

## Some Hybridizing Basics

This is some more of my email correspondence with a student of the daylily. This brings to light a couple of hybridizing concepts, some basic and some more advanced. All of which you will no doubt hear more about, if you haven't heard of them already. Again this represents only my opinions and not fact. My opinions are based on my experience and trials in my own gardens.

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To start this off, I was asked about a specific plant, a white daylily, and its gene pool. The question had to do with its offspring and the watermark eyes that some were showing. I was shown a series of seedling pictures that displayed different qualities of color and eyes. Some seedlings had more color and some had less color. Some seedlings didn't have an eye while others had a watermark eye. Neither of the parents had a visible eye of any kind. This is what raised the question in the first place and started the discussion. Things quickly got very deep as you will see. I believe that much can be learned and applied to hybridizing from this series.

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I doubt that the white color has anything to do with producing eyed daylilies. There is the possibility that the white flower you were using has a recessive eye. The eye could be hidden from sight and be only in the genes. There is a good possibility that the eye you did have and see was dominant and that is why you are seeing so many in the seedlings. I think that I alluded to that the other night. I believe that the watermark eye is a dominant gene and I know that the eye itself is dominant. Let's look at that for a minute.

If I had an eyed daylily and crossed it on a daylily with an eye then all of the seedlings would have eyes, with the possible rare exception maybe 1 in a 100.

If we had an eyed flower and crossed it with a self flower (a self being a flower with no eye at all and with the assumption of no eye gene) this is what we could expect. Assume the dominant gene is the eye gene for this discussion. The eye gene would show up in 75% percent of the seedlings. This would play out like this; 25% of the plants that would have no eye and no gene, 50% would have no eye and have an eye gene, 25% would have an eye.

Here is where things start to get really interesting. A term used in genetics and hybridizing for crossing siblings is F2. If we crossed two of the seedlings that didn't show an eye but had the eye gene then guess what happens? The eye will show up 75% of the time! Now if we do an F3 cross of these siblings we would continue to isolate this gene even further. This is how a recessive trait is brought forward by breeding. This is where the term line breeding comes from. If you were then to make a cross back to one of the original parents this would be called a back cross. A self pollination would be the same as an F2.

As you isolate the genes you will bring things forward that have always been there but have never been seen (recessive). This can be both good and bad. If you go too far you

will create weak sickly plants that need new blood brought into the line. Weakness and disease can be brought forward just as any other trait. I have heard some of the old timers say not to ever go past F5. I haven't been doing this long enough to get to that point so I wouldn't know from experience. It takes us 3 years to turn a generation here so that would be at least 15 years on the same direct line.

The white flower you used, you would have to look at it's parentage to verify this, may have had a recessive eye gene that may have helped you in producing eyed seedlings. This is one thing that makes all of this so frustrating and at the same time so exciting and mystifying. The genetics are very complicated and there is no predicting the outcome of any given cross unless you are very familiar with it and stay within the breeding line.

For instance, Jackie has crossed Indian Giver (a purple with a white edge) X Border Crossing (pink with a white edge) in order to intensify the white edge and to isolate it. At the same time she has crossed Indian Giver X Bernadette (pink self). Both of these flowers have produced some seedlings that were purple with white edges that we selected to watch. By crossing these two seedlings to each other that is still within the line of Indian Giver and those seedlings would be 1/2 Indian Giver but from two different sources, both improved. This proved in the field to isolate and intensify that white edge even more while adding the qualities of the other two plants that were wanted such as flower width and ruffling. She was also able to increase the bud count, branching, plant vigor, and greatly improve on the color all at the same time because of well-selected crosses. We will go into that more a little later, I promise. This is the purple flower that you liked the picture of. It took her 7 years and about 4 thousand seedlings to make that one, but that's how it happened and believe it or not, it was planned. From here the line has been refined two more generations. From the plants in this line that you have seen there have been out crosses to new blood also.

As she continues to work this line it becomes more predictable because the gene pool is beginning to narrow and amplify. We have worked to only select and breed with the qualities that we want and the others are discarded. When we find a plant that is less than desirable, Roundup! One thing that should be clear in your mind by now is that you must have a very clear idea of what you want to achieve or else you will be lost in the shuffle. You should now be able to see how it could take someone a very long time to come up with something totally unique and to stabilize it. It might take many daylily generations or the better part of a lifetime. Few people have that much insight into the future. Even fewer people can stick with something that long.

The tetraploid daylily 'ain't got 'nothin' that the diploid didn't already have. There are no natural tets. They have all been man made or induced. The process of doubling the genes has just sped up the hybridizing process of isolation just a bit in some areas. The main factor now is that much more interest in being put into the tets and many more people are working on them. The sad part is that more and more people are dropping out of breeding the dips while at the same time everyone is looking for good dips to convert. Kind of stupid if you just think about it a little isn't it. Now what are they going to do when nobody is giving them the new blood they need? The genetic pool of the tets is not nearly as large as the dips.

One of the things that we think is very important is to know what everyone else in the .....

country is doing. That is why we make a point of going to Myrtle Beach and Chattanooga each year. We get to see slides of new selected seedlings and their crosses from hybridizers around the country. This lets us know what they are working on and we can see their new introductions before they come out. Often this is several years in advance. This tells us which direction to go in. We want to make sure that we are going in a direction that is of interest but at the same time not the same as the others. If the others take our direction, then we have to change fast. We just can't compete head to head with any of the FL growers. We can only compete by not competing, if that makes sense.

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Continuation:

Yes, I think you understand what I was saying from your response. You are at least pretty close. If both seedlings have eyes you will get an eye 100%. If there is no eye AND have the RECESSIVE GENE not seen then 75% will have eyes. Remember that 25% of the original seedlings do not have this recessive gene but 50% do. The odds are in your favor even though you can't see it. This means you should select several with the flower and plant qualities that you like. You can use the eyed seedling with them as an F2. But you do appear to get the idea of how powerful this F2 cross is or can be, that's for sure. This is what I wanted you to understand and to know how to isolate the traits that you seek. Just because you can't see them passed on doesn't mean you have failed. You just haven't gone far enough yet.

What we look for in certain crosses are traits that we are working on. One of the things that we feel is of the utmost importance is the plants overall quality. That would be bud count and branching and how well it's growing. So, from a line of seedlings we will select the best eye or the best flower, and the best plant. These would be the two that we would pick to F2. This way we would hope to make the plant better and improve the flower at the same time. Actually, if the cross was very long we might pick more than just two, but the idea is the same even how you apply it. You don't want to use a weak plant or a poor bud count. One thing that seems to happen very often is that the best flower will be on a 5 bud scape. If the scape is that bad we won't breed it. We just will not breed a scape with less than 15 buds unless it's something so different that it is unbelievable. It's very hard to throw these away. You finally get what you want and the darn thing has a bad scape. OUCH!

In our introductions we are striving for a low bud count of 25, average of 35, and high meaning 45 and over. Too many people have the wrong idea of what a good bud count is. I have even heard well known hybridizers say, "well what do you want a good flower or a good bud count". Bull! If you don't breed with a bud count of 12 then you won't have it in your program. The best thing to do is be careful in your seedling selections and be ruthless. Low bud count is a very dominant trait that is hard to breed out once you get it in your line.

There is a lot to understand and it takes time and practice in the field. Hang in there and it will start coming to you. You should keep good records. This is very important. It is your learning curve.

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Continuation:

As far as your crosses go, like Nike, just do it. Jackie makes what I think are some pretty crazy crosses sometimes. I used to tell her that they were really stupid crosses and they wouldn't work but just let her do them anyway. I insisted that she not make too many seed from them, so that she could learn not to do such crazy things. Well, I have learned to keep my mouth shut. She has made crosses that I can assure you no one would ever think could possibly work, but somehow something happens. Like I told you she does have an eye and some days she will see a little something that just might be a possibility. There won't be a huge cross but there will be a pod or two from what she sees as a possibility. Occasionally these things turn out something really unique and truly worth having. The moral of the story here is to listen to no one and do your own thing. Try everything at least once just to see what will happen if you think it might work. If nobody else would consider doing it, then that in itself may be a good reason to try it.

We try to mix things up as much as we can, looking for the right combination, which is of course unknown. In the dips it seems that two or three pods of a cross is a good number to tell if there is hope in a cross. If things turn out well sometimes we will go back and make a whole bunch of seeds. If they all look like crap then we haven't wasted too much space on the experiment. I used to have these big ideas about what a certain cross would give and then make a thousand seed from it. When the cross didn't work, which was about 99% of the time, then there was a whole lot of garden space that could have been used for more productive things like searching for good crosses. I guess I have had to learn the hard way to not get stuck on these theories too much and just to try doing things differently. By far the most important thing is keeping up with the parentage so that we can learn what is and what isn't working. Here again, most importantly what isn't working so that we can move on. If a plant hasn't produced something in 3 or 4 years then I get it out of my hybridizing program. In that amount of time I have been able to try in enough different ways that I should know if there is any potential. Maybe some of this will be of some help to you. It has taken us a long time to figure these things out.

After having worked the last few years with the watermark eyes I am starting to think that they may be somewhat of a dominant trait over not having an eye, but sub-dominant to certain other eyes. I know that eyes in general are a dominant trait. I am seeing this show up when crossed with a regular eye in about 25% of the seedlings while nearly none have no eye. If you were to cross a watermark eye with no eye you would still get only about 25% of the seedlings with a watermark eye but this time you would have about 25% with no eye and 50% with a strong eye. I haven't really counted, but this is how it seems to be working. Of course this all depends on what parents we are crossing too. Many of the parents have eyes that don't show up in themselves but do in their offspring.