Forging Your Program: Experimenting with Tetraploid Conversions

by Cameron Stern

Whether you’re a collector or breeder, novice or seasoned professional, it’s likely we all got into daylilies for our own unique reasons. My obsession with collecting and breeding daylilies began close to 12 years ago as a project in middle school. A family member showed me just how easy it was to cross and breed my own daylilies, and I’ve been hooked ever since. Whatever your reason, I’m sure you can name at least one, if not many, attributes that keep you falling in love with daylilies each and every summer.

We all have our own unique vision of what makes for the perfect daylily, and therein lies the challenge. How do we find and create a daylily that fits our ideal? How do we pursue our own personal goals? For me, the answer has been conversions. Ever since my start as a hybridizer, I can’t tell you how many times I’ve wished I could cross one of my favorite dips into my tet program and vice versa. I always found this crossing barrier to be more than frustrating, but I knew there was something that could be done to overcome that. My options were to scour the internet looking for a conversion of the plant I wanted – hoping that someone else found it worthy enough to convert – or I could convert the plant myself. More often than not, the work still had to be done. When I could find a fertile conversion on the market, the ability to add it to my program was often cost prohibitive, leaving me to wait years for the price to come down. Other times, I could find an introduction from the conversion I was looking for, but it wasn’t always taken in the direction I was hoping to go. Now, I’ve spent more money on conversions and subsequent introductions than I care to admit. These plants can add tremendous value to a breeding program, and with the amount of work that goes into creating them, as well as their rarity, their price can be justified. However, having done some conversions myself, I also know the power and freedom you have to forge your own unique program when you take the time to convert your own plants.

I won’t lie to you and tell you that it’s a quick and easy thing to do, but if you have some patience and are persistent, converting plants can do wonders for your breeding program – bringing the traits from your favorite diploid into your tetraploid lines. I hope to inspire you to experiment, to risk a few of your plants, and to really take your breeding program in the direction you want without necessarily relying on or waiting for advancements from other programs. In my own searches for how to convert plants, I read about so many people looking to try the process for themselves. The greatest limitation is access to colchicine – one of the most common chemicals used by daylily enthusiasts to convert plants. It acts to inhibit microtubule production and disrupt mitosis – the process of cell division. It is considered an extremely hazardous chemical and its sale is primarily restricted to research facilities. Luckily, there is an alternative – oryzalin.

Oryzalin is one of the main ingredients in the herbicide Surflan®, and can also be used to produce polyploids. It has been used to convert plants in numerous other species (e.g. lilium, rhododendron, etc.) and unlike colchicine,
Forging Your Program: Experimenting with Tetraploid Conversions

...can easily be purchased on the web. The problem we face with daylilies is that we have yet to work out a successful concentration to use. One of the best places to start is to look at the concentration used in other species and see if it works with daylilies, and then move the concentration higher or lower from there. I recently purchased Surflan® from www.Amazon.com and tried using it in the most recent round of conversions I was attempting. I have yet to find a good working concentration, but I have definitely found that using oryzalin can produce similar post-treatment symptoms, including the rot often associated with traditional colchicine treatments. This is where I think a willingness to experiment can really advance the daylily and bring even more diversity to tetraploid breeding programs. It allows anyone and everyone willing to spend the time, to have access to the process and the conversions they want, instead of limiting it to those capable of purchasing colchicine — though you will still have to sacrifice some plants. Diversity is key to any good breeding program, as it allows you to preserve and integrate key traits into your breeding lines as you move forward and encounter new problems, new environments, and new interests. It allows you the capacity to create the program you want at any given moment.

I have found Bill Waldrop’s article, “Dips to tets: a how-to guide” (The Daylily Journal, Vol. 70 No. 1 Spring 2015), as well his blog, “Bill’s Daylily Corner,” to be very good resources on how to perform conversions. There are also a number of people who post about their efforts on Facebook, myself included. I do also want to stress, despite a lower toxicity than colchicine, Surflan® should still be handled with care, and proper safety precautions should be used when handling the herbicide (remember your personal protective equipment).

Don’t be afraid to experiment. It may take an expert to decipher what your experiments mean, the conclusions you can draw, and how to design a better, more meaningful experiment, but it doesn’t take an expert to take that initial step — to test ideas, make observations, and ask “what if?” Working together, asking questions, and sharing what we know will help us all to create our very own program that accentuates all of those traits that got us into daylilies to begin with.

[Photos by Cameron Stern]

_I also want to note, care was used when taking these photos. Gloves don't mean much if you handle these chemicals using gloves, then you handle everyday objects (like your phone) or touch your skin/clothes. It is also good practice to thoroughly wash your hands after you're done handling chemicals (even if you wore gloves)._
Forging Your Program: Experimenting with Tetraploid Conversions

Tried to make mixing colchicine a little bit safer. This is why... Colchicine [above] is VERY DANGEROUS... LD50 is 5.886mg/kg.

Above: DMSO (used with colchicine in tetraploid conversions) is a strong solvent... also use caution when handling. It was recommended to me by members of the UVM risk management and safety department to double glove -- especially when used in solution with colchicine. DMSO is capable of penetrating nitrile gloves, so if you get some on your gloves you are capable of removing one layer before it can reach your skin.

Above: The setup for mixing colchicine. I used a plastic garbage bag to protect the work surface in case of a spill. Below: Tools for trimming and carving the plants. I use the hand sanitizer to clean the tools.
Forging Your Program: Experimenting with Tetraploid Conversions

Clockwise: Above, a daylily ready to be trimmed to ~1/4inch; Cut and ready to be carved to allow coverage of the meristem by the colchicine solution; Carved to create a "well" to hold the solution around the meristem; A different angle, showing the height of carved plants; Plants after 4 days of treatment with colchicine.