Germinating Difficult Herbaceous Perennial Seeds

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Many perennials have a reputation for being difficult to germinate. It is not the complexity of the process, but rather the lack of information about germination requirements of particular seeds that leads to this misunderstanding.

I am going to discuss some of the basic issues that impact the germination of seeds in genera that are often perceived as intimidating, but are nevertheless very worthwhile growing.

A number of factors can affect the germination process. In many cases, it is not a single factor, but a combination of factors that produces success. The most frequent obstacles to germination are:

1) Impervious seed coat.
2) Lack of long-term viability or complex requirements due to age of seed.
3) Different conditioning requirements.
4) Different temperature requirements at germination.

Specific requirements often apply to many members of a family of plants. For example, many legumes have impervious seed coats. These need to be physically abraded in some manner. Seed from the Umbelliferae and Ranunculaceae generally needs to be fresh when sown in order to achieve high germination percentages. As with most matters related to plants, these generalizations are only useful to a point. There is always variation within a given group.

Plants with hard seed coats are actually very quick to germinate and often need no conditioning other than breaking the seed coat in order to allow moisture to pass through.

Baptisia species are a group of plants with this requirement. There are many good species, some of which are uncommon. Seed is often unavailable or obtainable only in small quantities.

In order to obtain maximum germination, seeds are soaked for 24 h after which any seeds that have absorbed enough water to increase in size are removed and planted. A small notch is filed in the seed coat of the remaining seeds, and these are then soaked an additional 24 h, then planted. This procedure usually results in a high germination percentage within a week.

An alternative method is to abrade the seed between two sheets of sandpaper, although when seed is scarce, the filing method produces a higher germination percentage.

A requirement for many genera is freshness of seed. In these cases it is important to have a seed source that will ship seed in a timely manner. In many cases, it is quite worthwhile to grow stock plants in order to have a reliable supply of fresh seed. Some worthy plants falling into this category are *Aconitum, Clematis, Cimicifuga, Paeonia, Glaucidium, Helleborus*, and *Thalictrum*; all members of the Ranunculaceae. Some plants from other families where freshness of seed is important are *Corydalis, Astrantia, Adonis*, and *Kirengeshoma*.

The very definition of freshness is highly variable. For many seeds, freshness can

mean refrigerated storage after harvest, followed by sowing within a month or two. For others sowing must occur immediately after harvest. These include *Aconitum, Glaucidium, Helleborus, Anemonopsis, Astrantia,* and *Adonis*.

Conditioning is necessary for all seed germination. This is the process by which physical or chemical treatments are used to overcome delay mechanisms in seed. Many of these treatments require alternate periods of time when the seed is exposed to different temperature regimes, usually under moist conditions.

Deno (1993) has run tests on thousands of species and provides useful information on different conditioning requirements in his book, *Seed Germination Theory and Practice.*

These tests provide much practical information as shown in the germination requirements of*Cimicifuga racemosa*. This is a plant that blooms late in the summer with seed ripening in early fall. One might come to the conclusion that since *Cimicifuga* seed ripens just before the onset of winter, it needs a period of cold-conditioning to start the germination process. In fact, this seed first requires a period of time under moist conditions at room temperature, followed by a time period at 40F under moist conditions. It then germinates at 40F.*Cimicifuga* is in the Ranunculaceae and seed freshness has an impact on germination percentage also.

Fresh seed is placed in a plastic bag with a small amount of moist medium and stored at room temperature for 3 months. The bag is then placed in refrigeration at 40F for 2 to 3 months after which germination will commence in the bag. Seed is then removed from the bag and spread out in a flat of soil mix and grown on in a cold frame. This method saves us one year in production time.

It should be noted that we are growing in Zone 5. In areas with milder fall weather, there may be a long enough period of warm weather to condition seed outdoors in one season.

Some other plants that require conditioning at 70F followed by a period at 40F are *Adonis*, some *Clematis, Corydalis, Helleborus*, and *Paeonia*.

The largest group of seeds have relatively simple needs and require one cold period of about 3 months. They will then germinate when the temperature rises. This is especially true when seed is fresh.

However, some seed requires three or more conditioning periods to germinate. In our experience, *Podophyllum hexandrum* and *Veratrum* species require two 3 month cycles of 70F, and two 3 month cycles at 40F. To make things a bit more challenging once the seeds germinate, they produce a set of leaves, then proceed to sit for another year without growing appreciably.

Two plants which we grow, *Kirengeshoma palmata* and *Meconopsis betonicifolia*, require only one conditioning period at 40. Germination begins at this temperature, and it is important to keep the seedlings growing at or near that temperature until they are well established, probably 6 to 8 weeks.

While it is relatively easy to grow young plants of *Meconopsis* under controlled conditions, the real challenge is to find suitable locations for growing it outside, unless you are located in Vermont or New Hampshire.

In our climate *Kirengeshoma* is quite hardy, but the length of the season is insufficient for ripening seeds on plants grown outdoors. We find it worthwhile to keep a stock plant in a container which can be moved into a greenhouse when necessary for the express purpose of ripening seeds. Making this extra effort guarantees a reliable supply of fresh seed.

It is often the combination of previous knowledge of a given plant, with our experience in germinating its seed, and perhaps most importantly with what we know of the plant's natural habitat that results in the discovery of an efficient germinating procedure. For it is when we succeed in our attempts to mimic those natural conditions that we can overcome dormancy in the seed, and are rewarded with germination.

LITERATURE CITED

Deno, N.C. 1993. Seed Germination, Theory and Practice. 2nd edition. State College, Pennsylvania.

Propagation and Production of Wildflowers.

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INTRODUCTION

The topic of this paper is propagation and production of wildflowers. It is based on the work I did from 1990 to 1995 as propagator at Garden in the Woods, the botanic garden of the New England Wild Flower Society in Framingham, Massachusetts. The nursery at Garden in the Woods was established to propagate plants for the garden's collection, to conduct research on propagation and cultivation techniques for native species, and to produce plants for sale to the general public. Every year approximately 16,000 pots of nursery-propagated native plants (mostly herbaceous wildflowers) are sold from this facility to support the Society's various education and conservation programs.

When I became propagator, I wanted my nursery practices to reflect the Society's mission of native plant conservation. In my mind, this means plant propagation that preserves the genetic diversity inherent in wild native plants and cultivation practices that are conserving of natural resources. I see traditional nursery practices which emphasize vegetative propagation of "superior clones" and a reliance on sterile peat-based soil mixes nourished with petroleum fertilizers as counter to this mission. Instead, I focused most of my propagation on seed germination out of doors in flats or raised beds, and I developed an inexpensive compost-based potting mix that eliminated the need to use peat moss and fertilizers made from fossil fuels.

SEED PROPAGATION

Because much of our native flora has been overlooked by the nursery trade, many species have not been altered by plant domestication and breeding. Hence these plants can be propagated the way they do in nature—from seed. Seed propagation of wild flowers has several advantages:

- Plants grown from seed exhibit a wide range of genetic diversity, unlike plants which are vegetatively propagated and are genetically identical to the parent plant. Genetic diversity in wild plant populations enhances a species' ability to adapt to changing conditions. This is particularly desirable for plants that are used by