Grafting: 2019 Specimens Part 2

GBald 2019E[1] with 7 flowers in May 2020, just over 2 months after the specimen produced its first flower. This is the scion's third flush of flowers.

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

Reduced-Risk Fat Stems

These grafted GBalds are *fat stems*. There is risk when cultivating fat stems in the hot and humid tropics, especially during rainy weather. But if we can keep them alive and healthy, they are very productive. Luckily, with grafted fat stems one does not need to worry about their root systems.

1 See the previous chapter, Grafting: 2019 Specimens Part 1 for an explanation of these specimen labels.

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.

Transition to Mature Cacti

2019A starting to look like a mature specimen in early January 2020. Note the large and wooly newer areoles. The scion has a healthy deep green colour.

In the months leading to the first bud, growth speeds up. Areoles become larger and more wooly, signs that the GBald scion is turning into a mature plant. When this happens, there is a high probability that flower buds are on the way. Not immediately, but I'd say that one can expect something to happen for healthy specimens in a timeframe of a few months to less than a year.

2019ABC in early January 2020. (The wire-frame netting enclosure behind them was made for growing vegetables, and is not related to my efforts in growing cacti.)

2019DEF in early January 2020. The smallest GBald scion when it was grafted in April 2019 is now the biggest of the six. The ribs on the MGeo stocks can't expand anymore – the stems have become cylindrical. Note the new rib on 2019F at right.

2019C (left) and 2019E (right) in early January 2020.

The above pictures shows the final phase of the scions' growth. Many of the changes are related to the scions changing from juveline offsets to mature stems that are capable of reproduction – flower production.

Mature growth have a deep green colour and the ribs of the cacti have prominent 'chins'. The areoles are larger and many look elongated and wooly. Spines on mature growth are longer than older spines. The older parts of the stem have a lighter green colour, possibly because some of the resources there are being scavenged in order to fuel the growth of the upper stem.

Compare the areoles of the two MGeo rootstocks, and you will see that the MGeo stock of 2019E is abnormal. All MGeo specimens in my collection have areoles with no wool on them – their black spines sit on areoles that look slightly white, and the white parts never looked fuzzy. But on the MGeo stem for 2019E are areoles that are very fuzzy with wool. I believe it has to do with hormones transported from the GBald scion, and it appears to be harmless. But if a GBald scion manages to coax a MGeo stock to flower, I'd be a very happy grower!

A month later, 2019ABC in early February 2020.

2019DEF in early February 2020. If you compare these pictures to those from a month ago, you can easily see the changes in the size of the GBald scions. The new rib on 2019F has grown a bit.

The First Buds

Bingo! 2019E was grafted on 2019-04-11 and the first bud (at the 5 o'clock position on the left picture) was seen on 2020-02-29. That amounts to just under 11 months.

The first flower bud was seen on 2019E on the last day of February 2020. Getting to this point wasn't difficult, thanks to the robust MGeo stems and the lack of bug attacks. It's the final few months of growth that makes the GBald scion look much like a mature cactus of that species. The diameter of the GBald scion was 2.0 inch while its height was 1.7 inch.

On the GBald scion, the spines have improved progressively and the newest spines look very much like the spines of normal GBalds. As for the MGeo stock, the surface that had been cut is now angled just like the way it looked immediately after grafting. So the MGeo stock has made a more or less complete recovery.

There is one interesting thing about those wooly areoles on 2019E: If you look at the picture at right in the above, all the areoles are wooly except for the upper one on the rib facing the camera. This areole is near the edge of the cut surface, so resource transport from the scion may be limited and it's probably not getting enough hormones from the scion.

2019ABC in early March 2020.

2019DEF in early March 2020. The new rib on 2019F may not have grown a lot in one month, but the stem of the scion has expanded as a whole.

The second bud. On 2020-03-10, this bud was found on 2019C. 2019C was grafted on 2019-04-09 using the shrink wrap method. From this angle, the spines on 2019C look nice because we are generally looking at spines on new growth.

The First Two Flowers

2019E with its first flower in mid-March 2020, 17 days after the bud was first detected.

2019C with its first flower in late March 2020, 16 days after the bud was first detected.

So there you go. In the tropics, I think it’s easy to get GBald flowers by grafting GBald onto MGeo. The only problem with this kind of graft is the spines on MGeo. These specimens must be handled with care: not for the plants, but for the well-being of your hands. Also, I strongly suggest that you do not consider these as perfect specimens: the GBald scions are too bloated to be truly healthy. But the flowers are awesome because bloated stems are able to push out many buds. It’s a blast.

Second Flush of Flowers for 2019E

2019E in early April 2020. About two weeks after the first flower closed on 2019E, many new buds have appeared. This GBald scion is strong.

GBalds produce flowers in flushes; buds tend to break out only after the current flower(s) dries up. Usually buds appear on new growth, but sometimes an older areole will produce a bud, such as the rightmost bud in the picture above. 2019E is a hybrid GBald of unknown provenance. Versus normal GBalds, it is more vigorous in terms of growth and it is also more willing to flower. Grafting it onto MGeo stems – another plus. It’s like a computer card game where you hold three power boost cards.

Fifteen days later, there were four flowers open. (April 2020)

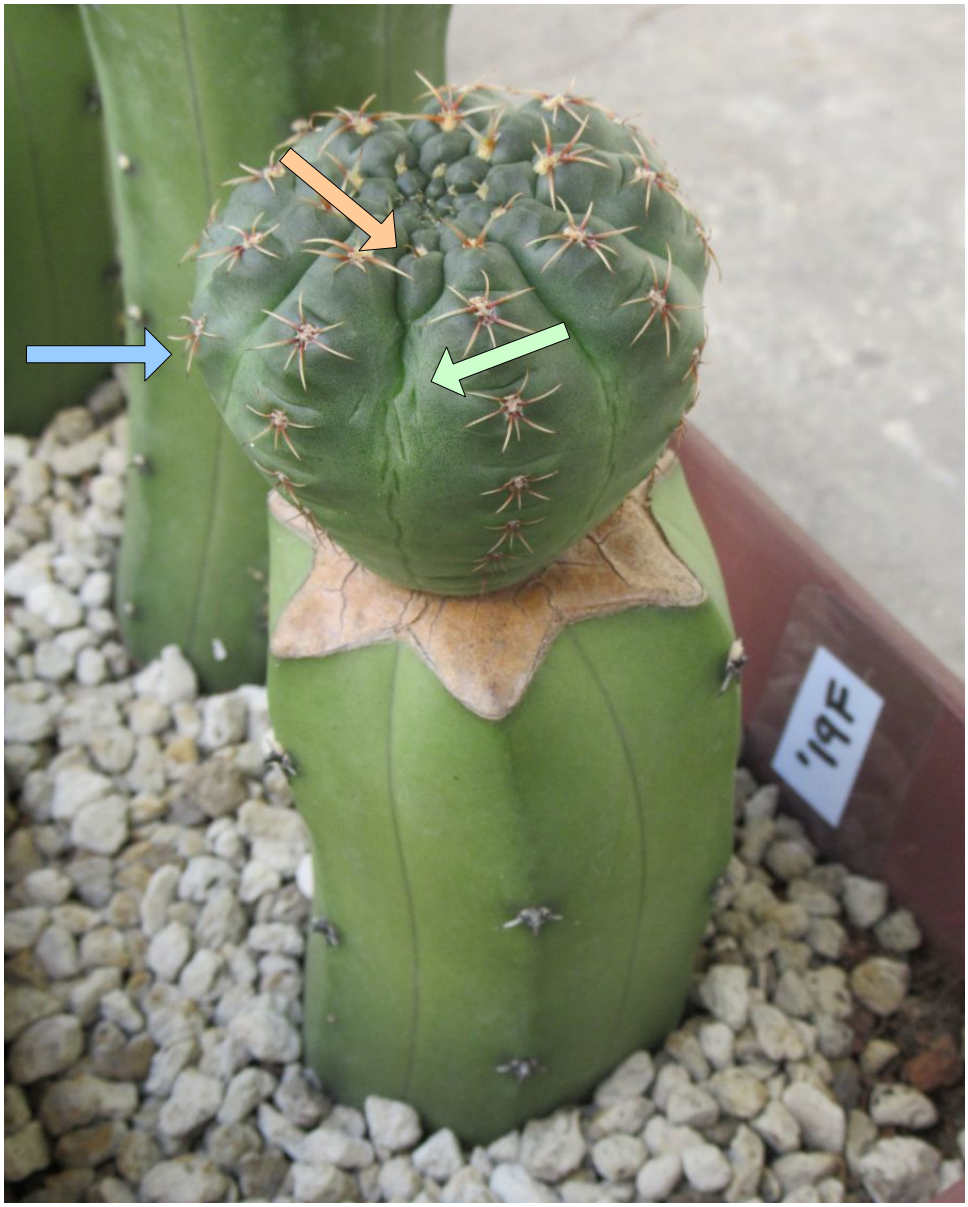
There were five buds for the second flush of flowers (I am counting the first flower as the first flush) and the bud on the older areole successfully opened. Thanks to better nutrition and being hybrids, these 2019 grafts appear to be much stronger than the 2014 graft.

2019E got out of the gate sprinting. Tracking data indicates that it produced 45 flowers in 10 months in 2020, and in 2021 it is sustaining flower production at a rate of about 5 flowers per month.

A fifth bud opened the next day, but the oldest flower in this flush had already dried up. All the stamens on the flowers lack pollen. (April 2020)

The downside is increased susceptibility to fungi damage. Also, the scions will all start to shrink or collapse at some point, and keeping fat stems alive will become increasingly more difficult. Having no pollen on stamens is not a huge problem, but I haven't had luck getting seed pods from these hybrids. And when there are many flowers open on the hybrid GBald scions, one can detect a slight *rancid* smell. I guess this is a GBald hybrid with genetic defects.

Near Bursting Point



2019F in late April 2020. The blue arrow points to a rib that appeared in early 2020, seen in earlier pictures. The orange arrow points to a new rib. The green arrow points to what may be stretch marks.

Having observed their behaviour for over two years now, I believe these GBald-on-MGeo grafts are growing at the maximum possible speed. In the above, 2019F may be exhibiting characteristics of extreme growth. So far I have seen such patches of multiple stretch marks on 2019F only, but all of the GBald scions have ribs that are fully expanded – any more juice and the stems will burst. Perhaps the stretch marks are some kind of tearing due to growth at a higher than normal rate.

A closer view of the stretch marks, April 2020.

The stem of the GBald scion may be having a hard time accommodating the enormous increase in the diameter of the stem in a short period of time. While the upper part of the stem is ribbed, the lower part has a circular cross section. There is a line between the ribs in the above picture – this may be another stretch mark. The scion was about ½ inch across a year ago. Mature growth at the top of the stem is now about 2 inch across.

The other abnormal feature of 2019F is the scion's skin on the lower stem, especially near the stretch marks. If you look carefully at the picture above, you should just be able to make out a kind of grainy pattern. This pattern is broken at the stretch marks and there are some scattered green dots. Normal GBald skin is just a solid green colour. The pattern may be the result of excessive stretching. While such stretching may not result in actual damage to the stem, the abnormal features suggests that it would be difficult to get grafted GBalds to grow faster than this.

Second Flush of Flowers for 2019C

The second flush of flowers for 2019C. **Left**: Two flowers about to open for the first time. (2020-04-26) **Right**: Four flowers open three days later. (2020-04-29)

Since 2019C is also a GBald hybrid, its behaviour proved to be similar to 2019E. The second flush of flowers for 2019C also totalled five flowers. For 10 months in 2020, 2019C produced 43 flowers.

For these GBalds, flower production is a question of resource availability. These scions have no health problems, but since GBalds have a limited stem diameter and they are not voracious feeders, there is a limit to resource production and accumulation. Sustained flower production currently seems to be about 4½ per month, so for GBald-on-MGeo specimens in their prime, you'll probably get just over 50 flowers a year if it all goes well.

GBalds can produce flushes of 7 flowers (uncommon) or maybe even 8 flowers (very uncommon), but that level of production cannot be sustained. Often a smaller flush of flowers may follow. Sometimes excess buds are aborted – they will dry up and drop off. That's how we end up with about 4½ flowers per month. As the GBald scions become older and larger, that number may inch up to maybe 5 flowers per month. We'll see.

If you want more flowers than that, you'll have to put on your Dr Frankenstein thinking cap and look into artificial (or mechanical) means of pushing resources into those GBald stems.

2019ABC and 2019DEF at the end of April 2020.

Two days later, a juvenile grasshopper paid a visit to 2019C’s flowers. (May 2020)

2019C later on the same day the grasshopper paid a visit. The youngest flower bud finally opened later in the afternoon. Sometimes GBald flowers open at slightly different times, but all should be open by late afternoon. Note the thin-looking stamens that lack pollen, a common trait of these GBald hybrids. (May 2020)

The second flush of flowers lasted 13 days; not all the buds matured at the same time. For normal GBald scions, flower production will be more similar to the 2014 GBald graft.

The Third Round

2019E eleven days later, in mid-May 2020. This time 10 buds have appeared, but not all survived to open as flowers. Another older areole has been activated and is contributing one flower bud. This is the reverse side of the planter box, because the non-wooly areole on the MGeo stock of 2019E is not visible here.

There must have been a lot of pent-up potential in 2019E, because *10 buds* appeared after the previous round of flowers have all dried up. Three buds failed by drying up and detaching. Buds are usually aborted when they are quite small, so one wonders whether it is possibe to suppress bud abortion using cultivation measures.

2019E with seven flowers, ten days later in late May 2020. This picture was taken in the evening, so the flowers may not have opened properly due to rainy weather. The planter box is now facing the normal way – 2019DEF. The laminated labels visible in many pictures were added in late April 2020.

The seven flowers opened normally the next day. (May 2020)

I think *seven* is the typical maximum number of simultaneous flowers that a GBald can do. I've had many specimens hit seven flowers at a time. Eight or more is not impossible, just very, very rare.

All six of the GBald-on-MGeo grafts on the same day. (May 2020)

Late May 2020, five days later. 2019C is at the beginning of its third flower flush, while the three remaining flowers on 2019E are on their last legs.

Flower flushes are really constrained by the growth speed of GBalds. One areole can produce only one flower bud, so flower production is limited by the growth rate of the stem. In the tropics, the climate does not change much, so it may not be possible to make these GBalds stop producing flower buds. The weather may be too hot to make them stop flowering. Or these hybrids are simply crazy.

2019C with six flowers not quite fully open, three days later. (June 2020)

2019C four days later, in early June 2020. Two flowers have been open for five days, and another two have been open for *eight* days.

Looking at the picture above, three phases can be discerned. First, the spineless light green base of the scion is the original indoor-grown stem. Second, the expanding section with weak spines is the juvenile part. Third, the upper stem with elongated areoles and strong spines is the mature part.

Interlude: Experimenting with MGeo Tops

Over a year after being cut, there are still no roots on these MGeo tops. (June 2020)

The bottom cut surfaces look leathery, and there is a lot of shrinking. Given the condition of the lower left piece, it is unlikely they will survive much longer.

In late June 2020, I decided that the MGeo tops were a lost cause. After over a year since the grafting operations, there is no progress on these pieces of MGeo. The six pieces had spent a month in a pot and a year in the pumice tray. There is not a single root or root nub to be seen; just leathery and badly shrunken bottom surfaces that doesn't quite look like normal MGeo cut surfaces.

Normal MGeo cut surfaces become heavily suberized as time goes by. Corky substances will reinforce the cut surfaces, and eventually it becomes quite hard. Not so with these MGeo tops.

Since it is suspected that the growing point is suppressing root growth, three pieces had their growing point or apex cut off – I will call these the headless MGeo tops. Initially they were left in the pumice tray. The other three were buried in recycled garden soil as an experiment. In the event, the three that were buried in soil as-is did not survive the experiment, rotting in the space of a few weeks. The soil in the pot did not manage to coax a single root out of the three pieces.

Three of the MGeo tops on the right had their growing points cut off. The other three in the pumice tray on the left were buried in recycled garden soil in a pot. (June 2020)

The three headless MGeo tops after 6 days, in late June 2020. The weakest piece on the right is clearly drying up and dying, too weak to survive.

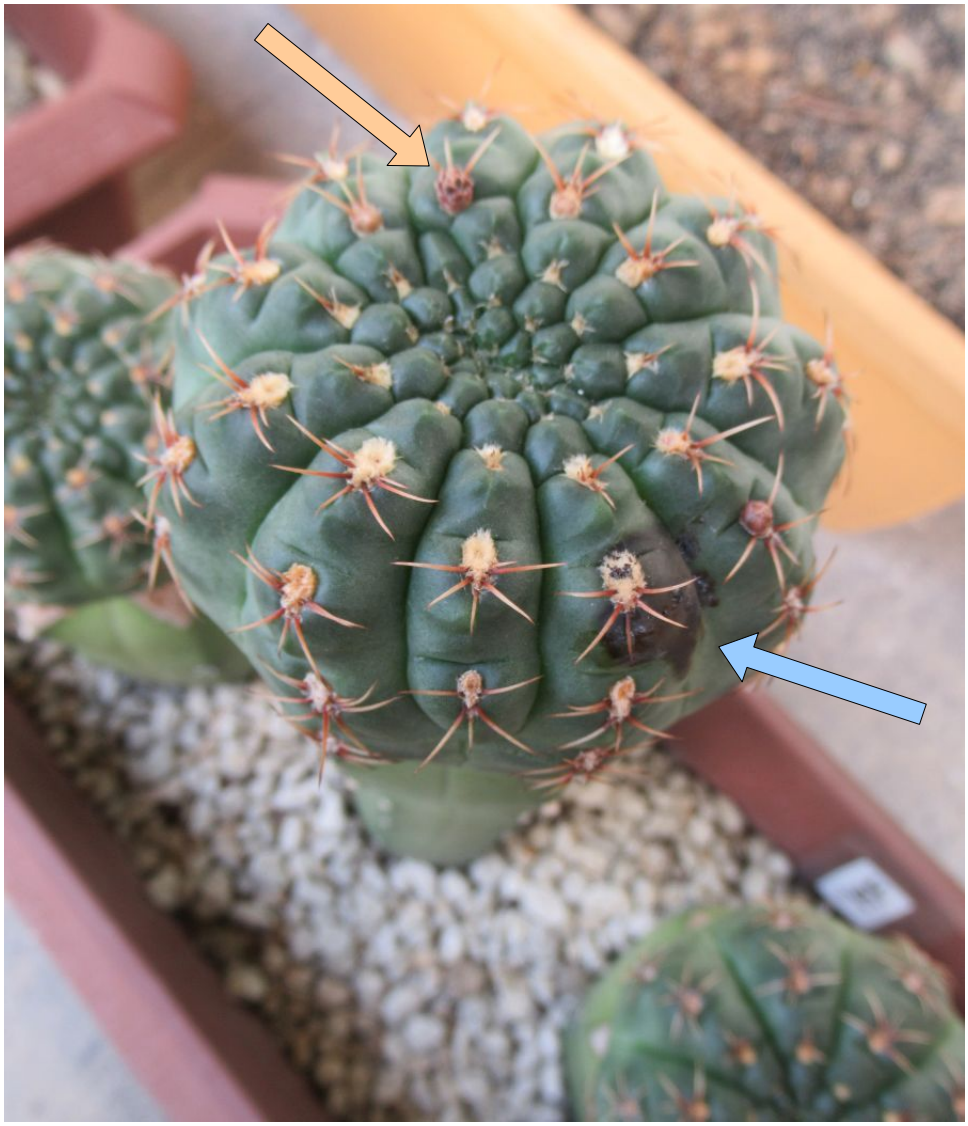
The underside of the headless pieces. The middle piece has a root nub! (June 2020)

A closeup of the middle headless MGeo top. The root nub is an apparently new root just breaking out of the leathery bottom surface, at the 9 o'clock position (see arrow).

After six days, it was decided to bury the three headless MGeo tops as well. While inspecting the pieces prior to burying them in a pot of soil, I finally found one root – on the largest (and presumably, the strongest) headless piece. The root was new, only just breaking out, so it may have started growing only after the growing point or apex of the MGeo top was sliced off.

Experimenting with these expendable pieces of MGeo was fun, and yielded some interesting observations. The phenomenom of apical dominance suppressing root growth is not a commonly-discussed issue, because the pieces of cacti most growers use are offsets – complete stems that have no problems at all with growing out roots. It is when you try to mess with bits and pieces of leftovers from grafting operations that you may encounter this behaviour.

Fat Stems and the Risk of Fungi



The first fungi attack on a post-flower areole (blue arrow) of 2019E, early June 2020. Note also the dry flower bud (orange arrow) – this was one of the aborted buds from the second flush of flowers.

This problem with fat GBald stems in the tropics is described in the Battling Bugs chapter. When a GBald flower drops, the flower scar on the areole becomes a temporary weak point. During a bout of wet weather, post-flower areoles may be susceptible to fungi attack. Black patches are generally non-existent during dry weather – a clue that fungal spores may be involved.

One day in May 2021, I poked a dried flower on 2019C and it fell off. The flower scar on the areole then oozed a bit of clear fluid at the edges, where xylem tissue would be located. That's a nice entry point for fungal spores. On fat stems, those flower scars may not dry fast enough in wet weather.

As of May 2021, at least three of these GBald-on-MGeo grafts have suffered such fungi attacks. So far they have all survived because the black patches did not spread much. The end result is a scar here and a scar there. Keep an eye on the scars and ensure that the scars are clean.

While I try to keep the GBald scions clean, wet weather is still an uncertain time for my GBald specimens because of this fungi threat. It will usually rain every day and even sheltered plants will be wet with spray after heavy rain. Pots may have trouble drying out due to increased humidity.

In the tropical urban environment, a major source of fungal spores may be moldy walls. While most paint products have some kind of fungicide mixed into the paint, mold and fungi will still get the upper hand because the hot sun eventually degrades the paint. This is an aspect of the tropical urban environment that growers need to be aware of. Remember, it's not a benign environment.

2019E in early August 2020. Another black patch has appeared (blue arrow). This picture shows the beginnings of the black patch. There is what looks like a drop of dark fluid in the flower scar.

2019E four days later. Two post-flower areoles have black patches. To their left is yet another aborted flower bud. The scar from the June 2020 black patch is visible near the 6 o'clock position. (August 2020)

Small scars do not appear to hurt flower production. A large scar may distort the stem. Generally, the GBald hybrids appear to be more susceptible to black patches. Currently, when a black patch appears, I try to give the specimen more sunlight by moving it a bit. I don't always use thymol as a fungicide. With tens of flowers a month, it is difficult to keep at spraying a thymol solution on all dried flowers. I am also trying sulfur powder on new flower scars, but keeping track of all the flowers is not trivial. I am not crazy for perfect-looking cacti and so I don't mind some damage on my specimens. So far, this black patch problem has not gone out of control.

Later in 2021, I may try a silicon fertilizer supplement to see if the occurrence of black patches can be reduced using silicon fertilization. Of course, if you really do not want to see black patches on your cacti, using a fungicide regularly may work fine for your collection.

Settling Into Regular Flower Flushes

2019E near the end of June 2020. Another flush of flowers.

2019C in early July 2020. Another flush of flowers. At the upper left in the background is a pot containing three buried MGeo tops.

Side view of 2019CBA in late July 2020.

Top view of 2019CBA in late July 2020.

2019CDEF are crazy hybrid GBalds, while the normal GBalds – 2019AB – are slower-growing.

Side view of 2019FED in late July 2020.

Top view of 2019FED in late July 2020.

Progress of Some MGeo Tops

Inspecting the buried headless MGeo tops in July 2020. The weakest piece is now dead, as expected.

In the end, the remaining MGeo tops – the headless ones – were still pretty messed-up pieces of cacti. Slicing off the growing points did not change anything, or perhaps the MGeo tops were already quite weak. The one single root on the large piece was still the only root that appeared.

The weakest piece turned into a dead brown husk not long after being buried in soil (picture above). As for the other two MGeo tops, they were still stuck in some kind of limbo – something is still holding them back from renewed growth.

In late July 2020, I threw away the piece with no root and so finally one MGeo top is left (see pictures on the next page.) This last MGeo top was then potted up in recycled garden soil. No other roots have appeared, so it is still behaving abnormally. The top surface had callused after the apex was sliced off, but instead of following that with suberization, the surface has turned somewhat *green* – another abnormality. Hormonal balance is probably still abnormal, so this specimen may continue to behave strangely for a long, long time.

The MGeo top with one root. After about a month, the piece still has one root. At least the root is healthy. (July 2020)

Potting up the only surviving MGeo top in late July 2020. The cut surface had callused over, but there is little suberization after a month. Instead, it looks a bit *green*.

And On and On...

2019E with five flowers at the beginning of August 2020. If the GBald scion is healthy, it can produce a flush of flowers about once a month.

2019E posed with four other flowering GBalds. (August 2020)

And so the flushes of GBald flowers kept appearing. Initially, it’s plain sailing. But when the GBald scions get older, we will have to face the challenge of keeping shrinking GBald stems alive. ♦

Version Information

This is the June 2021 Edition of this document.

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Colophon

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