

# Breaking daylily seed dormancy with stratification



▲ These seeds were refrigerated dry for four weeks followed by four weeks on a dampened coffee filter at room temperature. Compare with the next image. — Susan Bergeron photos

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When we buy packets of annual flower or vegetable seeds at retail stores and garden centers, those seeds generally germinate within a few days or a couple of weeks of sowing as long as they are provided with suitable temperatures, sufficient oxygen, and adequate but not excessive moisture. This is not always the case with daylily seeds, however, some of which can be quite slow to germinate.

The slow germination of some daylily seeds is frequently related to the conditions they experienced before being planted rather than the planting environment, because daylily seeds belong to the group of plants that can experience seed dormancy. This means that seeds will not necessarily germinate immediately when provided with normal germination conditions even though they are alive and capable of germination.

Dr. Robert Griesbach (see article page 30) conducted extensive research to further our understanding of daylily seed dormancy and germination back in the 1950s, some of which was published in AHS journals of the time. These articles are now available on the AHS website:

<http://www.daylilies.org/AHSArchives.html>

Dr. Griesbach discovered that although some daylily seeds will germinate more or less immediately when sown, a percentage benefit from moist-chilling, commonly referred to as stratification, in order to quickly break their seed dormancy. Over the years, the “moist” aspect has sometimes been overlooked resulting in disappointment for many who find their dry refrigerated seeds don’t all germinate as quickly as desired. Those stragglers are often discarded because the gardener assumes they are not viable if they don’t emerge with the others, or that the late ones are weak when in reality they are just dormant.

When someone says they had a low germination percentage with their particular seed starting method, ask at what length of time after sowing the percentage was calculated. For instance was it after two weeks, four weeks, two months or six months? The number of seeds that germinate may increase over time if the seeds aren’t



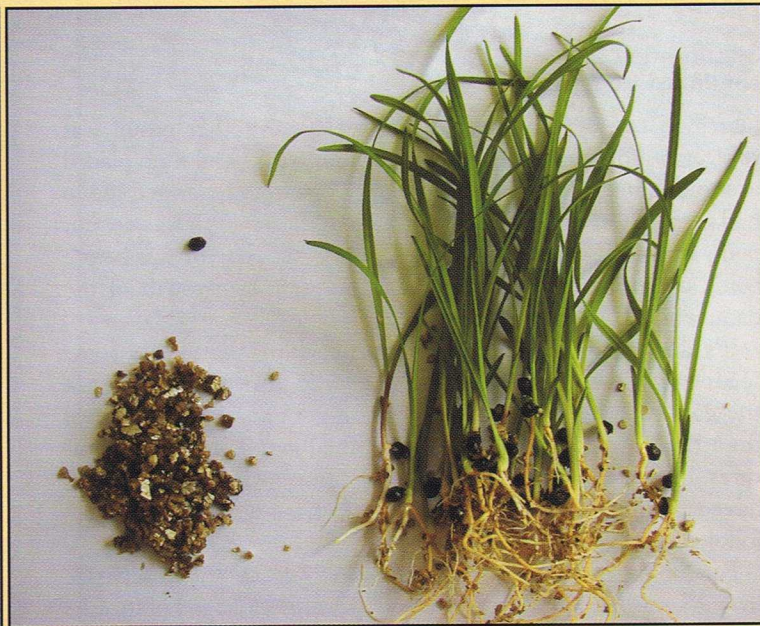
▲ Seeds are shown stratified in various dampened media for one month and pictured one month after removal from refrigerator. Left to right: sand, perlite, vermiculite, and coffee filter. Germination was 97 percent except for those on coffee filter at 93 percent. Damp coffee filter seedlings were also smaller.

tossed before they are ready to cooperate, so the germination percentage may change. In fact many people have thrown out or reused media containing un-germinated daylily seeds only to find seedlings emerging months later because they were merely dormant rather than dead.





▲ These seeds were refrigerated on a damp coffee filter for four weeks followed by four weeks at room temperature. A much higher germination and more growth is seen than those refrigerated dry as seen in previous photo. But compare these with...



▲ Seeds refrigerated in damp vermiculite for one month germinated at 97 percent after one month at room temperature. They had more growth as well as higher germination rates compared to controls. Results for sand and perlite were equally good.

The number of dormant seeds in a given batch of daylily seeds may vary due to several factors, thus some gardeners may have very few dormant seeds and need no moist-chilling to achieve prompt germination at high percentages. Others may have many seeds that don't germinate within three or four weeks of sowing due to seed dormancy. If one gets different results from different crosses, or even from the same cross in different years, and the gardener didn't adequately moist-chill the seeds before sowing, then those differences could simply be the result of variable percentages of dormancy in the seeds.

So how does one moist-chill, or stratify, daylily seeds? According to Dr. Griesbach's research, the effective range for stratifying daylily seeds is 0-10 degrees C, 32 to 50 degrees F, with the low end of this range being the optimum. Some people sow their daylily seeds outdoors in fall or winter, although this could have variable results in different climates. Others sow their seeds outdoors in spring while the soil is still cool enough to break any seed dormancy but when the risk of potentially damaging freezing temperatures is lower. Seeds can often tolerate significant freezing if sufficiently dried but not when hydrated. Plus freezing does not necessari-

ly contribute to stratification time. Four to eight weeks of moist-chilling was sufficient for the breaking of daylily seed dormancy in Dr. Griesbach's outdoor experiments.

Many people prefer starting their daylily seeds indoors over winter or early spring. If seed dormancy is anticipated, it can be broken before sowing by stratification in a refrigerator. The seeds are simply refrigerated in damp conditions (not wet, because that would reduce oxygen supply) for about four to six weeks prior to the intended sowing date. Between harvest and stratification, the seeds may be stored dry at cool room temperature if high humidity can be avoided, or in the fridge. Many people feel their seeds experience less mold if sufficiently dried (for about two or three weeks) prior to long term storage in a refrigerator. Until used in his experiments, Dr. Griesbach's seeds were generally stored in paper bags at room temperature.

Sufficient moisture for stratification can be maintained by enclosing the seeds and damp media in plastic sandwich bags, small freezer containers, old film canisters, etc. to prevent drying out. The necessary moisture can be provided by mixing the seeds with, or placing them on, various

dampened media according to preference (e.g., vermiculite, perlite, sand, paper filters, kitchen paper towels, etc). If you wish to separate the seeds later at planting time rather than starting them while still in their refrigeration container, it is best not to use media dark in color or it will be more difficult to pick out the seeds.

Wondering whether the media used would make a difference to stratification effectiveness, I tested dampened sand, perlite, vermiculite and coffee filters with some previously un-refrigerated daylily seeds using insect-pollinated pods. After four weeks in damp conditions in the fridge followed by four weeks at room temperature in the same media, germination was 97 percent for all except those on the damp coffee filter, which germinated at 93 percent. Although the difference in germination percentage was not significant, the seedlings that germinated on the damp coffee filter had grown less than those in the other media.

A comparison control group of never-refrigerated seeds was sown at room temperature at the time the other seeds went into the fridge. Germination in this non-stratified group was only about 17 percent after four weeks, although this had



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increased to 43 percent by eight weeks. Another group was refrigerated dry rather than damp for four weeks and then placed at room temperature for four weeks. This dry refrigerated group had germinated at 60 percent by the time their month was up, but many of them had only just started to sprout a day or two before being counted, in comparison to the significant growth of the damp chilled seeds.

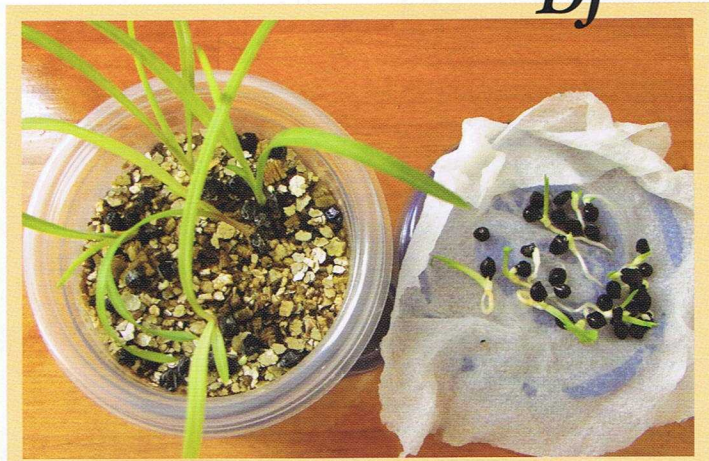
It's important to note when moist-chilling that while some seeds may germinate during the refrigeration period, this is not the goal. The goal is for the seeds to germinate after removal from the fridge and placement at normal germination temperatures. In other words, the seeds are not left in the fridge until all have germinated. What we are aiming for is a simulated "winter" followed by a warmer "spring."

For the purposes of this article it is also important to separate in one's mind dormancy of the seed from the foliage habit of its parents or the ultimate foliage habit of the seedling itself. While I don't know of any specific studies on this aspect, it doesn't necessarily follow that seed dormancy is absolutely related to foliage habit. For example, Japanese research with *Hemerocallis dumortieri* var. *esculenta* and *H. fulva* var. *littorea* found that both species produced some seeds with dormancy and some without.

One question that is often asked is whether seeds refrigerated straight from the pod, with no drying, would already contain enough moisture for chilling to break their dormancy. A couple of years ago, using seeds chilled straight from the pod with no supplemental moisture, I found they did not germinate any better than the low rate of seeds that hadn't been chilled, implying seed dormancy was still present in most of the refrigerated seeds. But the number of seeds available for this test was too small, so this experiment needs to be repeated. If refrigeration seems to work straight from the pod, it's possible those seeds were not dormant anyway. We cannot tell if a given seed is dormant by looking at it, or from its parentage. The only way to find out is to start them and see how many germinate within three or four weeks. If many don't germinate within that time-frame, consider stratifying in future.

Other dormancy-breaking suggestions are made for daylily seeds, such as soaking the seeds in dilute hydrogen peroxide, or soaking in plain water. In my experience soaking in dilute hydrogen peroxide can indeed speed up germination, but others have told me some seeds stubbornly refuse to germinate in it and still need to be stratified. Prolonged soaking in plain water appeared to inhibit daylily seed germination in my tests so I wouldn't recommend it. It may be that those gardeners who appear to have success with soaking seeds in plain water have seeds that are not dormant and which would, therefore, germinate right away if planted conventionally.

The bottom line is that if your seeds typically germinate slowly over a protracted period of time (i.e., it takes longer than a month to get a satisfactory germination rate) then you may want to try moist-chilling in future years to see if that improves your short-term germination percentages. ■



▲ These are the control groups started without moist-chilling. Those on the left were planted the same day all the other groups went into the refrigerator and those on the right were refrigerated dry on coffee filter paper for one month prior to one month damp at room temperature. Picture taken eight weeks from start of test.

#### References:

- Griesbach, RA and Voth, PD. On Dormancy and Seed Germination in *Hemerocallis*, *Botanical Gazette*, Vol. 118, No. 4 (Jun., 1957), pp. 223-237. The University of Chicago Press. Available for purchase from: <http://www.jstor.org/pss/2473081>
- Suzuki, K., Nakajima, H., Hamano, C. Cold-induced germination promotion in *Hemerocallis dumortieri* var. *esculenta* and *H. fulva* var. *littorea* seeds. The biology of seeds: recent research advances. *Proceedings of the Seventh International Workshop on Seeds*, Salamanca, Spain, 2002