



Hybridizing Peonies

Don R. Smith—Hybridizer, West Newton, Massachusetts, USA

Hybridizing can be an involved activity that encompasses parent selection, fertility research, hereditary studies, pollination techniques and record keeping, to name just a few. However, it can be simplified or complicated further, depending on the goals of the hybridizer. In simple terms, the goal of the hybridizer is to produce new offspring with desired traits. These wanted traits may take on a myriad of expressions—flower color, plant height, bloom season, flower form, cut flower potential, fragrance, etc..., all determined by the hybridizer and the plants that are chosen as parents. Most peony hybridizers start out by experimenting, without any clear goals, leading them to more focused crosses over time.

In any event, hybridizing peonies is fun, rewarding and is a lot easier than most people think, but also requires a considerable amount of patience. Peonies grow very slowly and it takes anywhere from four to six years from the time the cross is made before first flowers are produced. After which point, another one or two years is required before the young plants mature to display flowers that are truly representative. Thus patience is paramount, but the rewards are often worth the effort.

Hybridizing can become addictive and many gardeners have fallen prey to the endlessly interesting possibilities that the activity supplies.

Before continuing, consider that many people fail to fully consider the amount of space required in growing peonies. Growing hybrid seedlings requires a considerable amount of garden space, maybe not so much at first, but more and more as the little plants steadily grow towards maturity. This can be a problem created by the combination of good luck and success, which in turn leads to far more seedlings than anticipated. Culling inferior plants can lessen space requirements, but the labor involved in removing mature peonies can be considerable and should be taken into account. For this reason, many hybridizer's focus their efforts on difficult crosses that may yield only a few seeds, but have high potential.

All a hybridizer really needs to get started is a few fertile varieties, a little extra time during the bloom season and a whole lot of patience. It isn't necessary to grow a large number of peonies or have a really big garden to get in on the fun and enjoyment. For those who have never tried hybridizing before, the following is a detailed step-by-step guide explaining exactly what is needed to be successful.

Preparing for the Season. The first step is to assess the plants in the garden and determine whether any are suitable to use as seed or pollen parents (fertility). Any plants that produce seed pods containing good-looking seeds on their own will probably be useful as seed parents. Identifying a few pollen parents to work with should not be very difficult either, unless there are only fully double, bomb-type peonies in the garden. These types of flowers often lack pollen or do not have developed receptive structures. Most single and semi-double peonies have a dense ring of stamens topped with yellow anthers filled with pollen. If no such peonies exist in the garden, develop a plan to acquire a few good candidates before the season gets started. Most peony enthusiasts or growers will be glad to help you

determine some good starter plants. Neighbors or friends who grow peonies are good sources of pollen and usually are willing to share. All that is needed to collect pollen is a few small paper envelopes and a marker pen. If attending an American Peony Society Convention, pollen can often be collected at the end of the flower exhibition for use in hybridizing, which allows for some choice parent selections. Garden tours during the convention may also provide opportunities for pollen collection in gardens that are on the schedule. Permission from the tour garden's owner to collect pollen should always be arranged.

Collecting Pollen. Pollen collection is easily accomplished in the garden by simply grabbing a finger full of anthers (i.e., the top part of the stamen) between forefinger and thumb. Gently pulling to separate



Bud ready to "force open" for pollination

the anthers from the filaments works well. Place the pollen bearing anthers in a paper envelope that is clearly marked with the name of the variety. Remove and collect as many of the anthers as possible in order to be certain that sufficient pollen is available for later hybridizing efforts. It is preferable (and much less messy) to collect the anthers from the plants you intend to use from a newly opened flower. Done at this point, the anthers will most easily separate from the filaments which hold them. Older flowers will have begun releasing pollen from open anthers and recovering the pollen can be challenging.

After pollen is collected, it is essential to pour and spread out the contents of the envelope onto a small sheet of aluminum foil (~6" x 8") and let it "dry out" (dehiscence) for a day or two before use, otherwise it quickly begins to rot. This is especially true if plastic bags are used to collect pollen, which is the reason small paper envelopes are recommended. Either way, it is very important to get the anthers spread out onto a sheet of foil as soon as possible. Place the foil sheets under a small (~60 watt) incandescent light bulb to warm and dry it up for ~24 hours. This step forces the quick release of the pollen grains from



Flower with petals removed

the anthers in a process known as "anther dehiscence". Cutting an opening flower and bringing it indoors where it can be easily plucked of all anthers is a fine method of collection, which supplies a more controlled environment. The anthers can then be dropped directly onto the aluminum foil for drying. Either way, once "dried-out" in this manner, it is important to immediately get the dehisced pollen into some type of moisture proof container, such as an old pill container or old 35 mm film canister. This will prevent any further loss of moisture and also prevent exposure to disease or fowling organisms. If a suitable

container is not available, simply fold the aluminum foil into a small packet or and label it with the name of the pollen parent using a permanent marker. Place these folded mini-envelopes in a zip-lock plastic bag. Stored this way, the pollen should remain viable for several days. If kept longer (say for several weeks or more) as is often the case, storage in a refrigerator or freezer is recommended.

Maintaining the viability of your pollen samples is a critical element in having a successful breeding program, especially when attempting any of the more difficult crosses. Therefore, it is important to know and remember that the primary factor affecting the loss of pollen viability is the loss of water content, which is, in turn, highly correlated with increased temperature. Thus, the bottom line is keep pollen cool. This is especially true when working outside in the garden, where temperatures can often be in the high 80F's or 90F's during bloom season. It is especially important to protect pollen holding containers from exposure to the sun, which can 'cook' and destroy the pollen. Simply sitting on the ground in the hot sun for as little as 15-30 minutes can quickly heat pollen to over 100°F, thus accelerating the water loss rate by up to 1000 times. Pollen kept in a closed, insulated cooler, shaded from the sun will enable pollen to remain viable and is recommended.

Selecting the Seed Parents. Select the species, herbaceous hybrids or tree peony varieties that best fit into hybridizing plan to be undertaken. Knowing whether the plants in a garden are fertile (or not) is helpful, but trial and error will supply an answer later in the season. Parent selection is as much a scientific endeavor as an artistic journey. Many of the most notable hybridizers have had little formal training, if any, and have been quite successful. However, having an understanding of genetics allows the hybridizer to make good choices and not repeat already known mistakes. No comprehensive literature exists on hybridizing peonies, although numerous articles are available for those that want to know more. Don't be afraid to experiment, no harm will come to the subjects of your efforts and know that some of the most interesting and beautiful hybrids were created by simply experimenting with different parental combinations.



Fully emasculated flower, ready for pollination

Pollinating the Flowers. Force open and strip-off all of the petals and anthers from the flowers of the selected seed parent, 1-2 days prior to normal opening (emasculating). This practice will prevent the flower from being self-pollinated. Pollinate these flowers immediately. If pollen appears on your fingers during stripping of the anthers, move on to another flower, rather than risk the possibility of a contaminated cross. Check carefully for anthers struck between the carpels and remove them with a pair of tweezers or a sharp tool being very careful not to damage the carpels. This is a very common occurrence. A small magnifying glass is helpful in

finding these trapped anthers. Contrary to popular wisdom, there is no advantage or reason to delay pollination. The stigmas are receptive at this time or will be very soon.

Using the tip of a finger, transfer pollen from a container to the flower's stigmas, being careful to cover the stigmatic surfaces with a liberal amount of pollen. A small paint brush can be used in place of finger application. The stigmas may not be sticky at this point, but the grains of pollen will stick to them very nicely, nonetheless. Since stigmas are often pink or red in color and pollen is usually yellow or cream, it is usually quite easy to see how much pollen has been deposited on each stigma. Attempt to cover each stigma as fully as possible. Generally, there will be 3 to 5 stigmas per flower. Remember to protect your pollen from heating while performing the pollination process. When possible, do pollinations in the early morning or evening. Morning pollinations can be difficult due to the presence of dew, which can cause pollen to become unusable and problematic to work with.

Bagging and Labeling. Immediately after pollinating the flower, label the stem and "bag" the flower using a small paper bag or wax paper envelope. Mailing envelopes (~3 ½ x 6 ½ inch) with the flap licked and sealed and one of the small edges cut off, can be prepared ahead of time and work quite well. Press the edges of the envelope together, this forms



Flower pollinated and tagged

a sort of "mini-tent", which can easily be slipped over the pollinated flower. Before covering the pollinated flower with the envelope, write the pollination date in the upper corner of the envelope, so that the envelope can be removed in a timely manner at a later date. This constitutes the "bag" and serves several different purposes. The bag keeps the pollen dry and protects it from the heat of the sun. It also serves as a barrier to prevent insects from removing pollen or pollinating the flowers, which would destroy the work already done. If pollination is performed as above, there is almost no chance for contamination to occur.

Unless it is very windy, there should be no need to tie-off, seal or attach the envelope at the bottom. Sealing the envelope around the flower would only trap moisture and help promote rot and decay. Plastic bags should not be used due to their water holding qualities and ability to trap heat. The envelopes should stay in place for 2 to 4 days and then removed. Once the envelopes are removed, they can be dried out and reused multiple times. To avoid contaminating pollen containers, use only one pollen container at a time. Make all crosses using that pollen, then cover and put it away before switching to different pollen. Be sure to clean your fingertips when switching pollens, small pre-wetted wipes can be purchased inexpensively for such purposes and work well. Studies on peonies indicate that pollen tube growth and subsequent



Bagged Cross

fertilization of the ovule generally occurs within 24 hours of pollination, therefore, there is no good reason to leave the “bags” on beyond two days, and doing so will only increase the chances of stem rot.

As far as labels go, simply designate a different color (or combination of two colors) for each pollen that is intended for use. The use of ordinary colored kitchen-type tie bands of the appropriate color(s) can be placed around the stem just beneath the flower to indicate which pollen was used on a particular flower. When many different pollens are used (more than 7), resorting to two tags for some crosses works well. For example, a single green tie band = Pollen#1, a single white tie band = Pollen#2, green + white = Pollen#3, green + green = pollen#4, etc...



Lactiflora seed pod (carpels)

Waiting for the results. Once pollinations have been completed and bags have been removed, all that is needed is to sit back and wait until the seeds are fully developed. For those who hate to wait, results can be assessed after a few weeks through close examination of the developing pods. In crosses where fertilization has occurred, the pods will begin to swell and fill-out, indicating that there are seeds growing inside. The bigger the pods, the more seeds there are growing inside. However, some peonies produce large seed pods that are empty, making it difficult to determine success. Again patience...

Harvesting your Seeds. Seeds are usually ready for harvest near the last week in August to the first week in September in New England (which is approx. 12-13 weeks after pollination). Seed maturation will vary from location to location and is somewhat dependent on conditions during the growing season. Harvest the seeds at an early stage, but not before they have all turned completely brown or black. Inspect the seeds as soon as the pods begin to split. If most seeds in the pods are brown, harvest (cut) the stem and put it in a vase of water for a few more days to allow immature seeds to develop completely. This prevents seeds from falling on the ground and getting lost before they are collected. When all of the seeds have turned completely brown, blue or black (dependent on genetic heritage of the parent), remove the seeds from the pods. Some red seeds may be mixed with more mature ones, these can be collected and they will turn to the ripe color in a week or two. Let the seeds dry off for several days.

See APS articles concerning seed germination and growing seedlings for the next steps. Most hybridizers adjust techniques to suit their needs and this can lead to better results. No one hybridizer works in exactly the same way, but comparable results are experienced by many. Thus, feel free to experiment to find methods that may be more productive. Consider joining one of the internet based peony chat groups to learn more and share your experiences.

Unfortunately, the above discussion only covers the operational part of hybridizing. The more difficult part is deciding what to cross with what. Due to the endless number of possibilities, deciding on parents can be frustrating. Discussing successes and failures with other hybridizers and enthusiasts is often helpful and should be pursued. Studying the American Peony Society's Cultivar Registry will assist, as a good number of the entries contain parent information. This information can be helpful in determining fertility and possible outcomes.

In most cases, people get into hybridizing to try to create something new or different or, at least, something significantly better than anything which currently exists. With peonies, there are many plant and flower characteristics where improvements would be welcomed and appreciated. New and/or better flowers colors, more and/or longer lasting flowers, extended or repeated bloom, stronger stems and better plant habit are all areas where progress can be made. The chances of producing something really new or special are seldom very high, but are probably better than you might think, especially with peonies where there are only a relative handful of new varieties introduced and registered each year. A fair amount of luck can be involved, thus anyone's efforts may be rewarded.



Seedling from the American Peony Society Seed Distribution Program.

To maximize chances of getting something really new and different, work with some of the newer types of peonies, such as the Advanced Generation Herbaceous Hybrids, which are mostly fertile tetraploids. Many of these new hybrid peonies contain 4 or more (sometimes up to 7) different species in their genetic makeup. Thus, the gene pool of this hybrid group is extremely diverse, which can lead to some very interesting results. Some of the newer varieties have become very popular with peony hybridizers and produced many outstanding new seedlings. These include varieties such as Dr. David Reath's 'Lemon Chiffon' and 'Salmon Dream', Chris Lanning's 'Sunny Boy' and Seidl's 'Pastelegance'. Other hybrid peonies with rich genealogy that should be more extensively explored as parents are Seidl's 'Carnation Bouquet', 'Little Corporal' and 'Valkyrie'. If concerned about running out of garden space, try your the intersectional cross, which is undoubtedly more difficult, but chances of getting something "new" are likely to be significantly improved.

Discovering the joys of hybridizing peonies has turned out to be a "life changing" event for me. So, if you're like me and have a real "passion for peonies," there's a good chance it could become one for you as well. Ultimately, there is only one way for you to find out. Try it for yourself! Don't just settle for growing other people's plants, try creating and growing a few of your own. Hopefully, if you're lucky like I was, you might get to name one of your future creations after your mother or daughter or some other really special person in your life. Or perhaps, you will get to experience the great satisfaction and

enjoyment that comes from seeing one of your creations enhancing the landscape in someone else's garden. There is little question in my mind that these type of rewards have far out-weighted the many hours invested and have resulted in some of the most satisfying moments of my life. In the end, it is hard for me to imagine finding a more satisfying and rewarding retirement hobby than creating new varieties of my favorite flower.

©American Peony Society. Revised 2019. All Rights Reserved.

