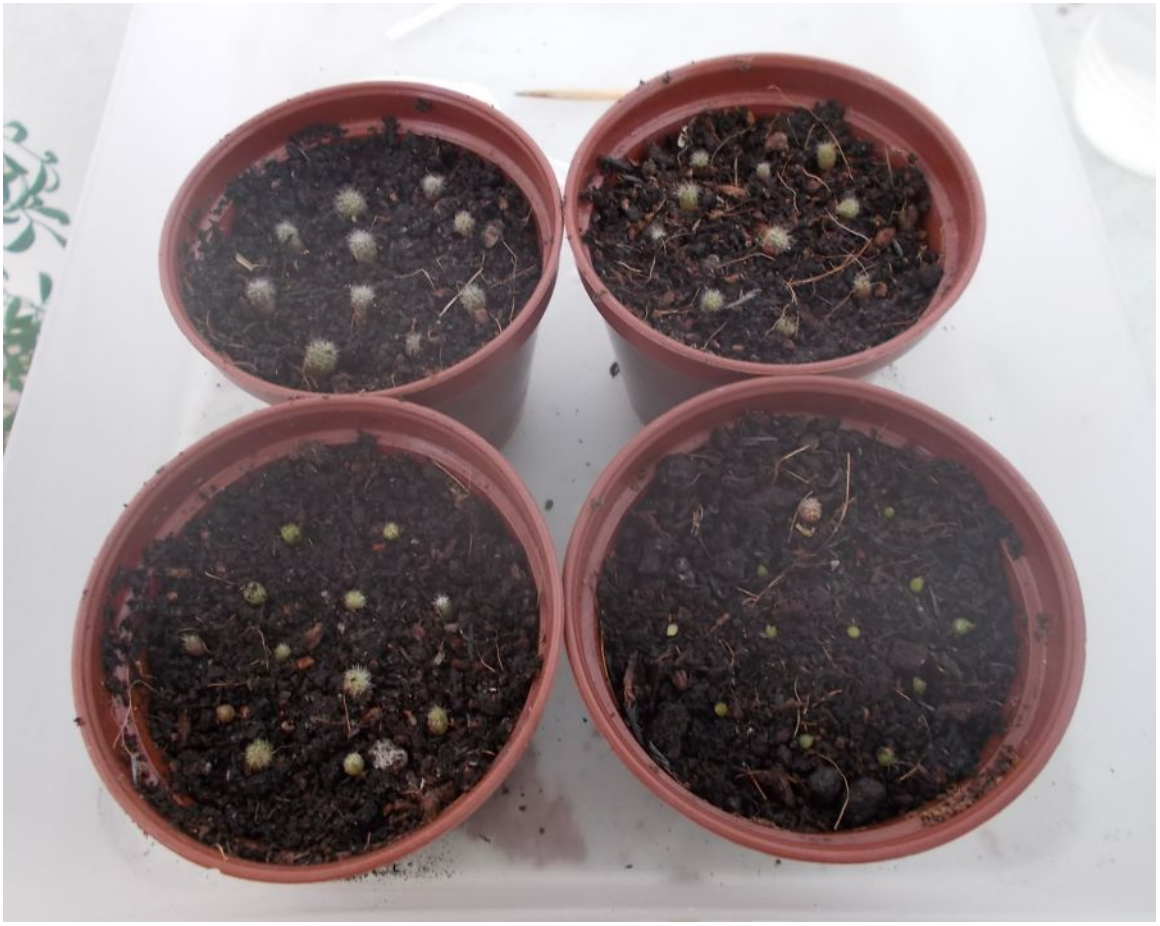
As seen in these pictures, tens of seedlings were found in two smaller PClav pots. These two PClavs were rooted offsets, and had been pushed to flower[2]. The smaller specimen has yet to flower at this time, while the larger specimen had already produced two flowers. This means the two specimens also got better care, and the pots were usually moist. Therefore seeds that spilled into these two pots were lucky.

The two PClavs have grown a lot since they were potted up and the pots were beginning to look small and crowded. The narrow strips of soil still visible are usually moist and in shadow. Because these narrow strips of soil had more benign conditions, more seeds germinated and more seedlings survived. But note that the seedlings were still stressed because they were all red in colour.

In order to grow cactus seedlings outdoors and have them look green, they will need to be cultivated under milder conditions. Without some kind of extra shelter, this is difficult to accomplish in an urban heat island in the tropics. In their natural habitat, seedlings often survive in the shadow of the parent plant, which itself is often slightly shaded under sparse or scattered vegetation[3]. But you can still grow seedlings in an exposed location in a hot tropical setting, if you don't mind killing a good number of the weaker or smaller seedlings.

2 See the chapter on Flowers and Forcing Flowers for the details.
3 I think this is valid for South American cacti such as *Parodia* or *Gymnocalycium*.

Transplanting for Outdoor Cultivation



The PClav seedlings after transplanting into pots. (January 2019)

Since the volunteer PClav seedlings cannot be left in their original location forever, they were carefully picked out and transplanted in the following month (picture above.) My objective was to gain experience in growing seedlings outdoors. Losses are to be expected, given the extremes of the tropical urban microclimate[4]. On the bright side, these seedlings feel firm and have good spines.

The potting mix was probably new black soil mixed with some coco peat. In order to provide a bit more shelter, the four pots of PClav seedlings were put in a clear plastic kiwifruit container. The container is open at the sides, so there is some ventilation. But if the soil becomes bone-dry, seedlings may get cooked in the sunlight. So the challenge is to keep the soil mix moist. Too dry and the seedlings will become stressed and their roots damaged. Too wet and algae will start to take over the surface of the potting mix.

4 This discussion is in the context of the concrete jungle part of urban Klang Valley, Malaysia, where developers are obsessed with turning every bit of green land into properties they can sell. Your plants may enjoy milder conditions if you live elsewhere in Malaysia. For example, I've never had much luck with spanish moss (*Tillandsia usneoides*) but I've seen gardens with beautiful masses of them outside of Klang Valley.

A closeup view of the largest bunch of rescued seedlings. (January 2019)

The pots were placed in a kiwifruit container as an additional shelter from the sometimes extreme urban tropical climate. (January 2019)

The kiwifruit container with its cover open. (January 2019)

After a month, some progress can be discerned. These seedlings look noticeably larger. The large seedling at far left is not a PClav seedling, is a GSteno seedling from indoors. (February 2019)

Algae Problems with Growing Seedlings Outdoors

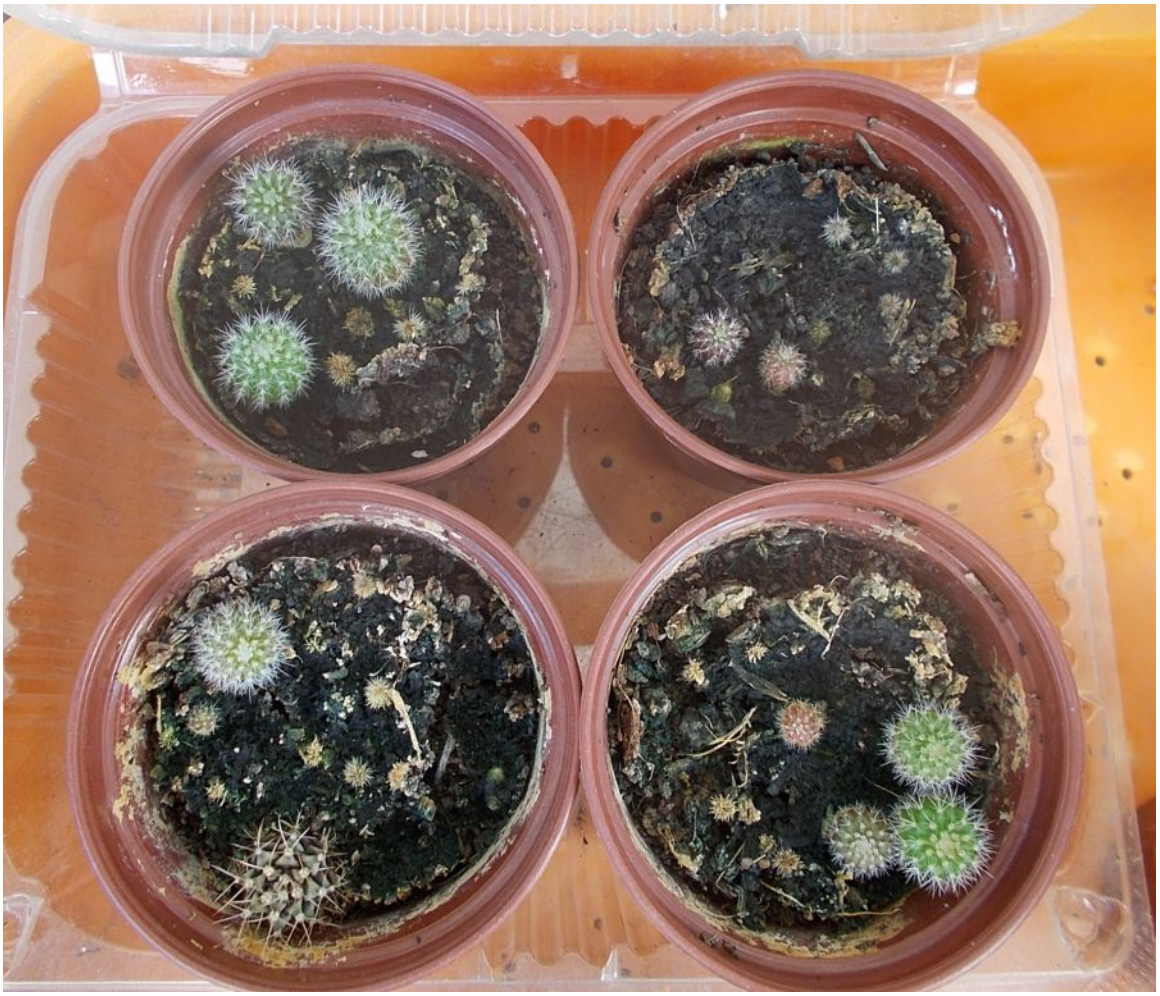
The beginnings of an algae invasion. Some seedlings were doing well, some others were not. Some were already dead. Plastic pots of cactus seedlings or small cacti using a soil-based mix will often have salt deposits on the sides of the pots due to the high rate of evaporation in the tropics. (March 2019)

Algae invasions are not new to me – I've had such issues in the past. When we try to cultivate cactus seedlings outdoors in the humid tropics, algae can be hard to avoid. We need to maintain the pots of seedlings so that they do not become bone-dry – the objective is to avoid damaging the fragile root systems of small seedlings. Seedlings with damaged roots or seedlings that are stressed and look red in colour will often take months to recover. Or they may die. Since the pots are always moist to some degree, it is easy for algae to take hold on the surface of the potting mix.

If you are careful not to keep the potting mix wet for too long, it will take months before algae becomes a problem. However, extended wet conditions coupled with dilute fertilizer feedings will turn a minor algae problem into a crisis in a few months. Algae will grow all over the surface of the soil and suffocate your cactus seedlings. I don't use any anti-algae chemicals and my water spraying regime is not perfect; as such I have to accept some losses.

A closeup view of the largest seedlings. (March 2019)

The algae problem is worsening. (April 2019)



About 5 months after the pots were established, the algae has become so thick that there is a kind of dark green skin as the top layer. (July 2019)

After a few months, one can easily smell the algae. Some of the smaller or weaker seedlings will get swamped or suffocated by the algae and will die, turning into tiny dried spiny husks (above picture.) Picking out pieces of algae is at best a stopgap measure. Prevention is the best strategy. For example, see this online article:

> Ann Chase, **Algae Invasion**, *Greenhouse Management*, November 2013.
> URL: `https://www.greenhousemag.com/article/gm1113-algae-invasion-management/`

To slow down the invasion of algae, I suppose one has to have some skill in controlling moisture and nutrients. Actually, while there are about 10 PClav seedlings that are able to weather the algae onslaught, many other smaller seedlings are not truly dead yet, but they are in danger, stuck in the thick layer of algae. I guess this is sort of a self-inflicted mess due to less than perfect care. But it's not the end of the world, since these outdoor seedlings were more or less expendable[5].

5 In late March 2019 I sowed some seeds indoors and germination rate was good. Plenty to experiment with.

Transplanting (or Rescuing) the Seedlings Again

In August 2019, with a stone to hold the container cover down.

There is no fixing this algae invasion. (August 2019)

Closeup of one pot, showing the algae layer on top of the soil. The little brown spiny tuffs are dead seedlings. (August 2019)

If you are growing cactus seedlings outdoors in the urban tropics, and you occasionally over-water, then an algae invasion is inevitable. That extra bit of moisture and the bright tropical sun allows algae to grow very fast. Soon you will see a green layer on the soil surface. You'll be able to smell the algae. Watch out for the fungus gnats too – wet algae is yummy food for them.

I think *Parodia* seedlings are quite robust, and they will do well outdoors with some help. Give then some shade and some moisture. If you are willing to transplant them every few months, then it's possible to mitigate the algae problem. You can also try to pick out the algae. The latter may be a good preventive measure if you can provide consistent care for your pots of seedlings. Careful watering and feeding will also help to limit or slow the spread of algae.

The entire algae layer can be removed from the pot as a single piece. (August 2019)

As you can see in the above picture, the algae has glued together the top layer of soil, so the algae layer can be pulled off in one piece. Lift the piece to your nose and you will be able to discern the smell of algae.

Larger PClav seedlings can probably survive such an algae invasion; they are strong enough to extend their stems upward out of the algae layer, and their roots downward to reach the soil below. In the picture on the next page, you can see that most of the large seedlings have good root systems.

There were also a good number of small PClav seedlings that survived (see picture on the next page.) Most were hardly visible, embedded within the piece of algae and soil. Like most small, stressed seedlings, these do not have a lot of roots to speak of. These seedlings will eventually get overrun by algae if nothing is done.

Thus, this somewhat haphazard cultivation of seedlings outdoors in the urban tropics is not a total failure. If you don’t mind a high mortality rate, then this may be an acceptable method of getting some PClavs from seeds with a minimum of effort. Poor care will lead to many dead seedlings, but a fraction will survive and become viable small cactus plants. The tropical urban outdoors is not a benign environment. Put in more sustained effort, and you’ll get more small PClavs.

These are the larger seedlings. Note the root systems. (August 2019)

Surprisingly, there were still a good number of smaller seedlings. (August 2019)

The new experiment: seedlings in a container of jiffy peat and coco peat. (Aug 2019)

The seedlings were transplanted into a new experiment: a square disposable container with no drainage filled with a mix of jiffy peat and coco peat. This avoids the use of soil. However, the risk of algae is still present due to nutrients in the mix[6]. Squeeze some water from the mass of jiffy peat if it's too wet. The coco peat will of course absorb some of the water.

One thing to remember about such potting mixes is that you must *never* let it turn bone-dry. Sometimes that is easier said than done in a hot tropical climate. The exposed surface of the mix will dry out *very fast* when it is hot and windy. I use a top layer of scoria as mulch for larger specimens, but scoria is hard to use when seedlings are very small. Coarse sand is often recommended for seedlings, but in the future I plan instead to use slightly coarser material such as stone aggregate, granite chips, or stone pebbles. Stone of around 2–3 mm in size should be suitable.

I have come across one excellent explanation for this problem with soilless mixes: When the mix becomes bone-dry, there is no more water and the organics in the peat will come up to the surface of peat particles. Since organics are often water-repellent, the peat particles will become water-repellent too. Thus, you will usually have difficulty in getting your soilless mix properly moist again.

6 I vaguely recall checking the EC reading of water squeezed from a jiffy pellet and it was around 1000 µS/cm. So there is likely some fertilizer present in most jiffy pellets.

The container of seedlings was placed in a clamshell burger container so that airflow can be better controlled. (August 2019)

The seedlings after a spray of water. (August 2019)

The seedlings in their container were then placed outdoors in a sheltered location where they are protected from the hot noonday sun. The clamshell container is usually held slightly open by the stone seen at the bottom of the picture. (September 2019)

A jiffy peat and coco peat mix is not a foolproof solution to the problem of algae control. More important is how you water, the nutrients in the mix, and the environment or protections that you provide[7]. This is quite a challenging problem in the tropics because the surface of the potting mix is the glaring weak point – the exposed surface dries out really fast in hot and dry weather.

For this experiment, I changed the outer container to a clamshell burger container. Unlike the kiwifruit container, this clamshell container can be closed tightly. But I'm not keen on keeping containers of seedlings completely closed – some of my normal indoor seedlings turned glassy or translucent in a closed container under very moist conditions[8]. As such, I usually prop up the lid with a stone so that the container is slightly open to allow for a bit of airflow.

The overarching issue with growing seedlings outdoors in the urban tropics is the need to provide sustained and precise care needed to maintain cactus seedlings under generally moist conditions.

7 It would have been better with a mulch – which is now clear in hindsight. Put your thoughts in words, it's useful.

8 I'm not aware of any official C&S terminology for this phenomenon, but in plant tissue culture, a similar phenomenon is called *hyperhydricity* (previously known as vitrification.) This is covered in the next chapter.

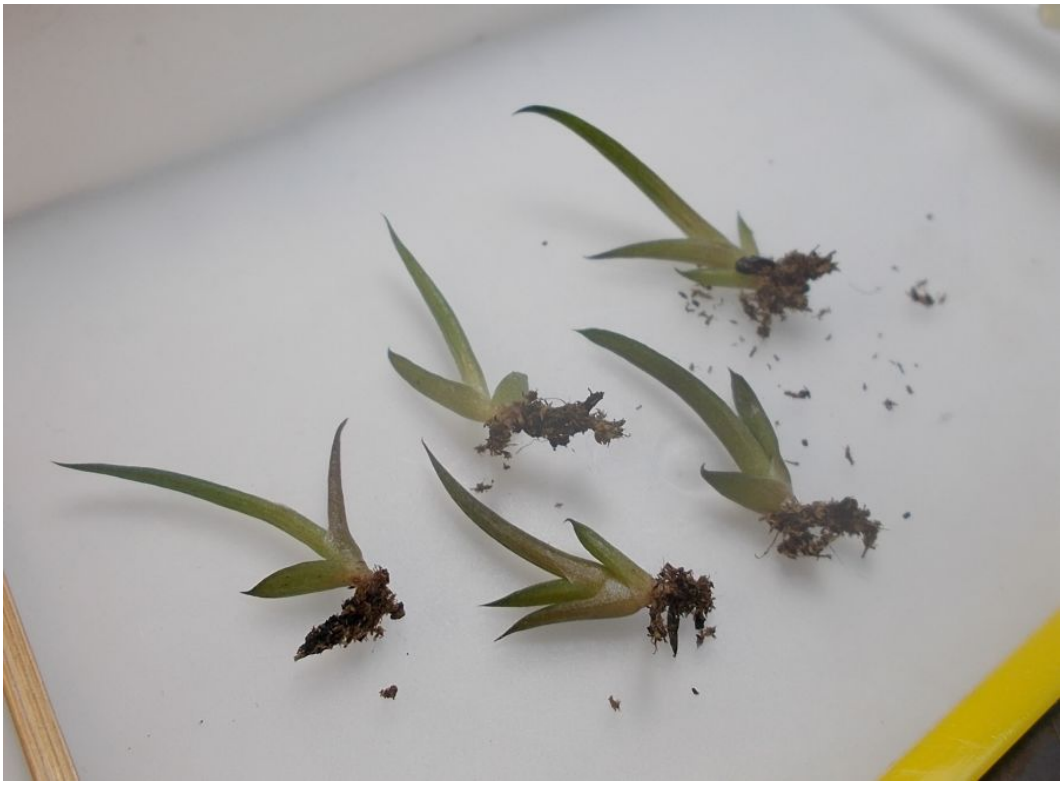
Struggle for Progress

The seedlings a month later, in October 2019.

This kind of enclosed cultivation for cactus seedlings is appealing to growers like me in the tropics because it provides some level of protection to seedlings from the extremes of the microclimate. But a lot can still go wrong. The potting mix is now soilless but there will be trouble if it dries up completely. The presence of fertilizer or nutrients will tend to encourage algae to form, whatever kind of potting mix used. It's hard for hobby growers to provide perfect care to plants.

The small seedlings are still very much at risk. On the other hand, the large seedlings are now somewhat robust, so they are very likely to survive in the long term barring severe neglect.

Initially, the level of moisture in the container was kept under control. Feeling lucky, I then decided to add a few *Haworthia limifolia* seedlings from indoors (see pictures on the next page.)



Haworthia limifolia seedlings from indoors. (October 2019)

The container after adding the *H. limifolia* seedlings. (October 2019)

The *H. limifolia* seedlings were grown from seed sown in March 2019, so they were about 7 months old at this point. The seeds were collected from my oldest *H. limifolia* specimen – you can either pollinate the flowers manually[9] or let the wind do its job by swaying the flower stalk about. The seedlings did fine indoors using artificial lighting or sunlight near a window. But they will need to be acclimatized to outdoor conditions at some point anyway.

As you can see in the picture below, my spotty level of care caused the potting mix to dry out at times. This will stress the smaller seedlings. Larger seedlings have bigger root systems to seek out moisture. Also remember, larger cactus plants are more robust.

The *Haworthia limifolia* seedlings survived, but they first shrunked a bit, then turned a shade of red. The seedlings survived though. Conditions were not ideal but hopefully one or two will survive.

There are pictures on the Internet of commercial growers showing off trays with hundreds of seedlings, grown outdoors under cover. The temptation is to try and replicate what you see. However, growers in the tropics should not assume that it will work well in their microclimate, especially if they live in an urban concrete jungle where there are occasional extreme conditions. Also, consider that commercial growers are highly motivated to provide good sustained care to minimize losses. But one useful takeaway is that a carpet of seedlings can act as their own mulch, because crowded seedlings will cover most of the surface of the potting mix.

Uh oh, I have left it a bit dry. (November 2019)

9 I use a very slightly moistened paint brush bristle to transfer pollen.

By May 2020, the surface of the potting mix is covered with algae. Part of the reason for this is the fortified water sprays I use on my normal specimens. So, the algae was getting nutrients regularly too, same as the seedlings. In late September 2020, they were transplanted into a container indoors so that they can be plumped up.

Generally, I have been growing seedlings casually so this discussion is focused on problems rather than well-tested solutions. Growing cacti from seed outdoors in the tropics is certainly possible, but I think a lot will depend on our focus on details. Take it easy and problems will arise. There are other solutions that you can research on the Internet. For example, the baggie method is a time saver that is worth trying but may be more suited for indoor growing.

In the future, I intend to make better use of mulches, to protect the surface of the potting mix. I think pebbles works well as a mulch, note the volunteer seedlings at the start of this chapter that had germinated among pebbles. You can also sow more seeds so that seedlings act as their own mulch. Many growers have noted that cactus seedlings grow better when crowded. I would also consider using coarse plastic netting to provide dappled shading so that seedlings do not get full sun in the tropical outdoors, even in a sheltered location.

Seedlings in the Shadow of Bigger Plants

This PMag has been turned 90° counterclockwise. At the base of the specimen, there are a few PMag seedlings surviving among the pebbles. (November 2020)

In their natural habitat, cactus plants often produce a lot of seeds, most of which fall around the base of the parent plant. Thus, cactus seedlings that grow in the shadow of a large specimen get some protection from the elements. In practice, the mortality rate is still very high. Most seedlings will die, and only a few lucky ones will grow up to become mature specimens.

Four PMag seedlings can be seen in this closeup view. (November 2020)

The PMag seedlings in these pictures are not volunteer seedlings. Instead, they are the result of seeds dumped at the base of this PMag pot. The objective is to learn more about the viability of letting seedlings fend for themselves the way nature intended, only this time in a tropical microclimate.

I get quite a number of PMag seed pods, the majority of which have a few seeds to about 30 or so seeds. Less common are PMag seed pods with more than a hundred seeds. So the PMag seed pods with fewer seeds are used in this experiment – when a pod bursts open and there are not a lot of seeds, the pod is harvested, then the seeds are removed and immediately dumped at the base of this PMag specimen.

The mortality rate must be high, but as of November 2020, there are about 10 surviving seedlings. All of them are in a shade of red so these are stressed seedlings. They get no special care except for an occasional extra spray of water on really hot days (but only if it happened to cross my mind.) This may also be a good demonstration of the value of pebbles as a mulch for young cactus seedlings.

Turn the pot another 90° counterclockwise, and a few more seedlings can be seen. This side of the pot faces the wall, so the seedlings have some protection from full sun and heat. (November 2020)

It's not an ideal thing to do with cactus seeds, but it's fine to be a bit wasteful if you have *Parodia* flowers all the time and plenty of resulting seeds. With a little bit of luck, I might even get a few seed-grown PMags out of this...

There are many ways to attack the problem of growing cacti from seeds in the tropics. It's fun to experiment if you have a good supply of cactus seeds. And thanks to the two large species of South American *Parodia*, PClav and PMag, we can have a steady supply[10] of our very own homegrown cactus seeds in the tropics. I have no plans to buy or source cactus seeds from outside – you'll have to read about growing other species of cacti from seed elsewhere.

So it is possible to grow PMag seedlings with virtually no effort, outdoors in the urban tropics, if you don't mind the high mortality rate.

That's it for now. I'm afraid I don't have any gold-plated solutions for growing cactus from seed in the tropics at present. Generally one needs to be very patient with the tiny plants. Indulge in your Need for Speed, and the thing will blow up in your face. ♦

10 Records show 52 seed pods in 2019, and about the same number in 2020. Number of seeds per pod varies wildly.

Version Information

This is the June 2021 Edition of this document.

Every released PDF can be found at: `https://www.mysmallcacti.net/`

Author & Copyright

Colophon

Written on LibreOffice. Most images were produced using GIMP and IrfanView. PDF tested using SumatraPDF. Fonts used include Liberation Serif, Arimo and Liberation Mono. The document is sized for A4 or Letter printing with enough whitespace for comfortable reading.

All pictures used to produce the images in the document were taken by the author unless otherwise stated. Images are not meant to be of art print quality. The pictures were taken by unsteady hands without a tripod, then they are cut or resized and finally resampled to about 150 DPI and a JPEG quality of 80 for screen reading and also to keep file sizes manageable.