Freeze-Drying Carnivorous Plant Pitchers At Home

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This article is directed to hobbyists and others who do not have access to elaborate laboratory equipment and are looking for alternatives to silica gel, sand and other desiccants and who want to have long lasting, somewhat durable dried pitchers that are not pressed. Cliff Dodd II first showed me a *Nepenthes bicalcarata* and *N. lowii* that he had dried by simply placing them in his home freezer until they seemed dry. Cliff let me handle the two sturdy dried pitchers, and I was impressed that he did have much obvious concern. Cliff had other preserved specimens of *Nepenthes*, but I was most impressed by the two species I had closely examined.

There have been several very good articles already printed in the Carnivorous Plant Newsletter about drying and preserving carnivorous plants (Lamb 1989; Shanos 1985; Shivas 1983). In this article I will go into exact details so others can reproduce my technique, and so enjoy their favorite pitchers not only in pictures, but by handling, arranging, altering colors, or sharing them with others. Arranging and use of freeze-dried pitchers is limited only to one's imagination (see Figures 1, 2).

Figure 1: Freeze dried *Nepenthes* pitchers. Top pitcher set: *N. bicalcarata*, all six or more years old, spray painted (left to right) copper, gold, burgundy, white and burgundy. Bottom set: four *N. bicalcarata* (top left waxed finish, others natural finish), *N.* × *hookeriana* red form (waxed), *N. fusca* from Sarawak (natural), *N. spectabilis* × *spathulata* (waxed), *N. veitchii* × *lowii* (natural), *N. ventricosa* (natural), *N. ampullaria* (just out of freezer and thawed).

Figure 2: Dried arrangements: Sarraceniaceae on left, *Nepenthes* on right.

All of the methods used in this and the previously noted articles are very useful in some ways but problematic in others. I have used silica gel to dry *Nepenthes*, *Sarracenia*, and *Cephalotus* successfully, but found the finished product to be very fragile when over-dried. Also, it was difficult for me to completely clean the silica gel from the pitchers without doing damage to their fine details. I have tried preserving *Nepenthes* pitchers in blocks of acrylic, but I never found the finished product to be worth all of the time and effort, though I have been told that acrylics have improved a great deal since the 1970s. My first attempts with liquid acrylic and *Nepenthes* were nothing short of disaster. I have used glycerin to preserve leaves, but I never liked the dark oily look it gives flowers or leaves. Shanos (1985) described methods, including a -50ºC vacuum, which I do not have access to!

While it is possible that early pitcher removal does take some energy away from the plant, in the form of unutilized or pre-digested food and photosynthesis, I have found the impact is minimal if a low percentage of pitchers on each plant are used for drying. I have worked in greenhouses, cutting roses and carnations, and perhaps this has made harvesting material from plants less difficult for me. If my plants suffer from the removal of a few leaves, it is because of poor cultivation and not the loss of the leaves.

I do not condone wild harvesting of pitchers by hobbyists for drying, and have never done so myself. Using field grown material for this purpose is a topic for a separate article.

The typical frost-free freezer, as is found in most homes, operates at about -7ºC (20ºF) and is perfect for the job. However, in family situations they can be a minor challenge to use. While pitchers are freezing, they are very prone to damage. Dedicating a shelf or secure area to this project is an obstacle that has to be worked out in advance with those who are using the freezer to store food!

The two crux periods in the process are when the pitchers are first cut for freezing, and the thawing period. Cut the pitchers off the plant after the pitcher has matured, and as soon as the lid shows the slightest sign of browning. I realize how difficult it is to remove a perfect pitcher from the plant, but remember that the leaf will be replaced by new leaves. Also, instead of lasting only a few months on the plant, a preserved pitcher will last many years. Do not wait for the pitcher to begin to fade or even brown on the plant—doing so will usually give unsatisfactory results.

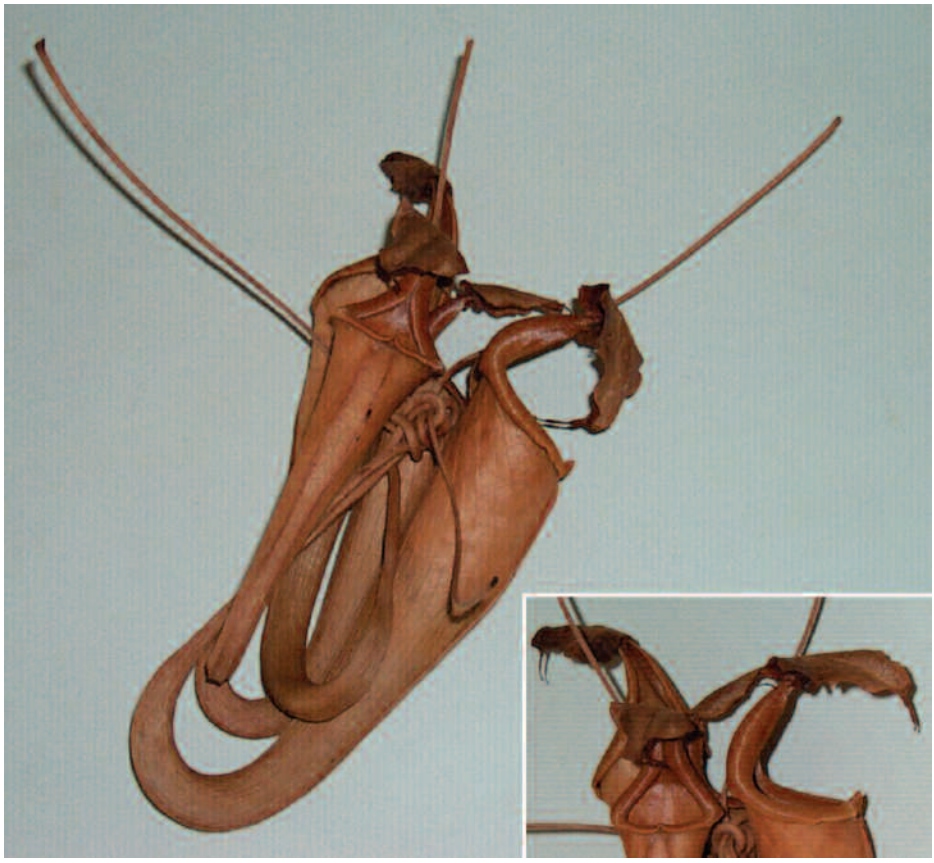

Figure 3: Bent *Nepenthes maxima* lid repair; inset shows after straightening.

I have tried to dry pitcher plant inflorescences, but those of *Heliamphora* are the only ones that I have been satisfied with (although they are very fragile). All my many attempts of home freeze-drying *Sarracenia* flowers have all turned out so badly, they were not worth keeping, nor was the loss of good seed worth it!

It is important that the pitchers be washed thoroughly, and any obvious mildew, nectar or chemical residue should be carefully scrubbed from the still fresh and turgid pitchers. A soft toothbrush works well for this task. Use care to brush in the same direction of any fine hairs, wing cilia, ridges, etc. The peristome of *Nepenthes* is especially important to clean if you want to see its smooth natural sheen in the finished product. When you have finished cleaning the pitchers, lightly shake off excess water and dry them with paper towels or absorbent cloth rags for a few minutes. Then place them in the freezer.

Deciding when the pitchers are thoroughly freeze-dried is something of a trial and error endeavor. The weight of the frozen pitchers helps indicate their dryness—a good deal of the pitchers weight is water and they become very light when dry. Pitchers of different individual plants of the same species have different size and thickness. Depending on the kind of material of the species used, and its stage of maturity, the pitchers will have different drying times. Small juvenile plant pitchers are the easiest to dry—four to eight weeks is usually plenty of drying time for most 15cm (6") pitchers, but patience never hurts, and incomplete drying will result in wrinkled or unsightly, curled brown pitchers.

For *Nepenthes* with thin walls like those on *N.* × *hookeriana*, *N. ampullaria*, *N. rafflesiana*, and *N. alata*, the drying time is relatively short (four to six weeks), but great care in handling thin walled pitchers must be given when thawing. *Heliamphora* also usually dry well in this period.

Figure 4: Nepenthes *bicalcarata* lid repair. Left—curled lid; middle—flattening lid next to another pitcher that is drying after being painted; right—flattened lid.

Thick walled or woody pitchers, such as giant forms of *N. rafflesiana* or large hybrids like *N.* × *dyeriana* are best dried a couple of weeks longer than young or smaller varieties. I have left pitchers in the freezer for 6 months with no apparent damage, so longer freezing time is better if you are in doubt. Mature *Sarracenia* need the same amount of time as large *Nepenthes* pitchers. Upper *Nepenthes* pitchers usually dry more easily and uniformly than most species with large lower pitchers.

Oddly, *Cephalotus* and *Darlingtonia* need a long freeze-drying time, eight weeks at least.

It is important to treat frozen pitchers with a delicate touch. The frilled wings on *Nepenthes* lower pitchers are very fragile. Handle frozen *Nepenthes* and *Cephalotus* by the tendrils only, and *Sarracenia* by their bases; any dents in the pitcher walls from rough handling will remain and be obvious.

After the freeze-drying period, the pitchers must be carefully thawed. This takes about 4-8 hours. Thawing the pitchers upside down makes for a superior finished product for several reasons. First, there is almost always some condensation and other minimal amount of frost liquid that is left in pitchers after the whole freezing process; turning the pitcher upside down allows this liquid to escape rapidly as it thaws. Second, the lids on all types of pitchers, except *Heliamphora* and *Darlingtonia*, tend to curl inward towards the mouth of the pitcher when dry. When thawed upside down, gravity works to help keep this type of curling from being a problem. Any frozen prey residue that was not cleaned out prior to freezing will also drop out of inverted pitchers when thawing, and this residue is not pleasant to smell when discovered at a later time. Hanging from string, or placing on vertical wooden dowels or thin upright wooden twigs will work well to support pitchers in the upside down position until completely thawed.

The most common problems I have encountered with freeze-drying is that the lids of many pitchers curl on the edges or roll inward toward the pitcher opening, even though the rest of the pitcher is well dried and in good shape (see Figure 3). Even pitchers still on the plants do this when experiencing extreme drought conditions. The thin nature of pitcher lids makes this an easily overcome problem, but it is also critical to use care when working on the lids of freeze-dried material. Simply remoisten the lid of the pitcher being worked on, by placing it under water for a few seconds and letting the pitcher stand for about 15 minutes to absorb the moisture evenly.

Once the lid is soft and pliable it is very prone to tearing, so use care. Methods for reshaping

the lid are unlimited and depend mainly on the natural shape of the lids being worked on. For examples, I have used paper clips, notebook clips, and many other tools (see Figure 4). Many pitcher lids will straighten out simply by moistening them, hanging the pitcher upside down and re-drying the pitcher at room temperature for 8-12 hours—gravity does all of the work. Rapidly drying with a hair dryer will cause curling and wrinkling of any thin portions of the pitchers.

In a more extreme case of deformation, the lid and neck of the pitchers of *Sarracenia* and *Nepenthes* will roll forward and inward. As before, moisten the relevant part of the pitcher—in this case the column and lid. A splint can be constructed from popsicle sticks, pieces of cardboard, plant labels, or any other materials that are light and easy to work with. Make a form for the individual pitcher lid and then re-dry at room temperature for 8-12 hrs in the preferred shape. I have several *N. bicalcarata* pitchers that I chose to reform the pitcher opening to a wider than normal point, to better show the abnormalities such as crossed fangs or three-fanged pitchers. Broken off and torn lids can be easily repaired with a small amount of carpenter's wood glue when dry.

Sometimes the pitcher is so deformed after drying that it would take a lot of work to repair it. In my opinion, easier is better, and unless the pitcher is very special to you, starting all over again by freeze-drying a new pitcher is often the wisest choice. After all, they do grow on trees! (At least, some *Nepenthes* do!)

Some *Nepenthes* will retain some pigmentation for years. Dried *N. rafflesiana* × *hookeriana* (red forms) and *N. spectabilis* × *spathulata* have stayed red for longer than six years. *Sarracenia* will hold some color for many months, but then turn assorted shades of brown. *Heliamphora* turn light brown while freezing, so I may let them brown on the plants before harvesting.

I have done some work with artificially coloring the freeze-dried pitchers. Spray paint can produce excellent results. I was surprised to discover that pitchers very lightly spray painted burgundy, or thoroughly spray painted with metallic paint, results in a nice finished product. I am certain there are many better artists than me that can come up with exceptional coloring, and can make any work I have done look amateurish.

I have used wood stains to attempt a carved wood appearance and although I have not tried every color of wood stain, I was not pleased with the results. The pitchers take up stains unevenly because of the waxy tissue and glandular areas, making for an uneven, messy look. Finishing wax paste used on wood, applied to brown pitchers and heated over a stove top to flow evenly into all pitcher areas makes for the most wooden look I have come up with. The wax probably helps the pitchers last longer as well. Paint cannot be applied after waxing, so if a pitcher is waxed this should be the last step of the project. Varnish and acrylic look good and can add durability to freeze-dried pitchers if not applied too liberally.

I have also tried carefully covering freeze-dried pitchers with expensive gold leaf. The materials for applying gold leaf are available from online sources such as (i.e., Mona Lisa Products, at www.houstonart.com). To my untrained eyes, gold leaf made the pitchers look like chocolate candies and make me hunger for a snack. I have not found an affordable and reliable electroplating company to apply any bronze or other metal finishes, but I do think it can be done. Electroplating would not be an environmentally friendly way to finish pitchers and would work best on very small material.

I have also tried a few methods that were not worth repeating! Green paint just looks wrong to me. If you paint the pitcher so that it looks artificially real, you should instead just work with making pitchers out of silk or cloth; these materials are easier to work with and are more flexible than freeze-dried pitchers.

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