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The Adventures, Challenges and Rewards of Propagating Rare and Unusual Perennials

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Summary

Over the past twenty years, I have participated in the production of countless perennials at Juniper Level Botanic Gardens Juniper Level Botanic Garden and Plant Delights Nursery Plant Delights Nursery,. This is a 28-acre ex situ conservation and research institution that also includes over 10-acres of gardens. During my time at Plant Delights Nursery and Juniper Level Botanical Gardens, an estimated 60,000 new garden accessions have been introduced and annually the collection increases by an average of 2,000 plants.

INTRODUCTION

With over 27,000 different active records in the garden, we are always on an "Adventure" in the world of propagation. Often this leads us into many propagation "Challenges," but also presents "Rewards" in many forms. Our specialty collection consists of 44 genera, 1,073 species, 162 nothospecies (a hybrid that is formed by the direct hybridization of two species, not other hybrids), 13,274 different clones and a cold hardy fern collection that boast roughly 400 species and 783 clones. It is often difficult for propagators to be aggressive with such rarities. But sometimes you just have to go for it (**Figs. 1, 2 and 3**).

Figure 1. (top, left) Sunrise over Juniper Level Botanic Garden (JLBG) Trillium Trial beds, (top, right) *Yucca filamentosa* flower spike node, (bottom, left) , *Agave x nickelima* (*asperimma x nickelsiae*) cultivar, and (bottom, right) Begonia 'Cotes de Castillon'.

Figure 2. (top, left) *Trillium discolor*, (top, right) *Agave ovatifolia*, (bottom, left) *Hosta* 'Cathedral Windows', and (bottom, right) *Lycoris sprengeri* 'Pink Floyd'.

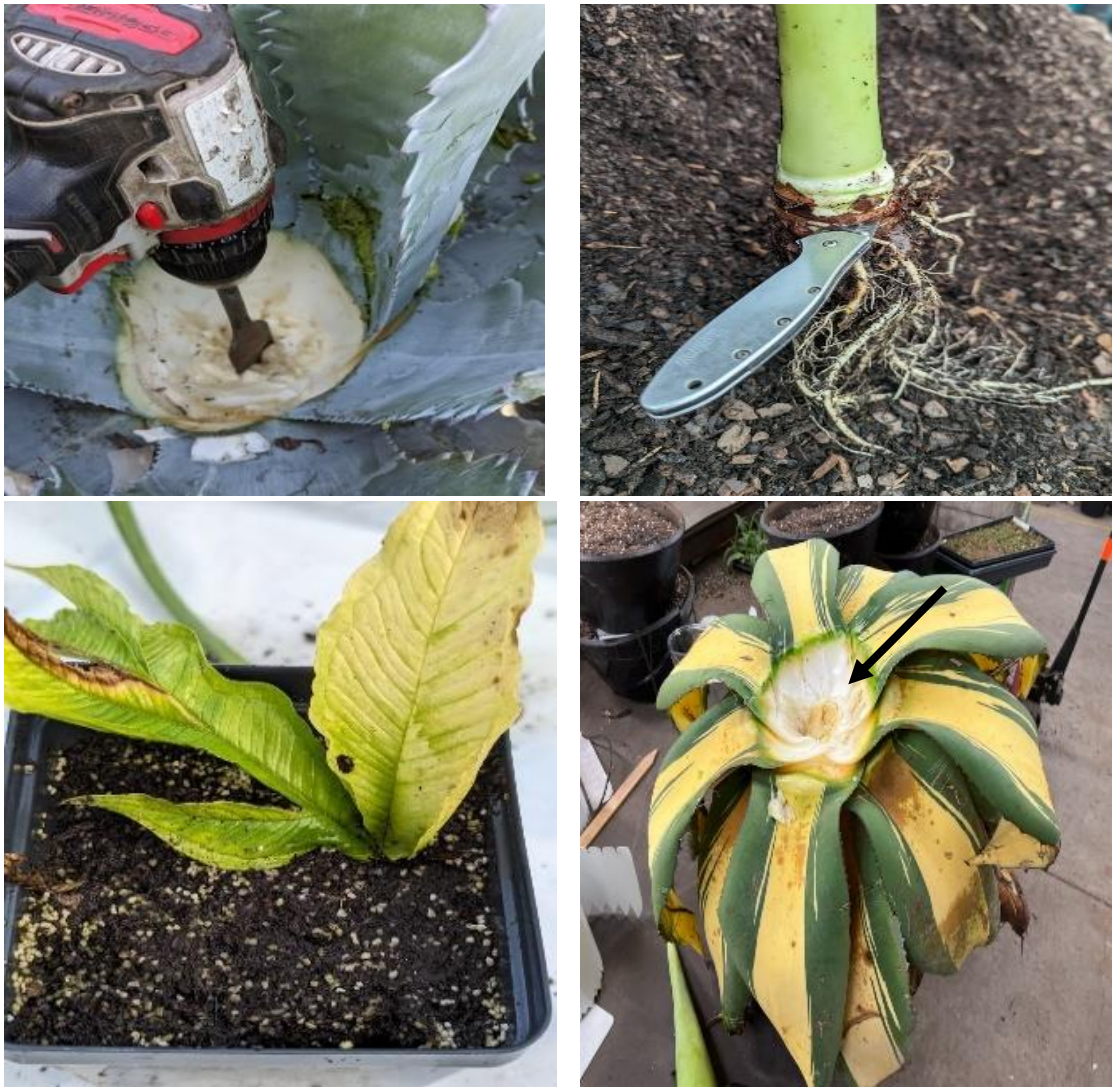

Figure 3. (top, left) Scooping Agave meristem with a power drill, (top, left) rhizome cutting of *Alocasia* 'Architexture', (bottom, left) leaf cutting of Amorphophallus x kachjac (*konjac x kachinensis*), and (bottom, right) large *Agave ovatifolia* 'Flipper' prepped for scooping (arrow).

With so many clones to play with, we are often dipping into uncharted waters. Many times, we may be the original source for things and many times the benefactor of such rarities. Some of the adventures dip into mutilating extremely rare plants such as *Musella lasiocarpa* var. rubribracteata **(Fig. 4**). Before we potentially killed this rare specimen, I crosscut the straight species *lasiocarpa*. I was confident that this would work rather well and most likely in a short amount of time. As expected, the plant produced offsets and divisions within a few weeks. Since we noticed this behavior, we hoped the results would be mirrored in our new variety *rubribracteata.* When I was given this plant to produce, it was only one of two specimens in the U.S. We went ahead and used a cross cutting technique to destroy the apical meristem and forced multiple offsets to break. With this technique you cut through the basal plate making the apical meristem the bullseye of the cut. To our surprise, this variety was rather slow to offset.

Figure 4. (top, left) *Musella lasiocarpa* var. rubrobracteata (in-situ), (top, right) *Musella lasiocarpa* [producing offsets with new, smaller shoots (arrow) - after cross-cutting the meristem], (bottom, left) *Musella lasiocarpa* var. rubrobracteata [producing offsets (arrow) after cross-cutting meristem], and (bottom, right) *Musella lasiocarpa* var. rubrobracteata [macro of offsets, (arrows)] bud development after cross-cutting meristem.

Other times we may be collecting rare and unusual plants from a wild population, and instead of consuming a whole plant we may be able to get a leaf cutting or small portion of the plant to reproduce, study and share. We have done this with one of our rare riparian natives *Helonias bullata*. We found that you can asexually propagate *Helonias* via leaf cuttings and when those bulk up after a couple of years, perform a crosscut technique through the basal plate **(Fig. 5).** What this does is to break apical dominance by reducing levels of the phytohormone, auxin, from the shoot apex - thus allowing a higher cytokinin/auxin ratio – stimulating dormant lateral buds - creating plantlets. We then go through those offsetting plants and divide them into individual crowns.

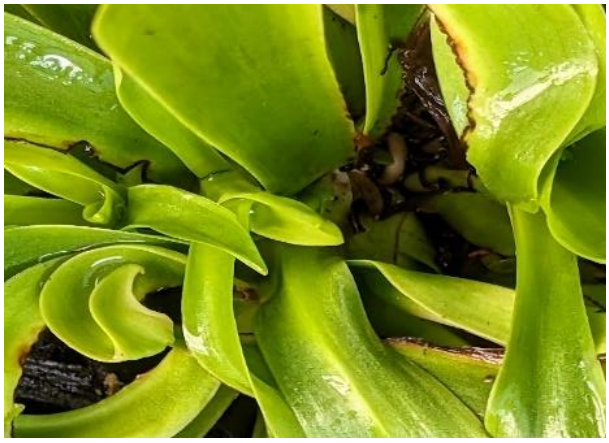

Figure 5. Offsetting with new shoots developing from a cross-cut (scooping) of *Helonias bullata*.

Cross-cutting and or scooping are techniques we use to isolate randoṃ leaf patterning in plants such as Agave (**Figs. 6 and 7).** We often find streaked mutations in plants that we then isolate through this technique. At the base of each leaf is a clone of the leaf it is attached to. We also use this technique to get a variegated plant to offset and clone its phenotype. We have done this with hundreds of agave specimen, but one of the first was to take Agave 'Craziness' - and stabilize it to become Agave 'Bareback Rider'. We will also isolate new sports of mutating plants like *Agave filifera* 'Golden Sword' and force clonal offsets on non-offsetting species like *Agave ovatifolia* 'Flipper'.

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Figure 6. (Agave sport isolation). (top, left) Agave 'Craziness' (*cupreata x asperrima*) (unstable streaked seedling), (top, right) Agave 'Bareback Rider (isolated and stabilized sport of 'Craziness'), (bottom, left) *Agave filifera* 'Golden Sword' (1/2 gold mutation), and (bottom, right) *Agave filifera* 'Golden Sword' (offsetting gold sport induced by scooping).

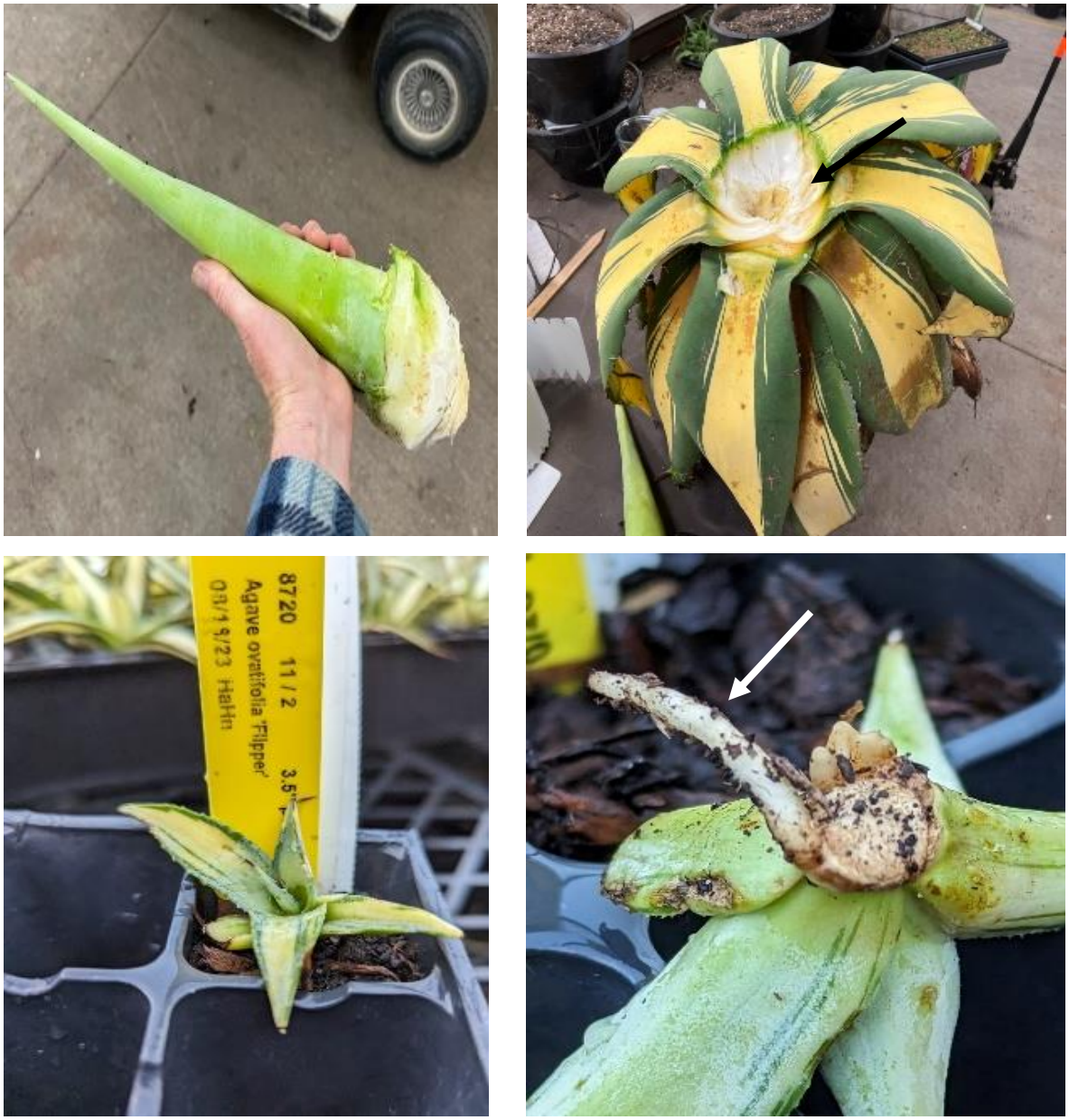

Figure 7. (top, left) *Agave ovatifolia* 'Flipper' core (only specimen at time of scooping), (top, right) *Agave ovatifolia* 'Flipper' (freshly scooped, arrow), (bottom, left) *Agave ovatifolia* 'Flipper' freshly stuck 3/4-in. offset, and (bottom, right) *Agave ovatifolia* 'Flipper' [freshly rooted (arrow) from the base of 3/4-in offset).

Some of our adventures includes plants such as *Bambusa multiplex* **(Fig. 8).** This is a more difficult-to-root species – but after a mild winter, and nice humid summer, the plant develops plantlets along the cane that we propagate from cuttings.

No rooting hormone/auxin is needed: just place it in perlite under mist. The cuttings typically start rooting within 20 days with a strike rate of nearly 100%. Once rooted, we simply pot these specimens up, bulk their size and then resume pot divisions once they mature.

Figure 8. (top, left) *Bambusa multiplex* 'Green Giant' (prior to cutting), (top, right*) Bambusa multiplex* 'Green Giant' (initial stage of adventitious roots on branch nodes), (bottom, left) *Bambusa multiplex* 'Green Giant' (cuttings stuck in perlite and under mist), and (bottom, right) *Bambusa multiplex* 'Green Giant' [6-day strike (rooting) and image of adventitious roots (arrow) at 12 days).

We are always getting new and interesting *Alocasia* and banana species in (**Fig. 9**). These are often rare, variegated and marginally cold hardy forms. When we need more, we simply use to rhizome cuttings. We will cut a rhizome (specialized shoot) that has developed into a "sub-trunk" with multiple eyes. We cut rhizomes somewhere between the meristem and the first set of roots. We then treat the cut portion with auxin (Hormodin 3) and stick it like a normal cutting into a pre-watered container. Sparingly water these plants for the next 2-3 weeks before they start to root into the pot.

Most adult *Alocasia* tubers will produce multiple offsets as well. Many times we take slowly offsetting forms of banana plants the same way. We bareroot the plant and examine the main rhizome for vegetative eyes. Once we confirm the eyes are developed enough, and there is enough rhizome to establish a new plant with, we cut the rhizome. We have the best results doing this in our heated propagation house with bottom heat from October to May.

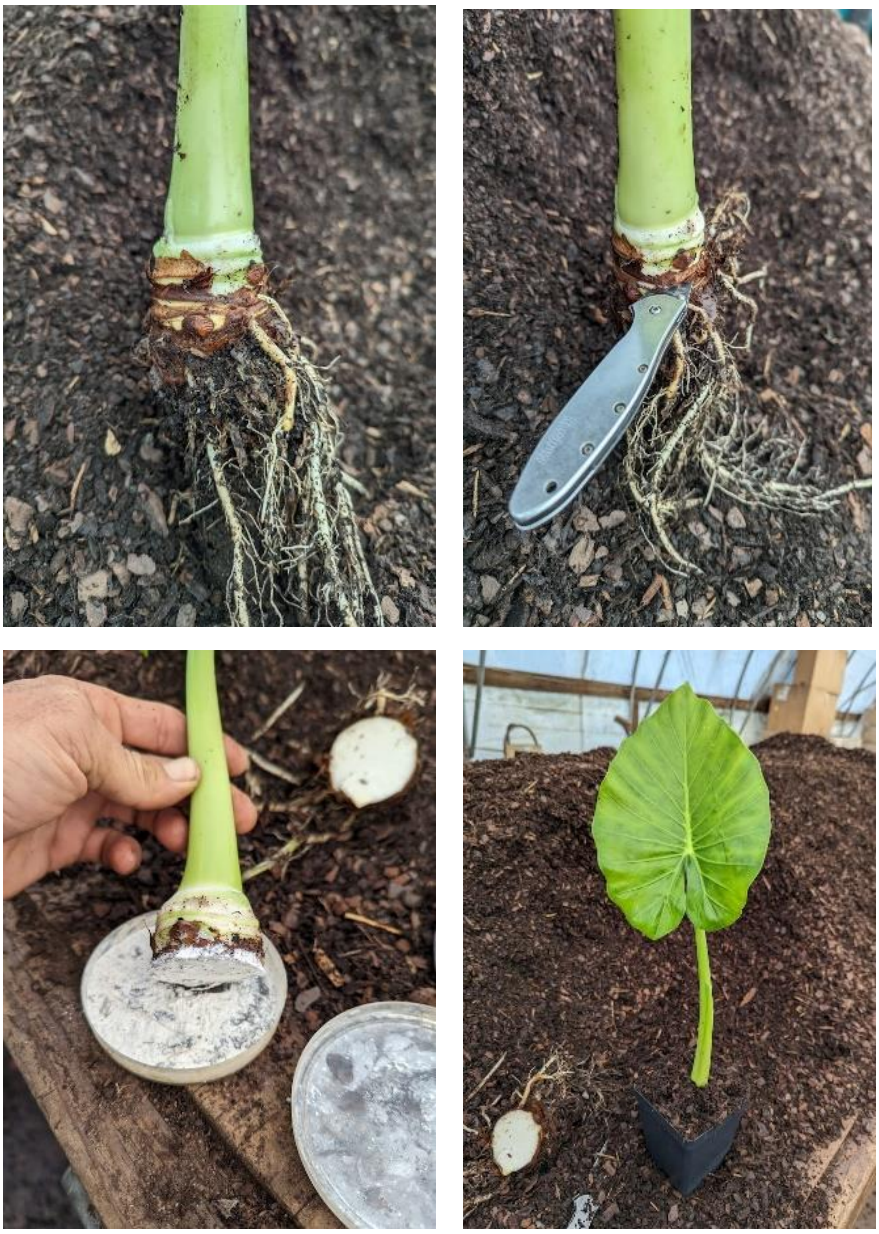

Figure 9. (top, left) *Alocasia* 'Architexture' (bare rooted rhizome prepped and examined for cutting), (top, right) *Alocasia* 'Architexture' (rhizome cutting with developed eyes both above and below cut), (bottom, left) *Alocasia* 'Architexture' (Hormodin 3 applied to fresh cutting), and bottom, right) *Alocasia* 'Architexture' (freshly stuck cutting placed in Pacific Organic potting soil).

Over the years we have adventured into doing leaf cuttings on aroids, but particularly the genus *Amorphophallus* (**Fig. 10**). Many of the species in this genus are difficult to root, and others not. However, some of the nothospecies that have two difficult species are now rooting with ease. We have tried to root leaf cuttings of the species *A. konjac*, along with many of its cultivars and forms. After sticking hundreds of different cuttings, we found that it simply does not root. But when this species was crossed with another enigmatic species *A. kachinensis*, a highly textural plant was formed. We took a leaf cutting and it has now produced multiple tubers along the petiole.

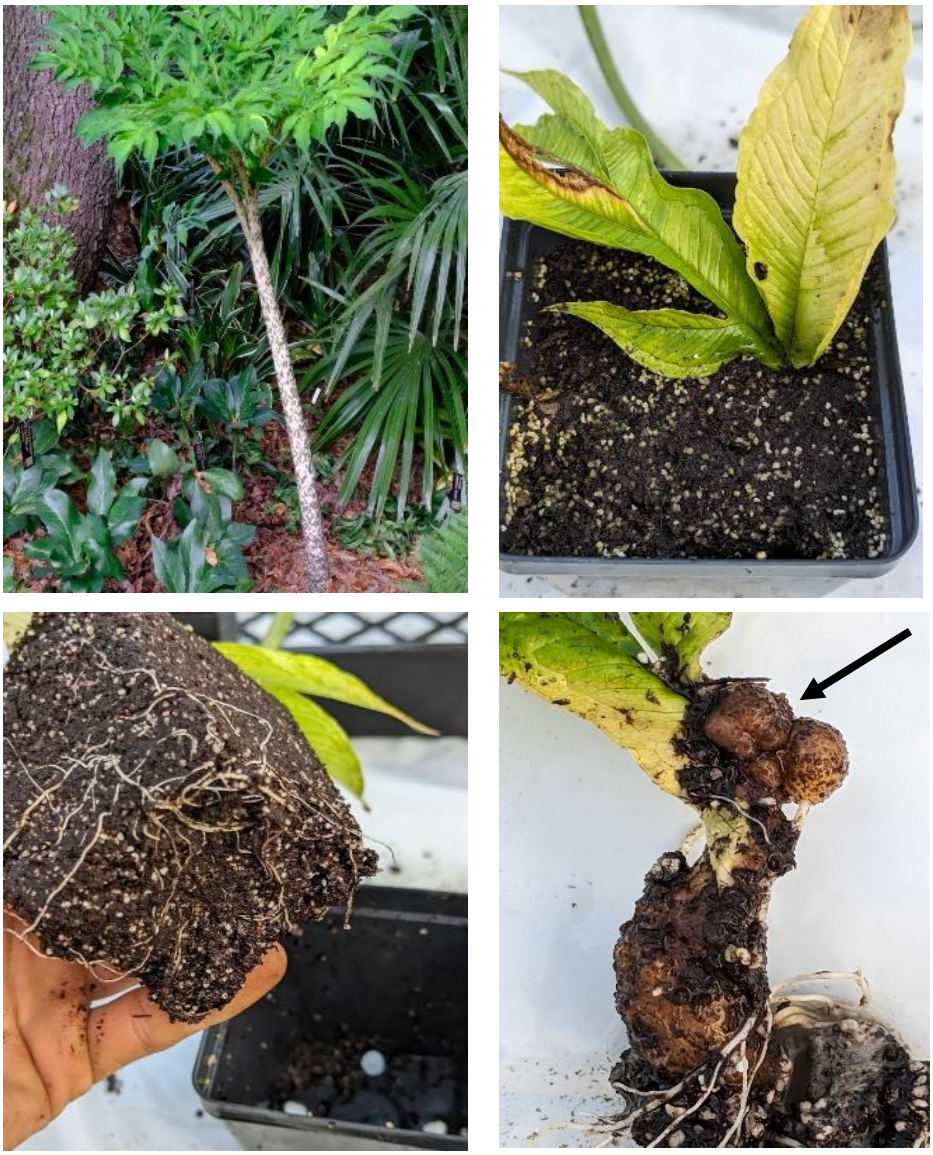

Figure 10. (top, left) *Amorphophallus x kachjac* (*konjac x kachinensis*) [in-situ at Juniper Level Botanic Garden (JLBG)], (top, right) *Amorphophallus x kachjac* (*konjac x kachinensis*) (leaf/petiole cutting), (bottom, left) *Amorphophallus x kachjac* (*konjac x kachinensis*) (rooted leaf/petiole cutting), and (bottom, right) *Amorphophallus x kachjac* (*konjac x kachinensis*) [tuber development (arrow) along cutting).

Along “adventures” come the “challenges.” Many of the plants we want to introduce simply do not root with any good percentages, if even at all. Many of these challenges come out of our breeding program for *Baptisia* (**Fig. 11**). Many cuttings root with exceptional strike rates and then there are those that do not. Unfortunately, sought after clones like *Baptisia perfoliata* ‘Flying Saucers’ are super difficult to root from the garden. With the addition of a large cooler, we force plants into dormancy in August by keeping them at 32° F for 90 days, remove and then place them on bottom heat in a heated greenhouse that is kept at a high of 75°F and a low of 58°F. We force the plants and after flowers are pinched, we take tip cuttings. Since this change, we now have an average strike (rooting) rate of 75% and the rate of perennialization has increased by 90%.

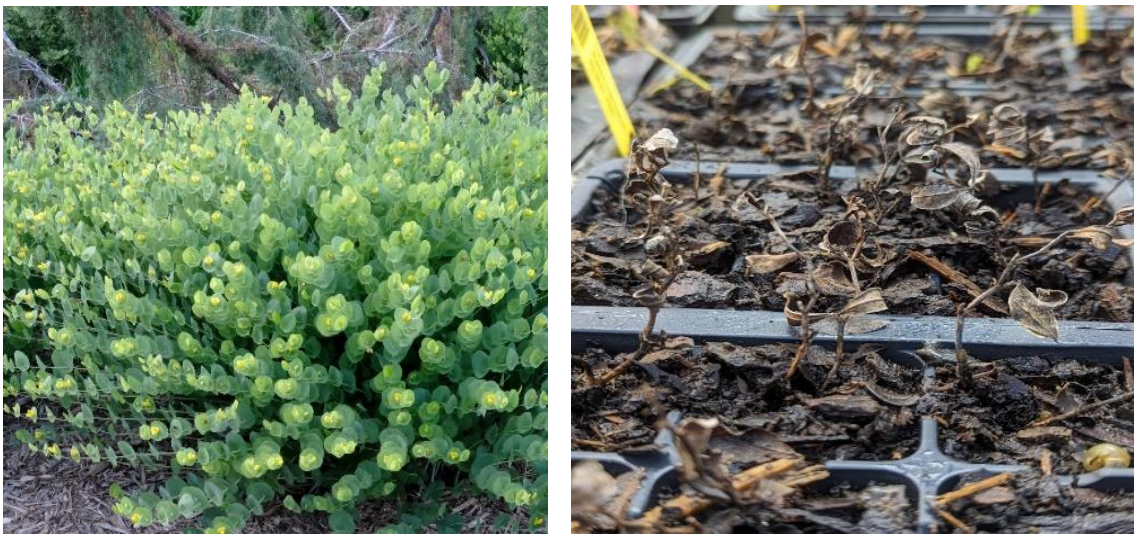

Figure 11. (left) *Baptisia perfoliata* 'Flying Saucers' (in-situ at JLBG), and (right) failed *Baptisia* cuttings during propagation.

We find propagation challenges with other taxa like *Castanopsis cuspidata* ‘Nakafu’ or even *Ilex chinensis* ‘Cherry Ice’ (**Fig. 12**). We have stuck every cutting imaginable, used every hormone known, and even tried during multiple seasons. At best you end up with a couple here or there. We will often take the rooted clones and use them as mother plants for future cuttings.

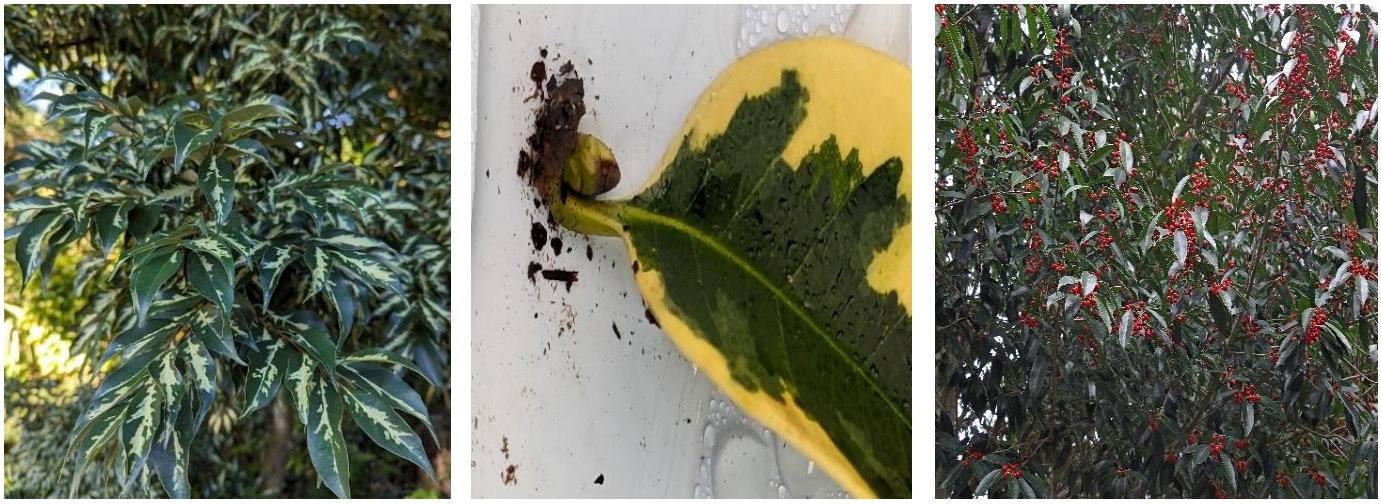

Figure 12. (top, left) *Castanopsis cuspidata* 'Nakafu' (in-situ at JLBG), (top, right) *Castanopsis cuspidata* 'Nakafu' (experimental bud cutting with Dyna-Gro IBA/NAA gel), and (bottom) *Ilex chinensis* 'Cherry Ice', which is difficult to clone.

Often the challenge may be to produce difficult and slowly offsetting plants like *Musa* 'Ae Ae'. (**Fig. 13**). We received our original clone in 2000 and our nursery mother plant in 2007. Since then, we have only been able to produce a few dozen plants. The demonstrated plant was a supreme specimen with a market value of several hundred dollars. When we find ourselves handling these rare and expensive clones, we aggressively process them in the manner I mentioned above for elephant ears and bananas. This rhizome cutting is placed on bottom heat through the cool months and kept at a temperature range of 75°F to 58°F and through the summer months as a normal cutting. The success rate drops through the heat of the summer – so I encourage aggressive techniques to be done during the cool season. We have also trialled crosscut techniques with the use of the plant growth regulator/cytokinin 6-BA. "Configure" to encourage offsetting. Overall, the process is slow and this plant will be expensive.

CONCLUSIONS

What I find to be the most satisfying is that there are so many different "Rewards." One of the most unique rewards I have ever been granted was when one of our 2009 leaf cuttings of *Amorphophallus titanum*, opened its bloom on its 9th birthday. This was one of three tuber offsets and the first of two to bloom (**Figs. 14 and 15**). Since then, we have flowered another *titanum* in the summer of 2023.

Other huge satisfactions are learning from peers, hobbyists, and colleagues that have become such an intricate part of my career. I have learned techniques like repotting cut *Sarracenia rhizome* that look good-as-dead - and resprouting them under mist. It may be the difficult plant to root, or the breakthrough technique you stumble across - but more often than not, it is just simply showing up to such a beautiful world class collection of plants to play with.

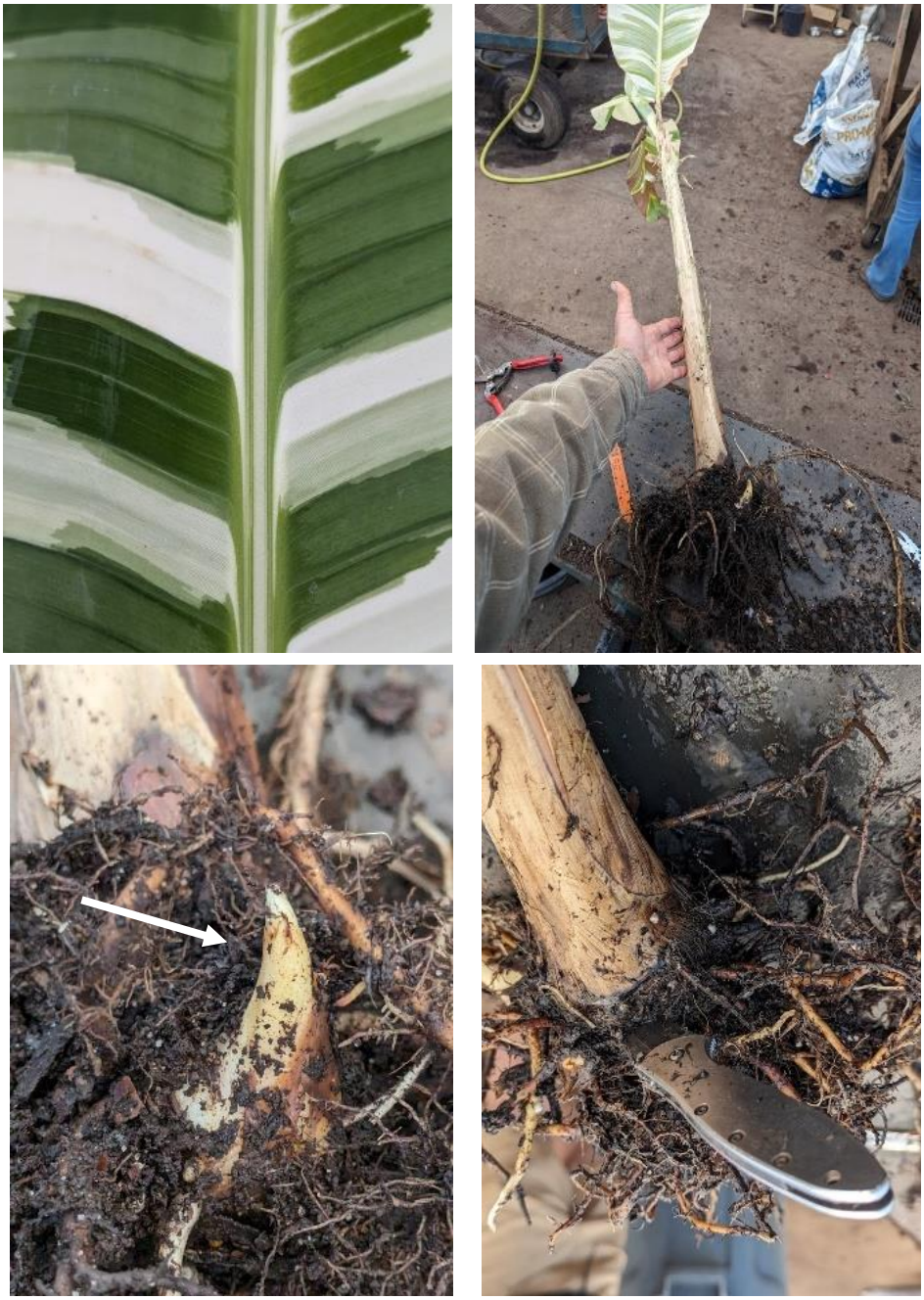

Figure 13. (top, left) *Musa x Paradisicaca* ‘Ae Ae’ variegated banana leaf, (top,right), (top, right) *Musa x Paradisicaca* ‘Ae Ae’ (bare rooted rhizome prepped and examined for cutting), (bottom, left) *Musa x Paradisicaca* ‘Ae Ae’ [verifying developed eyes (arrow) before cutting the rhizome], and (bottom, right) *Musa x Paradisicaca* ‘Ae Ae’ (non-rooted rhizome cutting above developed eyes).

Figure 14. (top, left) *Amorphophallus titanum* 'Peter Grande', (top, right) *Sarracenia* rhizome division w/ no growth, (bottom, left) foliage re-flush of *Sarracenia* rhizome divisions placed in a communal pot), and (bottom, right) *Amorphophallus sp*.

Figure 15. (top, left) *Narcissus sp*. (in-situ at JLBG), (top, right) *Opuntia santa-rita* 'Baby Rita' (in-situ at JLBG), (bottom, left) *Cylindropuntia x multigeniculata* (in-situ at JLBG), and (bottom, right) *Baptisia x* OP (un-named open pollinated trial plant).