

75 to 100 plants. The second group had the same procedure repeated 4 weeks later with growing plants. Yield decreased to an average of 30 plants. The last trial date 4 weeks after the second, plants had eight to 10 sets of leaves on the growing plants and the result was two plants.

PERENNIAL PHLOX GROWN IN NORTH AMERICA

It surprises me that most North American catalogues only list more or less the same 8 to 10 phlox cultivars; is that all there is? I looked to see what is grown in Europe; *List of Names of Perennials* showed 136 *P. paniculata* cultivars and an additional 20 cultivars were found in *Hardy Herbaceous Perennials*. Powdery mildew is usually the worst disease of *P. paniculata*. At my location night temperatures are usually 8 to 10C lower than day temperatures and with very heavy dew there is no mildew. As an aside *P. subulata* often has downy mildew. When root cuttings developed shoots in the ground, new plants sprouted from the remaining roots and were clean.

Asexual Propagation of *Anemonella*, *Dodecatheon*, and *Trillium*

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INTRODUCTION

North American wildflowers are becoming increasingly popular with our customers. We try to offer named cultivars, double forms, and good color forms. Each cultivar must have uniform color, size, and form. Vegetative propagation is necessary since seed produces wide variation. Like most nurseries, Blanchette Gardens tries to grow plants to blooming size in the shortest possible time. This paper outlines a few methods, and how I have developed them to asexually produce flowering-size *Anemonella*, *Dodecatheon*, and *Trillium* fairly quickly.

PLANTS AND PROPAGATION

Dodecatheon. Shooting star is native to the United States. It has wide smooth leaves with a flowering stalk 10 to 30 cm high depending on the species. The nodding flowers can be white, lilac, magenta, red, or pink. They are primarily woodland plants that go dormant in the summer. While in active growth they enjoy a moist humus soil.

One spring, about 15 years ago, I noticed many flowering dodecatheon in a nursery container. The plants had been divided the previous August to single divisions and I couldn't imagine how one crown had produced so many. I quickly shook the plants free of soil to examine the roots. I found a long single root at the base of each plant with small roots starting to form around the crown. In August, I closely examined another crown and found small buds at the ends of most individual roots near the crown. I separated a few roots with these buds and replanted the original crown to evaluate in the spring. I found that each pot had a plant the following spring. Most were flowering size and each pot only had one plant including the large crown I

replanted. The small buds did not develop while still attached to the crown. This led me to the following technique to propagate cultivars of *D. alpinum*, *D. hendersonii*, *D. jeffreyi*, and *D. meadia*. I first wash the soil off the root system after the plants have gone dormant in August. Grasping a root with two fingers about halfway down, I gently pull upward causing the root to break off with the small bud. Our form of *D. meadia* var. *alba* is the only form that often needs to be cut with a small, sharp knife as it often doesn't break off correctly. This is repeated until only a root or two remains on the original crown. Each root is then potted into a quart container about 1 cm below the surface. The potting medium used is sand and peatmoss (7 : 13, v/v) with the pH adjusted to between 7 and 8. No growth is seen until the following spring when the plant is saleable.

***Anemonella thalictroides*.** The rue anemone, *A. thalictroides*, is a woodland native of the East Coast of the United States. Its anemone-like flowers appear in early spring in shades of white or pale pink, sometimes in double forms. It grows 15 to 20 cm high. The trifoliolate leaves are small and delicate, and disappear in the summer when the plant goes dormant.

After my experience with dodecatheon I checked other plants to see if the same technique could possibly work with them. I noticed that anemonella also have minute eyes on the ends of their thickened roots. Crowns are carefully shaken free of soil and separated in August. They look like tiny bunches of carrots 1 cm long. Roots almost fall off on their own, very little pressure is needed. The shaking often separates a few. I leave at least two roots on the original crown. Each root section is repotted into a quart container just below the surface. The medium is sand and peatmoss (7 : 13, v/v) with a pH of 5.5 to 6.5. The following spring almost all flower. Again, left to their own few attached roots seemed to form new plants, but separated they do develop into nice plants which can be sold the next spring.

***Trillium*.** Different species of *Trillium* are native to different parts of the United States and Asia. These perennials offer color to the shaded garden in the spring. They have three petals, three sepals, and a three-celled ovary. A whirl of three leaves is at the end of an unbranched stem. Colors and heights vary with the different species.

A number of years ago, voles ravaged my garden during the fall and winter. The following spring, I noticed much of my *Trillium* stock had produced small single-leaf proliferations. I dug a few plants to see what had happened. The rodents had taken bites just behind the growing shoots. Now in late July, I lift some plants and cut two wedges 3 to 5 mm deep, 3 to 5 mm wide, and about 7 to 8 mm long just behind the shoot with a sharp knife. These are on the sides to the top of the rhizome and they touch at the top center. Only the top half of the rhizome is wounded. These are then replanted with the shoots just below the surface. Many produce numerous small shoots along the rhizome. The first year they appear, about 90% have only one leaf. After the second growing season, when they all have shown three leaves, they are separated off. Each is planted in quart containers with sand and peatmoss (7 : 13, v/v). The pH is adjusted to fit the needs of each species. It still takes me on average 4 years from notching to get to flowering size, but seed production takes me 6 or 7 years after germination. I have used this method successfully on 10 different *Trillium* species.

CONCLUSION

Seed has its place in the production of north American natives but the above methods of asexual propagation work well for our nursery operation. In each case blooming-size plants are produced faster than by using seed.

Commercial Propagation of *Trillium*

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INTRODUCTION

Trillium has a bad reputation. There's a prevailing sentiment among propagators that growing them from seed is difficult. I spoke to a number of you at the Eastern Region meeting in Newport, Rhode Island, in the fall of 1997 and you said, "it takes too long to grow to a saleable size and ties up valuable space in the nursery". When I mentioned vegetative propagation you said, "it doesn't produce the numbers necessary to be worth the effort". I also heard "there's very little demand." Finally, I got the feeling that you thought that no one was propagating trillium commercially.

Trillium doesn't deserve a bad reputation. Growing them from seed is not difficult. They can be brought to a saleable size in a relatively small amount of space in less time than you think. Vegetative propagation is a good method for certain species as well as cultivars and the double-flowered trilliums. A growing number of wholesale nurseries have made the commitment to propagate trilliums. They can't keep up with the demand!

GERMINATION

Understanding the germination process is the first step toward propagation. The seed has an appendage called an aril (or elaisome or strophiole depending on whom you talk to). The aril serves to attract ants and other insects who either eat the aril and discard the seed on the spot or take the seed back to their underground nest for a midnight aril snack eventually discarding the seed in their trash heap. It's been suggested that the aril should be removed prior to planting but that's labor intensive and unnecessary. If you are conducting a seed germination experiment under sterile conditions, it's advisable to remove the aril since a fungus in the aril may interfere with the experiment. The first step in the germination process is the splitting of the seed coat as the cells of the micropylar end of the seed enlarge. The root tip emerges through the enlarged collar followed by the immature rhizome. The root elongates and the rhizome enlarges. The petiole appears next followed by the cotyledon. The seed coat remains attached to the tip of the cotyledon until the cotyledon has absorbed the remaining food supply then drops off. Germination is completed during the first growing season for some species while others may exhibit a need for a subsequent cold period before cotyledon emergence.

FACTORS AFFECTING GERMINATION

A number of factors affect the germination process.