

Diploids, Triploids, Tetraploids, and Polyploids . . . Larry Diehl

Following is an article that appeared in the Ohio Lily Society Buckeye Bulletin, Larry Diehl is the Editor. I found it to be a very clear explanation of polyploids, and thought it would be of interest to our MARLS members also, especially as we are choosing new bulbs this Spring. It is reprinted with permission from the author. Ed.

I have decided to try an experiment. From time to time there are questions submitted by members about the culture of lilies. I have decided to start a Question and Answer column written by a local lily expert. His name is Harry Humus. Harry is not a member of any of the lily societies but he has considerable expertise about lilies. You have probably never seen Harry at any of our meetings but you will be surprised at how much he knows about OLS members. He is always underfoot somewhere.

I give Harry the floor with this column with some trepidation. His behavior frequently leaves something to be desired. He can be rude, insensitive and downright insulting. But his knowledge is worth tapping into, so submit your questions to me and I will pass them along to Harry. He may do us the favor of even responding to some of them. I have agreed to apply only a moderate amount of editing to his responses as part of the condition of his writing this column. I will insist that Harry maintain good taste in his writing. You may ask me to keep your name anonymous if you wish.

Ask Harry

By
Harry Humus

OK, so Larry talked me into doing this. I'm not sure what I'm letting myself in for. I don't totally trust your editor, Larry, he strikes me as someone who would stick a shovel into you when you are least expecting it. He treats me like dirt! Fortunately, he has come up with a very good question submitted by one of my favorite OLS members. So here goes.

Q: I am confused by all of the jargon concerning polyploids. What do the terms diploid, triploid, tetraploid and polyploid mean? What does it mean in terms of selecting a lily for my garden?
Kathleen Higgins.

A: Ah, Kathleen what a fine question! I have visited your garden many times but you didn't seem to notice me.

Let's begin at the beginning. Most lilies contain 24 chromosomes (12 pairs) within each of their cells. Such lilies with their paired chromosomes are referred to as diploids. During lily reproduction Mother Nature intends that when a sperm cell and egg cell are formed they should contain half the chromosomes of their parent, these half chromosome count cells are referred to as haploids and the process of forming the reproductive cells is referred to as

meiosis. When a normal fertilization occurs between haploid cells a new diploid cell is created which ultimately grows into a new plant containing genetic material from both parents.

Sometimes the meiosis process goes awry. A reproductive cell with a full gene complement may form, and when combined with a normal haploid cell, a new cell with three sets of chromosomes (36 total) is formed. This fertilization is much more difficult and chances of producing a viable cell are much smaller than the normal case. A lily formed this way with three sets of chromosomes is referred to as a triploid. Similarly, meiosis may produce reproductive cells from both parents that have a full gene complement. The resultant organism would have four sets of chromosomes (48 total) and is referred to as a tetraploid. Any lily with more than the normal number of chromosomes is called a polyploid.

As a general rule, polyploid lilies tend to be larger and stronger, their flowers have more substance and they are longer lived. These are all traits that gardeners desire. It is why you should desire having triploid and tetraploid lilies in your garden.

Reproductive cells containing more than the normal number of chromosomes may occur in nature. This may occur when the plants are exposed to unusual conditions such high temperature or radiation. The

polyploids cont.

chances of developing a natural triploid are low, but nevertheless there are several commercially available plants (E.G. Compass, Hornback's Gold, Seashell) where this occurred. Triploids may also occur when two widely different types (divisions) of lilies are crossed. Examples include some *L. longiflorum* and Asiatic crosses (known as LA's) and some of the oriental/trumpet crosses. The embryos of such crosses are usually very fragile and will not survive on their own unless the embryos are rescued and grown by tissue culture. Triploids are generally not fertile parents because of their chromosome count. If you want to try use triploids in your lily breeding program use them as the seed parent. It was amusing to watch Larry scurrying around his yard dabbing pollen given to him by Art Evans of Gravette, Arkansas. The pollen was from Art's seedling lily which won best of show at the NALS show in Minnesota. Larry neglected to write down the parentage from Art's cross. When he bothered to ask Art, he found the seedling was from a Damson x Flat Rose cross which is a diploid x tetraploid. Quick now, this is a test, should Larry have success with this pollen? Probably not, Art's seedling is probably a triploid and is probably therefore pollen sterile! Larry is such a numbskull!! I nearly coughed up a rootball laughing!! [Harry is right about the triploid part! No/few viable seed pods were obtained. Ed.]

Tetraploid lilies can also be created by treating lily cells with powerful chemicals (a process sometime referred to as conversion) . Many tetra lilies were created by treating lily scales with colchicine. Colchicine is derived from *Colchicum autumnale*. Early pioneers such as Emsweller and Griesbach used this approach. You can obtain colchicine by smashing up colchicum bulbs, but if you do so, keep your mitts out of the toxic mash!! Recently, hybridizers have been using the herbicide Surflan (Oryzalin) to accomplish the same thing. New tetraploids can also be created by crosses between tetraploids. Once the pool of available tetraploid lilies reached a sizable number, many new lilies were created by crosses between tetras. This arena has experienced explosive growth by lily breeders in the last decade and new crosses represent the 3rd 4th or even 5th generation of tetra breeding. Sometimes breakthroughs in lily breeding have been assisted by this conversion process in other ways. Leslie Woodriff produced the lovely lily Black

Beauty by crossing *L.henryi* with *L.speciosum*. This lily is sterile. However, by converting Black Beauty to a tetraploid form, fertility was obtained and any crosses containing Tetra Black Beauty (TBB) now exist.

The last 10-20 years has brought many breakthroughs in lily breeding. The use of tetraploids, embryo rescue and tissue culture has allowed creation of whole new classes of lilies. Magnificent interdivisional hybrids (crosses between different lily divisions such as asiatics x trumpets, orientals x trumpets, asiatics x martagons, Etc.) such as Silk Road/Northern Carrilion, Scheherazade, and Starburst Sensation are but a few examples. Recall from our discussion above that many of the interdivisional lilies will be polyploids! This is another reason to include polyploids, especially interdivisional lilies, in your garden. Wilbert Ronald of Manitoba and Judith Freeman of Washington are notable contributors to this area. Ever increasing numbers of interdivisional hybrids, especially the Oriental/Trumpet O/Ts and LA's, are appearing yearly. The future looks bright for these types lilies.

Well Kathleen, I hope this helps. If you are still confused, try reading this again. I'm not sure anyone could improve on the eloquence of my discussion.

