

Developing Cultivars by Cross Pollination Delphiniums as an Example, by Norman DeNeal

Cultivars are simply cultivated varieties of plants. Cultivars may be developed by selection or cross pollination. In this article cross pollination will be discussed. For example, suppose one wanted to develop an eight-foot delphinium cultivar with pink flowers.

In Butte, a garden club friend, Marie Chabai, has a remarkable stand of 8 to 9 foot, dark blue delphiniums she has grown for about 50 years. What is unusual about Marie's delphiniums is their height. Today delphiniums generally only grow about 5 feet tall. However, when Marie first planted her delphiniums, the 8 to 9 foot varieties were quite common. Early in the twentieth century, hybridizers were busy developing delphinium varieties emphasizing colors beyond dark blue and with an accent on flower stalks with tighter, more closely spaced florets. Sadly, after the 1940s most of these exotic cultivars were lost due to random cross pollination. What remained after the 1940s were some of the developed colors, but with less densely packed stalks, and a common five foot height. The peak of delphinium hybridization was largely achieved through deliberate cross pollination.

To illustrate a cultivar by cross pollination, our example would be to cross pollinate Marie's 8 to 9 foot, dark blue blooming plants with a 5 foot delphinium with pink flowers to achieve an 8 foot pink blooming delphinium. Most flowers have both male and female structures on each flower. The male structure, called a stamen, is tipped with pollen that is generally yellow...though the pollen can also be black, brown or even green. The female structure that concerns us is the pistil, and in particular its tip called the stigma (pl. stigmata). It is generally at the center of a flower and has a sticky tip to capture pollen. The stigma becomes sticky at about the time that pollen becomes viable or ripe. To develop a cultivar by cross pollination, you must cut the male stamens off the plant with one of the two desired characteristics as soon as the flowers form and before pollen has developed. From the second plant you can allow both the male stamens and the female stigmata to develop unhindered. In this delphinium example, it is rather tedious to emasculate all of the stamens of the entire stalk of flowers. So you need only to do this to a few flowers on the stalk. But whether you have emasculated an entire stalk or a few florets, those emasculated flowers then have to be isolated. This is generally accomplished by covering the emasculated flowers with a white cloth so that no pollen can randomly get to the female stigmata that have been left uncut. The cloth does not block air circulation to the flower, but only prevents random pollination from fertilizing the stigma. The cloth should be tied around the base of the flower (or the stalk if the entire stalk has been emasculated). Hopefully, the female stigma will become mature and sticky when the pollen from the second plant is also mature. At this time, with a small soft artist's brush, gather the pollen from the second plant and brush that pollen onto the female stigmata of the first plant that had been covered with cloth. Then again cover the female stigmata to prevent random pollination. You should do this once a day for about three days. Pollen is generally only viable for a few hours in the early morning. Thus pollinate within the first few hours of bright morning light. You will know that fertilization has taken place when the flower petals drop off or when the stigma blackens or shrivels up. Afterwards the cloth can be removed. At the base of the female pistil with its stigma is the ovary where the seed will develop. In two weeks the ovary will swell as the seeds develop. When the seed is ripe, gather it for planting the following year. You will know when the seed is ripe when

the ovary or seed capsule breaks open and exposes the dry seed...black or brown seed with delphiniums.

It is likely that the seed you collect will produce only a few plants with the characteristics that you want...in this example eight foot delphiniums with pink flowers. If your seed only results in 20% of the plants with the desired characteristics, you can either destroy the other 80% of the plants before they develop fertile pollen, or isolate the desired 20% with a cloth so that random pollination does not take place. The desired plants need not be further emasculated but they must self pollinate among themselves. In other words, when you finally have at least one desirable plant that you've cultivated by cross pollination, you may then further develop that plant by selection as outlined in another article on this site. It may take several generations of selecting out desired plants before you will have seed that always comes true...where the seed offspring always results in the desired characteristics. With perennials, it may take two years between generations to know if you've achieved your desired plants.

It makes no difference whether you emasculate and hand pollinate either the 8 foot, blue delphinium or the 5 foot pink delphinium in the example. But one of the two has to be emasculated, isolated and hand pollinated. Isolation can be accomplished either with a cloth or by isolation by distance from other plants of the same species such as at the opposite end of your yard or in a different room of your home. With many plants, you may also need to remove the flower petals when the flowers appear in order to reach and cut off the male stamens.

Though developing a cultivar by cross pollination is time consuming, the results are not only very satisfying but also can be profitable (note the article on this site on cultivars by selection).